

LEAGUE OF NATIONS

League of Nations Publications

III. HEALTH

1931

1-8

TABLE OF CONTENTS.

League of Nations Publications.

III. HEALTH.

Ser.L.o.N.P.

- 1931.III.1. ✓ Tuberculosis in Denmark, Norway and Sweden, by Dr. Ostenfeld, Dr. Heitman and Dr. Neander. 4-89H.
- 1931.III.2. ✓ The Principles of the Prophylaxis of Leprosy — First General Report of the Leprosy Commission. 90-95H.
- 1931.III.3. ✓ Annual Report of the Health Organisation for 1930.
- 1931.III.4. ✓ Report of the Laboratory Conference on the Serodiagnosis of Syphilis convened at Montevideo by the Institute for the Prevention of Syphilis of Uruguay (September 15th-26th, 1930). 96-161H.
- 1931.III.5. ✓ Health Committee — Minutes of the Seventeenth Session held at Geneva from May 4th to 8th, 1931.
- 1931.III.6. ✓ Housing and Malaria (A Critical Summary of the Literature dealing with This Subject) by Lt.-Col. Clayton Lane. 162-183H.
- 1931.III.7. ✓ European Conference on Rural Hygiene — Report of the Preparatory Committee on the Principles governing the Organisation of Medical Assistance, the Public Health Services and Sanitation in Rural Districts. 184-215H.
- 1931.III.8. ✓ Report on Medical Schools in China by Professor Knud Faber. 216-239H.
-

LEAGUE OF NATIONS

League of Nations Publications

III. HEALTH

1931

9-14

TABLE OF CONTENTS.

League of Nations Publications.

III. HEALTH.

Ser.L.o.N.P.

- 1931.III.9. ✓ Protective Measures against Dangers resulting from the Use of Radium, Roentgen and Ultra-violet Rays, by Professor H. Wintz. 240-296H.
- 1931.III.10. ✓ Report of the Permanent Commission on Biological Standardisation (London, June 23rd, 1931). 297-335H.
- 1931.III.11. ✓ European Conference on Rural Hygiene (June 29th to July 7th, 1931), 2 vols. 336-459H.
- 1931.III.12. (Cancelled.)
- 1931.III.13. ✓ Report on Material Welfare and the Hygiene of Infants and Children of Pre-school Age by the Reporting Committee appointed to deal with these Questions. 460-497H.
- 1931.III.14. ✓ Health Committee — Minutes of the Eighteenth Session held in Paris on October 12th and 13th, 1931.
-

Official No. : **C. H. 957.**
Geneva, June 1931.

LEAGUE OF NATIONS

HEALTH ORGANISATION

TUBERCULOSIS
IN DENMARK,
NORWAY AND SWEDEN

by

DR. OSTENFELD, DR. HEITMANN AND DR. NEANDER

Series of League of Nations Publications

III. HEALTH ✓

1931. III. 1.

CONTENTS.

I. Text.

	Page
INTRODUCTION	5
I. FUNDAMENTAL STATISTICAL ELEMENTS:	
Denmark	7
Norway	7
Sweden	9
2. PRELIMINARY REMARKS.	10
Situation, Physical Conditions and Climate.	10
Population	12
Demographic Statistics	16
Statistics of Occupations	20
Movements of Population	23
Emigration	23
Internal Migrations	28
3. GENERAL MORTALITY IN THE THREE SCANDINAVIAN COUNTRIES.	35
General Mortality by Age-Groups	40
General Mortality by Provinces in Each Country	47
4. MORTALITY FROM TUBERCULOSIS OF ALL FORMS AND FROM PULMONARY TUBERCULOSIS	50
Mortality from Tuberculosis by Age and Sex	
Mortality from Tuberculosis by Administrative Divisions (Fylker, Län and Amter) in the Three Countries	67 77
5. ORGANISATION OF ANTI-TUBERCULOSIS WORK:	
Denmark	89
Norway	97
Sweden	109

II. Statistical Tables.

1. Tables regarding General Mortality, Nos. 1 to 18	118
2. Tables regarding Tuberculosis Mortality, Nos. 19 to 52	138

INTRODUCTION.

Knowledge of the factors determining an increase or a decrease of tuberculosis is the most logical and trustworthy basis for the fight against this disease. The mortality from tuberculosis in a given country is determined by a great many factors of a biological, economic, social and medical nature, the respective importance of which should be measured in order to determine in a rational manner the best means for its control.

The Health Committee decided, in October 1924, to undertake an international study of this subject. At its request, two studies of a preliminary character were elaborated: one on the value and interpretation of tuberculosis statistics,¹ another on the causes of the decrease of tuberculosis mortality observed in a certain number of countries.²

The Tuberculosis Commission formed by the Health Committee in April 1925 decided to undertake a general study in several countries on the importance of the various factors influencing tuberculosis mortality.³

This investigation required exact and detailed data on tuberculosis mortality, going back as far as possible, and also statistics on the factors influencing its course (nutrition, housing, anti-tuberculosis measures, etc.).

The three Scandinavian countries, Denmark, Norway and Sweden, seemed to offer particularly favourable conditions for an enquiry on the factors influencing the incidence of tuberculosis, not merely because the necessary statistical data were available, but also because they present a geographical and ethnical unity which facilitates the comparison, and, finally, because the different provinces of Norway and Sweden are far from having attained the same point in the evolution of their tuberculosis mortality.

The plan for a uniform enquiry along parallel lines in the three countries was adopted⁴ during a meeting which took place at Copenhagen at the State Serum Institute under the chairmanship of Professor Madsen in September 1925.

Dr. N. Heitmann, Inspector-General of the State Anti-Tuberculosis Services of Norway; Dr. G. Neander, Medical Director of the Swedish National Association against Tuberculosis; and Dr. J. Ostenfeld, Secretary-General of the Danish Association for the Fight against Tuberculosis, undertook the enquiry in their respective countries.

In Norway, Dr. Heitmann received, as far as the statistical part of his task was concerned, the assistance of the Central Statistical Bureau (Director, Dr. Jahn) and, in particular, of Miss J. Backer, who was in charge of the vital statistics of this bureau.

¹ *Die Tuberkulosestatistik* (document C.H.284.1925), by Dr. S. ROSENFELD, of Vienna. Analytic summary in French and English (document C.H.284(1)).

² *Causes of the Recent Decline in Tuberculosis Mortality* (document C.H.291.1925), by Dr. Y. BIRAUD, of Paris.

³ Cf. document C.H.374: Studies of the Tuberculosis Commission, in Annex 72 of the verbal proceedings of the Health Committee's session of October 1925 (document C.647.M.236.1925.III), pages 80 and following.

The results of these three national enquiries were discussed by their authors at a second meeting held at Copenhagen in September 1929. At the request of his two colleagues, Dr. Ostenfeld undertook to prepare the comparative study of the information collected and to prepare the conclusions. This study, having been approved by Dr. Heitmann and Dr. Neander, is contained in the present volume.

This volume also contains valuable and detailed information regarding the general mortality, the tuberculosis mortality, and their evolution in the three countries, as well as notes on the organisation of anti-tuberculosis activities. The comparison is very interesting and the statistical material throws light upon many obscure points in the epidemiology of tuberculosis. It might serve as a basis for further special research into certain factors determining the tuberculosis mortality, researches which the lack of information has hitherto made impossible.

We desire here to express our sincere thanks to the three who undertook the enquiry and in particular to Dr. J. Ostenfeld, the Rapporteur.

THE HEALTH SECTION.

I. FUNDAMENTAL STATISTICAL ELEMENTS.

DENMARK.

The figures are based on the official mortality statistics issued by the Health Department. By the Law of January 2nd, 1871, physicians examine bodies and issue certificates stating the cause of death in the case of all deaths in towns and of deaths in the country districts which occur within two kilometres of a physician's residence. For other deaths in country districts, the death certificate may be issued by lay officials (Ligsynsmand).

Until 1920, regular statistics of the various causes of death are therefore given only in respect of the urban population.

Since 1920, it has been possible to register all deaths in the country with an exact statement of the cause of death. When a certificate is issued by a lay official (Ligsynsmand), the medical officer obtains a declaration from the last physician who treated the deceased as to the diagnosis of the fatal illness. Since 1920, therefore, completely reliable mortality statistics are available for the entire country.

There has been a great increase in the number of examinations of bodies by doctors in the case of deaths in country districts. In 1911, such examinations were held in respect of 60 per cent of all deaths in country districts; in 1924, 83 per cent; in 1926, 91 per cent. In 1928, the percentage of cases where the cause of death was unknown or was not certified by a physician was only 1.1 per cent.

Except for investigations regarding the general death-rate, as stated above, figures were only available for the urban population until 1920. The Danish statistics of tuberculosis mortality are thus based exclusively on doctors' certificates stating the cause of death.

Deaths occurring elsewhere than at the place of domicile are nevertheless registered at that place, and not at the place of death. The statistics therefore relate to the domiciled (legal) population.

The population and its distribution by sex, age and locality is calculated by the Statistical Department on the basis of the official census returns.

NORWAY.

The general mortality figures in Norway are calculated on the basis of the total number of deaths registered by the clergy and published by the Central Statistical Bureau.

It is based for the country as a whole on the number of deaths among the domiciled population. Until 1918, the number of deaths in the existing population (for Oslo until 1927) was used for making special calculations regarding country districts and towns;

but, since 1919 (in Oslo since 1928), the domiciled population has been used as a basis.

Calculations of the death-rate from all forms of tuberculosis and consumption are based on the medical officers' reports containing causes of deaths, which are published in the Health Department's reports.

In the towns, every certificate stating the cause of death must be issued by a physician, while in the country districts the civil authorities issue a declaration of death which is transmitted to the medical officer, who also receives from the clergy death certificates for the urban population.

The statistics regarding causes of death based on doctors' declarations are, however, not correct. Except for the city of Oslo, they always contain a smaller number of deaths than that declared by the clergy, and the difference was very large, particularly in country districts at the beginning of the period under investigation.

The deaths from causes known from medical certificates formed the following percentages of the total:

Year	Total	Country districts	Towns
1867	35	—	—
1870	39	—	—
1880	50	38	88
1890	56	45	88
1900	83	78	93
1910	88	86	93
1920	92	92	92

The discrepancies between the information obtained from physicians and from the clergy are not the same in the various age-groups; they are greatest in the case of children and old persons and smallest in the medium age-groups.

Tuberculosis death-rates calculated directly from the tuberculosis mortality figures supplied only by physicians will therefore be somewhat too low, particularly for the age-groups in which the deaths reported by physicians are the most incomplete.

In order to arrive, as far as possible, at the correct figures, the number of deaths from tuberculosis among males and females has been calculated for the country as a whole, including both rural districts and towns, on the assumption that the percentage of tuberculosis cases is the same among deaths from unknown causes as from deaths from known causes.

By this method the number of deaths from tuberculosis, particularly in the first years of the period under investigation, may be placed somewhat too high, as the number of deaths from unknown causes was fairly large. Deaths from tuberculosis and other chronic illnesses come more readily to the knowledge of the physicians than deaths from acute illnesses, and therefore the tuberculosis death-rate given is probably somewhat higher than the reality, particularly in the earlier years. In any case, it is certainly not too low.

In the case of Oslo, tuberculosis mortality is calculated directly on the basis of the figures supplied by physicians, since there has always been very little variance between the number of deaths from tuberculosis reported by physicians and by the clergy.

The information regarding the population of the country classified by sex and age is taken from the official reports and calculations on the subject.

SWEDEN.

In 1860, compulsory post-mortem examination by a doctor was introduced in Swedish towns. The statistics regarding causes of death are therefore entirely reliable for towns, in respect both of the general death-rate and the death-rate from tuberculosis.

In the country districts, the following procedure was introduced in 1911: registers of deaths are kept by the clergy, who enter the cause of death therein (*a*) in all cases where a body has been examined by a doctor and (*b*) in all cases where reliable information is obtainable regarding the cause of death.

Where no information is obtainable regarding the cause of death, the clergyman states the name of the last doctor who treated the deceased. Every half-year a copy of the death registers is sent to the provincial medical officer, who revises and supplements the causes of death by any information he is able to obtain. Under this system, the percentage of cases in country districts in which the cause of death was unknown was only 3.26 in 1925, and this figure is steadily falling.

All deaths are recorded at the place of domicile, whether they occur there or not. The statistics are therefore complete and reliable:

*

* *

It will be seen from the above: (1) that the tuberculosis mortality statistics in the three northern countries are now placed on as accurate a basis as possible; (2) that entirely reliable information regarding the death-rate from tuberculosis can be given for certain areas in the three countries — in Sweden from 1911, in Norway from 1918 and in Denmark from 1920; (3) that accurate statistics of tuberculosis mortality among the urban population only can be given for all three countries, for a much earlier period — namely, from about 1880.

2. PRELIMINARY REMARKS.

Before going into details in the present investigation regarding the general death-rate from tuberculosis in the three countries, we shall give some general information regarding the countries themselves, and the number and composition of their respective populations, etc., merely observing here that the population in all three countries is a common northern branch of the Teutonic race.

SITUATION, PHYSICAL CONDITIONS AND CLIMATE.

Denmark has an area of 42,927 square kilometres, with a population, according to the latest official census (November 5th, 1925), of 3,434,555. The country consists of Jutland, a peninsula jutting out from Central Europe, and about 150 large and small islands. It falls naturally into two main parts, Jutland and the islands, the latter of which may also be divided into the Funen group, the Zealand group and Bornholm. The country lies between 54° 33', and 57° 44' N.; it therefore extends over only three degrees of latitude, and the distance from north to south in a straight line is 360 kilometres. With the exception of Holstein, where Jutland joins Central Europe, the country is everywhere surrounded by sea; the length of the coast is approximately 5,000 kilometres (including fjords and bays).

Denmark consists entirely of lowland, with the exception of Bornholm, which has the same characteristics as the Scandinavian peninsula, and the Faroes, a group of rocky islands lying out in the Atlantic in 62° N. lat. More than half the country has an elevation of less than 30 metres above sea-level, and the highest point is 172 metres. The country is, however, not distinctively flat. The soil is uneven and undulating, with streams running through small valleys. The rivers are small, but the country is rich in lakes.

The climate is of the mild temperate insular type. The average temperature is 7.6° C. The difference between summer and winter temperature is only about 17° C., while this difference in other countries in the same latitude amounts to 28° C. The prevailing wind is from the west, except in spring, when the east wind is equally frequent. The wind reaches gale force on an average fifty-four days in the year. The average number of days when the thermometer is below freezing-point over a longer or shorter period is 120 to 130 in the middle of Jutland, and 80 to 95 along the coast and on the islands. There is rain or snow on 150 days on the average (including twenty-nine days of snow), the total annual fall amounting to about 600 millimetres.

*
* *
*

Norway lies between $57^{\circ} 58'$ and $71^{\circ} 11'$ N. lat. The length of the mainland in a straight line from Lindesnaes to the North Cape is 1,756 kilometres; the coastline is 3,400 kilometres long, without taking into consideration the fjords and bays. The area of Norway is 323,793 square kilometres. Only 30 per cent of the area is productive, while the remainder consists of hilly country, water, marshes, etc., which are uncultivated on account of the nature of the soil and the unfavourable climatic conditions; 40,000 square kilometres of land lies over 1,000 metres above sea-level, and 90,000 square kilometres between 500 and 1,000 metres. The average height is 490 metres. Owing to the Gulf Stream and the curious formation of the sea-bed along the coast, Norway has a milder climate than any other country in the same latitude, the average temperature at the Polar Circle being $+ 4^{\circ}$ to $- 5^{\circ}$ C., and in the eastern and southern part of the country from $+ 4^{\circ}$ to $- 7^{\circ}$ C. The climate is moist and the rainfall varies from 700 to 1,400 millimetres, but is considerably higher in many districts on the west coast; in a country with such a varied elevation the height above sea-level has a greater influence than the latitude on the climate in the various districts.

*
* *
*

Sweden occupies the eastern part of the Scandinavian peninsula. It is bounded on the west and north by Norway and on the north-east by Finland, and is elsewhere surrounded by water.

The area is 448,500 square kilometres. In 1925, the population was 6,036,000. The country lies between $55^{\circ} 20'$ and $69^{\circ} 3'$ N. lat. Its area is therefore very extensive, and the distance in a straight line between the northernmost and the southernmost points is 1,574 kilometres.

After Finland, Sweden is the richest country of Europe in fresh water. The lakes and rivers occupy an area of 37,900 square kilometres, or 8.4 per cent of the entire surface of the country. In addition, the country has many fjords and a number of archipelagoes both in the east and in the west containing numerous islands, islets and rocks. The physical features of the land are very varied. In the north, there are the north Swedish highlands, including Norrland, Dalecarlia and Vermland; they include a mountain chain with summits up to 2,000 metres, sloping down towards the Gulf of Bothnia and the lakes of central Sweden. Here there are numerous, often narrow, river valleys. Then come the central Swedish lowlands, partly covered by large lakes, and the south Swedish highlands, consisting of Småland, Västergötland, Halland, northern Scania and Blekinge. The highest parts of this district are 300 to 400 metres above sea-level. As in northern Sweden, this district includes extensive forests of pine and fir, mixed with birch and oak. Considerable areas are cultivated, while there are also extensive districts of moorland and peat bogs. The most southern part of the country is the flat region of Scania, which resembles the Danish islands.

Of the area of Sweden, 15 per cent lies within the Polar Circle, while the remainder is in the temperate zone. The climate of northern Sweden is similar to that of Russia, while the climate of the southern districts is more like that of Central Europe. The difference between the summer and winter temperature in Sweden is much greater than in Western Europe, but, on the other hand, much less than in the interior of Russia. The maximum summer temperature rises in most places to about 30° C., while the lowest winter temperature drops to $- 15^{\circ}$ to $- 20^{\circ}$ C. in the south and $- 30^{\circ}$ to $- 40^{\circ}$ C. in

the north. The country being so large, there are wide variations in the climate. While the spring advances slowly from south to north, the summer comes with great rapidity. The prevailing wind is south to south-west. The mean rainfall amounts to 515 millimetres, but both rainfall and snowfall vary considerably in different parts of the country.

POPULATION.

The population in the three northern countries belongs almost exclusively to the northern branch of the Germanic race.

DENMARK.

The population includes elements born in other countries. This proportion included, per 1,000 inhabitants:

29.6 in 1870
32.2 in 1880
33.3 in 1890
37.6 in 1901
34.2 in 1921

Of the population of foreign birth, a very large proportion comes from neighbouring countries. Denmark is one of the most thickly populated countries in Europe. The number of inhabitants per square kilometre was as follows:

67.9 in 1911
74.8 in 1916
75.9 in 1921
80.0 in 1925

The most thinly populated part is south-west Jutland, with 33.9 inhabitants per square kilometre in 1911, and 39.7 in 1925; while the most thickly populated is Funen, with 89.9 in 1911, and 97.7 in 1925.

The following table shows the increase in the population:

1860	1,608,362
1870	1,784,741
1880	1,969,039
1890	2,172,380
1901	2,449,540
1911	2,757,076
1921	3,267,831
1925	3,434,555

Even apart from the increase in population and area brought about by the union of southern Jutland with Denmark in 1920, it will be seen that the population of the same area was doubled in the sixty years from 1860 to 1921.

The distribution of the population in the towns and country districts has undergone considerable change:

Number of inhabitants per 1,000

Year	In country districts	In towns (including the capital)	In Copenhagen alone
1860	766	234	101
1870	751	249	111
1880	719	281	133
1890	666	334	165
1901	608	392	200
1911	597	403	212
1921	566	434	226
1925	568	432	225

The population of the capital — 700,000 — is remarkably large in proportion to the total population. The other Danish towns are, on the whole, very small. Of the eighty-six provincial towns in 1928, forty-one had less than 5,000 inhabitants, twenty-two between 5,000 and 10,000, and sixteen between 10,000 and 20,000, and only seven had from 20,000 to 75,000 inhabitants.

The above figures giving the proportion between the town and country population are based on the purely administrative division between towns and country, according to which various urban areas (suburbs, stations, etc.) are regarded as belonging to the rural districts. If these are included in the towns, about 53 per cent of the country's entire population become town-dwellers, while the capital alone accounts for 22 per cent of the entire population.

The growth in the town population is due not so much to the excess of births over deaths as to emigration, for which see below.

NORWAY.

From prehistoric times the population of Norway has consisted of Norsemen belonging to the Northern branch of the Germanic race, while there are also a small number of Lapps, who are of Mongolian origin. There has been a small immigration of Finns to the provinces (Fylker) of Troms and Finmark. The non-Norwegian element of the population is, however, almost negligible, and at the last census only amounted to about 1 per cent.

At the end of 1927, Norway had 2,797,827 inhabitants, so that the country is one of the most thinly populated in Europe. In 1927, there were nine inhabitants per square kilometre. The most thickly populated districts are around the Oslo Fjord and in the south-west. The inland and northern districts are thinly populated. In Finmark there is scarcely one person per square kilometre. Though the population per square kilometre is relatively small, however, this does not mean that the people live in isolated houses at great distances from each other. The inhabited areas in the valleys and along the coasts are thickly populated; but, on the other hand, there may be great distances between these populated tracts.

Norwegian towns are, on the whole, very small. Of the sixty-seven towns existing in 1927, thirty-nine had less than 5,000 inhabitants. Oslo has 251,000 inhabitants, after which come Bergen, with 96,000, and Trondhjem, with 56,000.

The following table shows the increase in the population:

1865	1,701,756
1875	1,813,424
1890	2,000,917
1900	2,239,880
1910	2,391,782
1920	2,649,775
1927	2,797,827

In the period under investigation, the population has therefore increased by about 65 per cent. A great change has taken place in the proportion between country and town-dwellers.

Number of inhabitants per 1,000:

Year	In country districts	In towns
1865	844	156
1875	817	183
1890	763	237
1900	720	280
1910	712	288
1920	704	296
1927	716	284

The above figures are based on the purely administrative divisions between towns and country districts; a great part of the population living near the towns, however, actually belongs to the towns. If the people living in thickly populated districts near towns are included in the urban population, that population would amount, for the year 1920, to 370 per 1,000 of the total population. Of the remaining population, 8 per cent lived in groups of houses in the country and 55 per cent in isolated dwellings.

SWEDEN.

As in Norway and Denmark, the population belongs to the North Germanic branch. It is very uniform, the only foreign elements being about 7,000 Lapps and 30,000 Finns. In 1925, the population was 6,044,840. On the whole, the country is very thinly populated and has fifteen inhabitants per square kilometre. In Europe, only Norway and Finland are more thinly populated.

The density of the population is very varied. In Lapland there are 0.9 inhabitant per square kilometre; in Jämtland and Norrbotten, from three to five, while the density increases greatly in the more southern districts. In Närke and Östergötland, there are thirty to forty inhabitants per square kilometre; in Blekinge, Södermanland and Västmanland, fifty; and in Scania, sixty-eight.

The following table shows the increase in the population:

1860	3,823,732
1870	4,163,641
1880	4,572,285
1890	4,779,695
1900	5,116,922
1910	5,499,422
1920	5,875,763
1925	6,044,840

In the period under investigation, the population has therefore increased by 58 per cent.

Most of the population live in the country districts, but the town population is growing much more quickly than the country population.

Number of inhabitants per 1,000:

Year	In country districts	In towns
1860	889	111
1870	872	128
1880	850	150
1890	813	187
1900	786	214
1910	754	246
1920	706	294
1925	693	307

Only three Swedish towns have more than 100,000 inhabitants (including Stockholm with 450,000); twelve towns have more than 20,000; twenty between 10,000 and 20,000; thirty-three between 5,000 and 10,000; while forty-three towns have a smaller population than 5,000.

Summary. — While Denmark is one of the most thickly populated countries in Europe, Norway and Sweden are among the most thinly populated. In all three countries the population has greatly increased, particularly in Denmark and to a less extent in Norway and Sweden. Most of the population live in rural districts. The proportion between the population in towns and in country districts has, however, undergone considerable change in all three countries, the town population growing relatively much more quickly than the country population. It is a trait common to all three countries that most of the towns are very small.

The figures given here for all three countries are based on the administrative divisions of town and country districts, according to which part of the population living under urban conditions is counted as belonging to the rural population.

DEMOGRAPHIC STATISTICS.

DISTRIBUTION OF POPULATION BY SEX.

Denmark: Per 1,000 Persons.

Year	The country as a whole		Copenhagen		Provincial towns		Country districts	
	Males	Females	Males	Females	Males	Females	Males	Females
1880	491	509	462	538	486	514	498	502
1901	487	513	457	543	475	525	501	499
1921	487	513	454	546	471	529	506	494
1925	488	512	452	548	470	530	515	485

Norway: Per 1,000 Persons.

Year	The country as a whole		Oslo	
	Males	Females	Males	Females
1880	488	512	463	537
1900	485	515	458	542
1910	482	518	450	550
1920	487	513	456	544
1927	486	514	—	—

The excess of females is much greater in the towns than in the country. At the 1920 census, there were 499 males and 501 females per 1,000 of the rural population — *i.e.*, the two sexes were almost equal — while in the town population in 1920 there were 460 males and 540 females per 1,000.

Sweden: Per 1,000 Persons.

Year	The country as a whole		Stockholm		Urban population		Rural population	
	Males	Females	Males	Females	Males	Females	Males	Females
1880	486	514	450	550	455	545	491	509
1900	488	512	457	543	460	540	495	505
1910	491	509	450	550	462	538	497	503
1920	491	509	446	554	465	535	501	499

As these tables show, the age-group under 15 years in both countries is less numerous than formerly; the age-groups between 15 and 30 years are more numerous, as are also those over 60 years. Further, the distribution of the population by age in the two countries differs less in the censuses after 1890 than before that year.

Fluctuations in the size of the age-classes between the various censuses are shown by the following percentage figures:

Denmark.

	Year					
	1860-1870	1870-1880	1880-1890	1890-1901	1901-1911	1911-1921
Under 15 years	10.4	11.7	13.6	9.7	11.4	4.5
15-19 years	13.9	6.7	10.5	21.4	7.4	15.8
20-24 years	6.7	16.5	1.3	20.9	9.6	19.5
25-29 years	10.4	10.8	3.6	16.3	17.6	13.8
30-59 years	10.9	5.8	8.5	11.5	14.8	16.8
Over 60 years	21.6	19.5	17.6	8.6	12.0	17.9
The population as a whole	11.5	10.3	10.3	12.7	12.5	12.6

Norway.

	Years					
	1865-1875	1875-1890	1890-1900	1900-1910	1910-1920	1920-1927
Under 15 years	1.9	13.9	10.3	5.8	2.2	1.7
15-19 years	13.5	1.9	16.7	9.4	12.8	2.2
20-24 years	15.0	4.3	23.5	0.7	27.4	3.2
25-29 years	9.7	5.8	13.2	2.2	28.4	11.3
30-59 years	7.3	6.2	9.9	8.6	12.6	12.6
Over 60 years	6.7	37.3	8.2	7.7	12.1	9.1
The population as a whole	6.9	10.2	11.8	6.6	10.9	5.1

It will be seen that, both in Denmark and Norway, there were considerable fluctuations between the censuses, particularly in Norway. The growth of the population between the ages of 20 and 30 years from 1910 to 1920 in Norway is particularly striking. The uneven growth in the various age-classes is presumably due mainly to the varying increase in the number of births and the decrease in the population through deaths and emigration.

Although there are divergences in various points in the percentage of increase in the two countries at various censuses, nevertheless the movement is, on the whole, in the same direction for both countries — in particular, as regards the census figures after 1890.

In Sweden, in 1920, 293 per 1,000 of the population were under 15 years — a somewhat smaller figure than in Denmark and Norway.

Distribution by age differs very considerably in the urban and rural populations. The age-classes between 15 and 60 years are more strongly represented in all three countries in the urban than in the rural population; while in the latter there is a relatively larger number of children and old people.

Denmark. — Distribution by Age.

	Copenhagen			Provincial towns			Country districts		
	Years								
	1880	1901	1921	1880	1901	1921	1880	1901	1921
Under 15 years	282	289	241	327	344	298	350	353	342
15-29 years	286	279	282	269	264	265	239	242	248
30-59 years	355	350	378	321	306	332	308	294	302
Over 60 years	76	79	97	82	83	101	102	110	105
Not stated	1	3	2	1	3	4	1	2	3
	I,000	I,000	I,000	I,000	I,000	I,000	I,000	I,000	I,000

Norway. — Distribution by Age in 1920.

	Towns	Country districts
Under 15 years	275	339
15-29 years	304	254
30-69 years	383	353
Over 70 years	38	54
Total	I,000	I,000

The inequality in the distribution by age is also evident on investigating small districts within the same country. In Norway, for instance, there are few children under 15 years and many persons over 70 years in Aust-Agder, Vest-Agder, Sogn and Fjordane, Møn and Nord Trøndelag, while in the three northernmost provinces there are comparatively many children and few old people. The age-class 15-29 years is relatively poorly represented in the southern provinces of Rogaland, Sogn and Fjordane, and is more strongly represented in Östfold, Nordland and Tromsø.

Although the distribution by age in the three countries shows disparities in various points, there are also pronounced similarities. The difference is much less striking between these three northern countries than between the northern and southern European countries, and, according to the investigations into distribution by age, the three countries form a good basis for the comparisons made in the following investigations into the aggregate death-rate and the death-rate from tuberculosis.

The following figures regarding the distribution by age of males and females in the three countries also show that the composition of the population by age is practically the same in the three countries:

Distribution by Age.

	Men					Women				
	Under 15 years	15-19	20-39	40-59	Over 60	Under 15 years	15-19	20-39	40-59	Over 60
Denmark	351	100	275	182	92	328	94	284	189	105
Norway	371	101	258	168	102	335	93	277	182	113
Sweden	338	99	272	182	109	312	90	271	199	128

STATISTICS OF OCCUPATIONS.

DISTRIBUTION OF THE ACTIVE POPULATION BY OCCUPATIONS AND PARTICIPATION OF WOMEN IN OCCUPATIONS.

Denmark. — Percentages of the Active Population represented in the Different Occupations.

	1860	1870	1880	1890	1901	1911	1921
Agriculture, forestry and fishing	56.1	54.9	53.8	48.6	44.4	36.4	33.0
Industry and trades	26.4	25.8	26.0	27.9	29.5	27.9	28.8
Commerce	5.9	6.8	7.7	9.9	14.8 ¹	16.6 ¹	16.7 ¹
Professions	5.8 ¹	5.9 ¹	6.7 ¹	7.3 ¹	4.7	5.2	5.7

¹ Including transport.

Agriculture is the principal occupation in Denmark, though in 1921 it occupied a relatively smaller number of people than ten years earlier, while the number of persons occupied in commerce and industry has increased.

The following division may also be made:

Year	1.	2.	3.
	Non-dependent persons (other than servants)	Servants	Dependent persons
	Per cent	Per cent	Per cent
1860	29.2	13.1	57.7
1880	30.0	11.4	58.6
1901	37.2	8.9	53.9

The group "non-dependent persons" has increased while the group "servants" has decreased, and this tendency has continued since 1901. Non-dependent persons are divided by sex as follows:

	Men Per cent	Women Per cent
1860	70.6	29.4
1880	70.4	29.6
1901	66.2	33.8
1921	67.3	32.7

The participation of women in occupations as non-dependants has increased.

If the male population over 15 years of age alone is taken into consideration, it consists predominatingly of non-dependent persons — namely:

	Per cent
1860.	91.8
1880.	90.8
1901.	96.2
1921.	95.2

In the period under investigation there has been only a slight increase in the relative number of non-dependent men. The increase is more pronounced among women, in accordance with the following figures regarding women over 15 years of age:

	Per cent
1860.	36.9
1880.	35.8
1901.	45.0
1921.	43.0

Moreover, the number of servants was reduced in the same period, so that the figures show a pronounced increase of women in occupations affording them independence.

Among women in the towns there is a greater proportion of non-dependants than in the country districts.

In the towns, 44.7 per cent of all women over 15 years were non-dependent, while the proportion in the country districts was 40.4 per cent. The following table for 1921 shows the percentage of women among the non-dependent workers:

	Per cent
In agriculture	14.6
In industry and trades	18.0
In commerce and transport.	23.4
In professions	31.8

Norway. — Distribution of the Population by Occupations.

	1891 Per cent	1900 Per cent	1910 Per cent	1920 Per cent
Agriculture, forestry and fishing	51.1	44.3	43.4	39.4
Industry	21.8	25.8	25.2	28.8
Commerce, navigation and transport	14.5	15.4	15.2	18.1
Professions	4.1	4.4	4.6	4.9

As in Denmark, therefore, agriculture, together with forestry and fishing, form the principal occupations of the country. As in Denmark, too, the figures show a relative decline in this group and a relative increase in the group of industry and commerce. The number of persons occupied in industry increased notably from 1890 to 1900 — namely, by 33 per cent, while the commercial and transport group increased by 19 per cent. In the following decade there was very little change in these groups, but from 1910 to 1920 commerce and transport increased by 23 per cent and industry by 15 per cent.

Women. — In 1920, 30 per cent of all women over 15 years had an occupation, in the country districts 23 per cent and in the towns 45 per cent. The percentage declined slightly between 1910 and 1920. Almost one-third of all workers were women, and this proportion has hardly changed in recent years. Of persons occupied in agriculture, 20 per cent were women; in industry, 20 per cent; in commerce, 44 per cent; and in professions, 40 per cent. The percentage of women in industry has declined in recent years. In 1890, about 28 per cent of women were occupied in industry; in 1900, 27 per cent; in 1910, 25 per cent; and in 1920 about 20 per cent. Commerce, transport and professions, on the other hand, occupied a continually increasing relative number of women.

In 1920, 32 per cent of all occupied women were engaged in domestic work, 21 per cent in industry, 19 per cent in agriculture and 18 per cent in commerce.

The position in *Sweden* is practically the same as in Norway and in Denmark.

In 1920, the percentage of the population engaged was:

- 38.5 in agriculture and forestry;
- 31.3 in industry;
- 12.9 in commerce and transport;
- 4.6 in professions.

Of the total area of Sweden in 1920, 9.4 per cent was under cultivation, 2.2 per cent was under pasture, 59.9 per cent was covered by forests and 28.5 per cent was unproductive (rock, marsh, etc.).

Apart from the very extensive forestry and timber industry, Sweden has an important mining industry, particularly iron-ore mining. There are large mining districts (about 15,000 square kilometres in area) in Örebro Län and Upland, and further extensive districts in Lapland.

MOVEMENTS OF POPULATION.

The migration of the population is of some importance in studying the development of mortality and also occasionally in investigating the death-rate from tuberculosis at various periods.

This subject is treated in detail with a view to determining its importance for this investigation.

EMIGRATION.

Emigration overseas was formerly greater in Norway and Sweden than in Denmark.

Denmark. — The following table contains the number of emigrants from Denmark in the years mentioned:

		Per 10,000
1870-1874	24,843	27
1875-1879	11,606	12
1880-1884	39,939	40
1885-1889	37,036	35
1890-1894	44,357	40
1895-1899	13,882	12
1900-1904	32,298	26
1905-1909	35,797	27
1910-1914	40,878	29
1915-1919	13,315	9
1920-1924	29,623	18
1926	5,804	17
1927	7,996	23
1928	7,699	22

It will be seen that the figures have undergone considerable changes, principally as a result of the cyclical fluctuations in the country's prosperity. They have possibly been more or less affected, too, by the prospects of earning a living in foreign countries.

Emigrants are divided by sex as follows:

Years	Males Per cent	Females Per cent
1890-1894	58	42
1895-1899	57	43
1900-1904	63	37
1905-1909	63	37
1910-1914	63	37
1915-1919	56	44
1920-1924	65	35

Emigrants may be divided into the following age-classes:

	1890-1894 Per cent	1895-1899 Per cent	1915-1919 Per cent	1920-1924 Per cent	1925-1928 Per cent
Under 15 years	19.7	14.3	12.2	10.6	9.9
15-19 years	79.0	83.5	90.8	86.8	87.9
20-24 years					
25-29 years					
30-40 years					
40-60 years					
Over 60 years	1.3	2.2	2.8	2.6	2.2

The proportion between emigration from the towns and from the country districts in Denmark is shown by the following figures, which refer only to male emigrants over 15 years:

	1890-1894 Per cent	1895-1899 Per cent	1915-1919 Per cent	1920-1924 Per cent
Copenhagen	18.7	25.2	44.1	32.4
Provincial towns	22.1	25.5	24.4	30.5
Country districts	59.2	49.3	31.5	37.1

Occupations of Male Emigrants over 15 Years:

	1890-1894 Per cent	1895-1899 Per cent	1915-1919 Per cent	1920-1924 Per cent
Farm and industrial labourers and servants	56.4	49.3	36.4	52.6
Skilled workers	27.9	25.7	19.1	22.9
Merchants	5.1	10.8	23.7	13.8
Other occupations	10.6	14.2	20.8	10.7

Norway. — The following table gives the absolute figures and the figures per 10,000 inhabitants in respect of emigration abroad:

Years	Total figures			Per 10,000		
	The country as a whole	Rural districts	Towns	The country as a whole	Rural districts	Towns
1866-1870 . . .	74,403	64,642	9,761	86	90	69
1871-1875 . . .	45,142	34,177	10,965	51	47	70
1876-1880 . . .	40,244	31,335	8,909	43	42	48
1881-1885 . . .	105,704	75,287	30,417	110	100	144
1886-1890 . . .	80,984	53,186	27,798	82	70	123
1891-1895 . . .	61,017	42,456	18,561	60	55	73
1896-1900 . . .	33,837	24,663	9,174	31	31	31
1901-1905 . . .	103,195	69,458	33,737	90	85	105
1906-1910 . . .	87,663	58,427	29,236	75	69	87
1911-1915 . . .	44,552	30,108	14,444	36	35	40
1916-1920 . . .	16,969	8,883	8,086	13	10	21
1921-1925 . . .	44,871	28,399	16,472	33	29	41

Emigration has varied with economic conditions at home; in bad times it has increased and in good times decreased. Since 1911, there has been a great decrease, and in the years immediately before the war it remained stationary at about 9,000 per year. There was a further drop in emigration during the war, and in 1918 a minimum figure of 1,226 was reached. In recent years emigration has again increased.

At first emigrants mostly came from the rural population, but in the 'seventies a change took place, and since that time emigration has been much greater from the towns than from the rural districts.

The variations in emigration from the various provinces are shown by the following figures per 10,000 inhabitants:

	1876-1890	1891-1900	1901-1910	1911-1915	1916-1920	1921-1925
Ostfold	56	21	47	21	10	16
Akershus	68	20	61	25	10	18
Oslo	96	29	87	37	21	30
Hedmark	110	38	76	25	6	10
Upland	169	61	112	41	9	15
Buskerud	110	39	75	25	9	16
Vestfold	38	36	77	30	14	26
Telemark	80	43	67	19	7	25
Aust-Agder	68	88	149	62	34	118
Vest-Agder	80	114	166	89	56	152
Rogaland	107	76	120	60	20	68
Hordaland	56	39	73	42	8	35
Bergen	55	34	93	54	27	47
Sogn-Fjordane	73	58	73	43	6	24
Mon	55	49	83	37	7	37
Sør-Trøndelag	88	50	75	34	10	28
Nord Trøndelag	87	53	79	29	5	16
Nordland	40	25	65	33	7	26
Tromsø	33	20	46	21	5	15
Finmark	64	28	31	9	3	6
The whole	71	45	82	36	13	33

In the period 1876-1890, the greatest emigration in proportion to population was from the eastern provinces, Hedemark, Upland and Buskerud. Since then the proportion has been greatly reduced in these provinces, with the exception of a temporary increase in 1901-1910. Since the 'nineties, the greatest emigration has taken place from Aust-Agder, Vest-Agder and Rogaland, and it has again greatly increased in recent years.

Proportion of Male and Female Emigrants

Years	The country as a whole		Rural districts		Towns	
	Male	Female	Male	Female	Male	Female
1876-1880 . .	59.1	40.9	59.7	40.3	57.2	42.8
1881-1885 . .	55.9	44.1	57.5	42.5	51.9	48.1
1886-1890 . .	58.6	41.4	61.5	38.5	52.8	47.2
1891-1895 . .	58	42	62.1	37.9	48.6	51.4
1896-1900 . .	61	39	64.4	35.6	51.8	48.2
1901-1905 . .	63.6	36.4	65.7	34.3	59.2	40.8
1906-1910 . .	62.1	37.9	66.2	33.8	53.8	46.2
1911-1915 . .	57.7	42.3	62.8	37.2	47.2	52.8
1916-1920 . .	49.5	50.5	52.7	47.3	45.9	54.1
1921-1925 . .	66	34	72.1	27.9	55.4	44.6

The males are in the majority for the country as a whole and also for the rural districts. As regards the towns, the number of males and females is approximately the same.

Division into Age-groups of Emigrants

Years	Males					Females				
	0-15 years	15-30 years	30-45 years	45-60 years	Over 60 years	0-15 years	15-30 years	30-45 years	45-60 years	Over 60 years
1876-1880	19.5	55.9	17.1	5.6	1.9	26.9	46.4	16.4	7.7	2.6
1881-1885	23.5	52.9	16.5	5.5	1.6	27.5	47	16.1	6.9	2.5
1886-1890	16.1	61.7	16.1	4.6	1.5	21.3	55.5	15	5.9	2.3
1891-1895	14.1	64.8	15.1	4.5	1.5	17.9	59.9	14	5.9	2.3
1896-1900	10	71.8	13.2	3.7	1.3	14.8	63.9	13.9	5.1	2.3
1901-1905	11.4	71.5	13.2	3.2	0.7	18.4	62	13.6	4.6	1.4
1906-1910	9.1	74.8	12.6	3	0.5	14.6	66.6	13.7	3.9	1.2
1911-1915	8.5	78	10.1	2.6	0.8	11	69.8	14	3.8	1.4
1916-1920	14	59.2	19.2	5.9	1.7	13.4	55.2	21.9	6.2	3.3
1921-1925	6.9	64.1	22.5	5.7	0.8	13.5	57.5	22.4	4.2	2.4

The age-group 15-30 has constantly increased, while the other groups decreased until 1911-1915; in the last two five-year periods the age-group 15-30 has again declined.

In order to show the emigration intensity in the various age-classes, emigrants are calculated per 10,000 of the corresponding population for 1901-1910, when emigration reached its maximum, and for the last five-year period 1921-1925:

Year	0-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-44 years	45-59 years	Over 60 years	Total
1901-1910: Males. . .	28.6	260.5	455.4	237.2	129.8	70.9	29.4	7	107.3
1901-1910: Females . .	28.3	132.2	193.9	132.8	74.3	35.1	19.3	7	59.1
1921-1925: Males. . .	9.4	58.3	149.9	113.7	73.9	48	20.9	3.4	44.7
1921-1925: Females . .	9.8	30.5	59.7	54.2	38.6	19.8	7	4.3	21.9

The emigration figure is largest in the age-group 20-24, after which come 15-19 and 25-29.

Sweden. — Emigration has been very widespread in Sweden also, though not quite so much as in Norway. The following figures show the approximate number of persons who have emigrated annually:

	Persons	Per 10,000
From 1860 to 1870	15,000	38
From 1880 to 1889	38,000	85
From 1890 to 1910	25,000	50
From 1911 to 1914	15,000	27
In 1923	28,000	47

Summary. — It will be seen from the above that emigration is much commoner in Norway and Sweden than in Denmark. In Norway, and probably also in Sweden, it has greatly hindered the growth of the population; in Norway, the natural growth of the population has in some periods been reduced by more than 50 per cent. As most of the emigrants are of marriageable age, there have also been, as a result, fewer marriages and therefore fewer births.

For a considerable number of years of the period under investigation, — *i.e.*, since 1911 — the differences in the proportion of emigration from the three countries have been considerably reduced, so that this question is of no importance, at any rate for this

period, in comparing the general mortality and the death-rate from tuberculosis in the three countries.

The question may naturally be raised whether the population has deteriorated through emigration on account of the fact that some of the healthiest and fittest elements have left the country, while the weaker have remained behind. No direct information is available on this subject, but it is probable that the qualitative reduction of the population brought about by emigration has consisted principally of a change in the age-grouping of the population, particularly in respect of the productive ages. This circumstance may perhaps acquire significance when comparing specific areas (counties, provinces, etc.) in the same or in different countries; emigration intensity, be it noted, has differed widely within the various counties or provinces.

On the other hand, there is scarcely reason to attach importance to emigration as a cause of the change in the age-groups when comparing conditions in the different countries, since, as pointed out above, there is little difference in the distribution of the population by age in the three countries when the entire population of the country is taken into consideration.

INTERNAL MIGRATIONS.

In addition to emigration to overseas countries, there are extensive migrations within the boundaries of the three countries themselves, and these migrations might conceivably influence mortality and also the death-rate from tuberculosis. The spread of infectious diseases such as tuberculosis might be facilitated by the development of means of communications; indeed, the spread of tuberculosis to districts in Norway and Sweden which once were only slightly affected, coinciding with easier communications to such districts, points to this possibility. The death-rate from tuberculosis among the rural and urban population might also conceivably be affected in certain age-classes.

But it is an open question whether any importance can be attached to migration between parts of the country where tuberculosis is common. Circumstances in Denmark do not bear out this assumption. The Danish rural population most affected by tuberculosis lives in districts where migration is at its lowest; while, on the other hand, the districts from which the greatest migration to the towns takes place are situated on the islands, where tuberculosis is least prevalent.

Moreover, migration takes place both in Norway and Denmark to such a great extent that, in making comparisons, it may be definitely stated that very little importance need be attached to them as a cause of infection.

Denmark. — If the resident population is classified according to place of birth under only three groups — *i.e.*, the capital, other towns and rural districts — the results are as follows:

Place of residence	Year	Place of Birth			
		Copenhagen Per cent	Provincial towns Per cent	Rural districts Per cent Per cent	
Copenhagen Provincial towns Rural districts	1850	67.8	13.2	19	= 100
		5.1	64.5	30.4	= 100
		1.3	2.5	96.2	= 100
	1880	59.2	16.1	24.7	= 100
		3.8	57.3	38.9	= 100
		1.9	3.5	94.6	= 100
	1901	57.7	16.3	26	= 100
		3.4	53.4	43.2	= 100
		1.8	4	94.2	= 100
	1911	59.8	16.2	24	= 100
		3.8	54.2	41.9	= 100
		2.7	5.3	92	= 100
	1921	59.3	16.9	23.8	= 100
		4.1	52.5	43.8	= 100
		2.5	6.2	91.3	= 100

It is clear that, although there is an increasing tendency towards migration in all three groups, the rural population is always the most stable — a fact which implies that the proportion of country-dwellers born in rural districts is greater than the proportion of town-dwellers born in towns.

Thus migration takes place from the country to the towns.

If the country is divided into small zones, it will be seen what a large number of removals take place.

Persons who have removed to these Zones, in Percentages of the Resident Population of the Zones.

	Urban population		Rural population	
	1901	1911	1901	1911
Copenhagen	42.3	40.2	—	—
Zeeland	44.7	55.5	13.1	17.9
Bornholm	38.1	39.6	11.5	13.2
Lolland-Falster	52.5	53.8	10.2	13
Funen	47.6	48	10.2	13.7
South-East Jutland	54.2	52.6	13	16.5
North Jutland	52.2	51.7	7	8.3
South-West Jutland	57	56.7	10.8	13.1

Persons who have removed from these Zones, in Percentages of the Population of the Places of Birth.

	Urban population		Rural population	
	1901	1911	1901	1911
Copenhagen	14.2	16.9	—	—
Zeeland	53.8	55.7	26.1	26.8
Bornholm	29.8	34.7	28.5	29
Lolland-Falster	47.9	48.9	23.5	27
Funen	39.2	44.3	22.2	23.1
South-East Jutland	35.7	39.7	29.4	27.4
North Jutland	37.1	40.7	18.2	20.4
South-West Jutland	44	45.2	20.6	21.7

Removals to the towns in Zeeland, Lolland-Falster and Jutland represent more than half the resident population. The smallest number of removals are to the towns on Bornholm. The removals to the rural districts everywhere form less than one-fifth of the resident population. The removals from the towns are relatively least numerous from the capital; the removals from provincial towns are between 30 and 56 per cent.



The extent to which removals have increased is shown by the following table, which gives the number of inhabitants of each parish or town who were born at their place of residence:

	1850	1880	1901	1911	1921
	Per cent	Per cent	Per cent	Per cent	Per cent
Copenhagen	67.8	59.2	57.7	52.1	59.3
Provincial towns in the islands	52.4	47	48.5	43.4	39.3
Provincial towns in Jutland	53.8	45.8	40.8	41.8	39.3
Rural districts in the islands	62.7	55.7	52.5	48.9	46.4
Rural districts in Jutland	61.1	55	53.7	51.5	51.2

Of the entire population of the country, only about half were born in the town or parish in which they now reside.

For the last three years exhaustive information can be given of all removals within the country:

November 5th, 1925, to November 1st, 1926 Places from which removals took place	Destination					
	Copenhagen	Towns in the islands	Towns in Jutland	Rural districts in the islands	Rural districts in Jutland	Total
	Males					
Copenhagen	—	2,066	1,670	6,020	1,188	10,944
Towns in the islands .	2,576	2,957	1,282	8,029	981	15,825
Towns in Jutland . .	2,012	1,301	5,513	1,194	11,099	21,119
Rural districts in the islands	5,158	8,740	1,015	49,940	4,386	69,239
Rural districts in Jut- land	1,384	997	11,231	4,603	57,817	76,032
Total . .	11,130	16,061	20,711	69,786	75,471	193,159
	Females					
Copenhagen	—	2,860	2,598	8,559	2,193	16,210
Towns in the islands .	3,424	3,314	1,309	9,937	1,182	19,166
Towns in Jutland . .	3,004	1,556	6,606	1,601	14,688	27,455
Rural districts in the islands	7,943	11,585	1,331	41,329	2,991	65,179
Rural districts in Jut- land	2,520	1,250	16,538	3,577	55,556	79,441
Total . .	16,891	20,565	28,382	65,003	76,610	207,451

November 1st, 1926, to November 1st, 1927 Places from which removals took place	Destination					
	Copen- hagen	Towns in the islands	Towns in Jutland	Rural districts in the islands	Rural districts in Jutland	Total
	Males					
Copenhagen	—	1,961	1,740	6,588	1,226	11,515
Towns in the islands .	2,823	2,783	1,060	8,869	811	16,346
Towns in Jutland . .	2,463	1,302	5,451	1,271	11,945	22,432
Rural districts in the islands	6,793	8,754	1,186	62,954	4,608	84,295
Rural districts in Jut- land	1,634	842	13,782	5,575	77,139	98,972
Total . .	13,713	15,642	23,219	85,257	95,729	233,560
	Females					
Copenhagen	—	2,963	2,845	9,574	2,662	18,044
Towns in the islands .	4,447	3,588	1,348	11,516	1,066	21,965
Towns in Jutland . .	3,931	1,451	7,355	1,818	16,963	31,518
Rural districts in the islands	10,364	12,276	1,502	53,496	3,306	80,944
Rural districts in Jut- land	3,316	1,043	20,515	4,141	73,322	102,337
Total . .	22,058	21,321	33,565	80,545	97,319	254,808

November 1st, 1927, to December 31st, 1928 Places from which removals took place	Destination					
	Copenhagen	Towns in the islands	Towns in Jutland	Rural districts in the islands	Rural districts in Jutland	Total
Males						
Copenhagen	—	2,501	2,282	8,097	1,497	14,377
Towns in the islands .	3,419	3,409	1,387	10,229	930	19,374
Towns in Jutland . . .	3,090	1,627	7,020	1,436	14,869	28,042
Rural districts in the islands	8,522	12,148	1,301	84,969	5,812	112,752
Rural districts in Jut- land	1,990	1,040	18,217	7,009	112,762	141,018
Total	17,021	20,725	30,207	111,740	135,870	315,563
Females						
Copenhagen	—	3,549	3,517	11,233	3,394	21,693
Towns in the islands .	5,017	4,173	1,584	13,837	1,342	25,953
Towns in Jutland . . .	4,965	1,794	9,418	2,099	21,904	40,180
Rural districts in the islands	13,148	16,921	1,643	72,049	4,365	108,126
Rural districts in Jut- land	4,266	1,400	26,749	5,227	107,590	145,232
Total	27,396	27,837	42,911	104,445	138,595	341,184

Investigations as to the age-classes in which removals take place show that the principal migrants are young persons in the working age-classes. Children also remove to a very great extent.

Age	Total removals					
	Males			Females		
	1.XI.25- 1.XI.26	1.XI.26- 1.XI.27	1.XI.27- 31.XII.28	1.XI.25- 1.XI.26	1.XI.26- 1.XI.27	1.XI.27- 31.XII.28
0-4 years	15,317	17,677	33,711	14,309	16,997	32,043
5-9 "	8,321	9,265	24,152	8,106	8,807	25,364
10-14 "	8,988	11,750	74,247	7,207	9,928	90,545
15-19 "	44,104	59,351	85,581	61,114	79,674	97,242
20-24 "	55,216	61,691	43,847	56,374	65,793	41,583
25-29 "	25,773	30,850	17,875	25,019	30,773	18,085
30-34 "	11,068	13,991	10,131	11,671	14,307	10,553
35-39 "	6,903	8,324	7,263	6,778	8,147	7,153
40-44 "	5,028	5,871	5,593	4,535	5,592	5,307
45-49 "	3,758	4,487	4,258	3,577	4,278	4,027
50-54 "	2,707	3,179	2,989	2,588	3,089	2,893
55-59 "	2,026	2,431	2,154	1,998	2,335	2,096
60-64 "	1,363	1,644	1,552	1,272	1,667	1,585
65-69 "	1,080	1,297	1,031	1,094	1,334	1,173
70-74 "	662	830	626	736	919	785
75-79 "	451	488	329	498	639	416
80-84 "	199	254	117	296	305	157
Over 85 "	63	87	17	115	124	30
Not stated	132	93	90	164	100	147
Total	193,159	233,560	315,563	207,451	254,808	341,184

	Removals within the capital			
	Total	Heads of households	Dependents	Individuals
1926	118,377	17,180	32,740	68,457
1927	135,825	20,524	40,110	75,191
1928	135,502	20,056	36,557	78,889

Norway. — The only information available throwing light on internal migrations of the population is that relating to birth-places obtained at each census since 1865.

The number of persons living in the commune where they were born is shown by the following table:

Year	The whole country Per cent	Rural districts Per cent	Towns Per cent
1865	77.4	82.0	52.7
1875	73	78.2	49.6
1890	70.8	77.2	49.6
1900	67	74.6	47.7
1910	65.8	72.3	50.2
1920	61.6	67.2	48.7

Removals have constantly increased with the improvement of means of communication and the specialisation of business. The movement is most pronounced in the country districts. In the towns the relative number of residents who were born there is reduced in periods of prosperity by the large number of persons moving into the towns, while it is increased in periods of depression when many persons move out of the towns or emigrate. This circumstance was most pronounced in the period 1890 to 1910.

The migration intensity has always been greater in towns than in rural districts. In 1920, only 49 per cent of the town population was born in the towns, while 51 per cent had moved in.

If the population is divided into males and females over and under 15 years, the following percentages are obtained of persons who at the 1920 census lived in the commune where they were born:

		The country as a whole Per cent	Rural districts Per cent	Towns Per cent
Under 15 years	Males.	82	82	83
	Females.	82	82	82
	Total	82	82	82
Over 15 years	Males.	59	66	41
	Females.	52	59	37
	Total	55	62	39

There is a relatively small number of removals among children, and fewer women than men lived in the commune where they were born.

Most removals take place within the same province (Fylke). Most of the population moving into towns comes from rural districts.

3. THE GENERAL MORTALITY IN THE THREE SCANDINAVIAN COUNTRIES.

Tables 1 to 10¹ contain a summary of the general death-rate in the three Scandinavian countries.

Table 1 gives the general death-rate for the entire country, for both sexes combined and for each sex separately, in Denmark from 1860 to 1928, in Norway from 1867 to 1923, and in Sweden from 1860 to 1928.

Table 2 contains information regarding the general death-rate among the rural population: Denmark, 1876-1928; Norway, 1867-1923; and Sweden, 1860-1928.

Table 3 gives a summary of the general death-rate among the entire town population and among males and females: in Denmark for 1867-1928; Norway, 1867-1927; Sweden, 1860-1928.

Table 4 shows the general death-rate among the total population of the capitals and among males and females: Copenhagen, 1876-1927; Oslo, 1881-1925; and Stockholm, 1860-1925.

The tables contain information regarding the general death-rate for the entire period under investigation, in some cases for each individual year and in other cases for five-year periods.

(See Graph 1.)

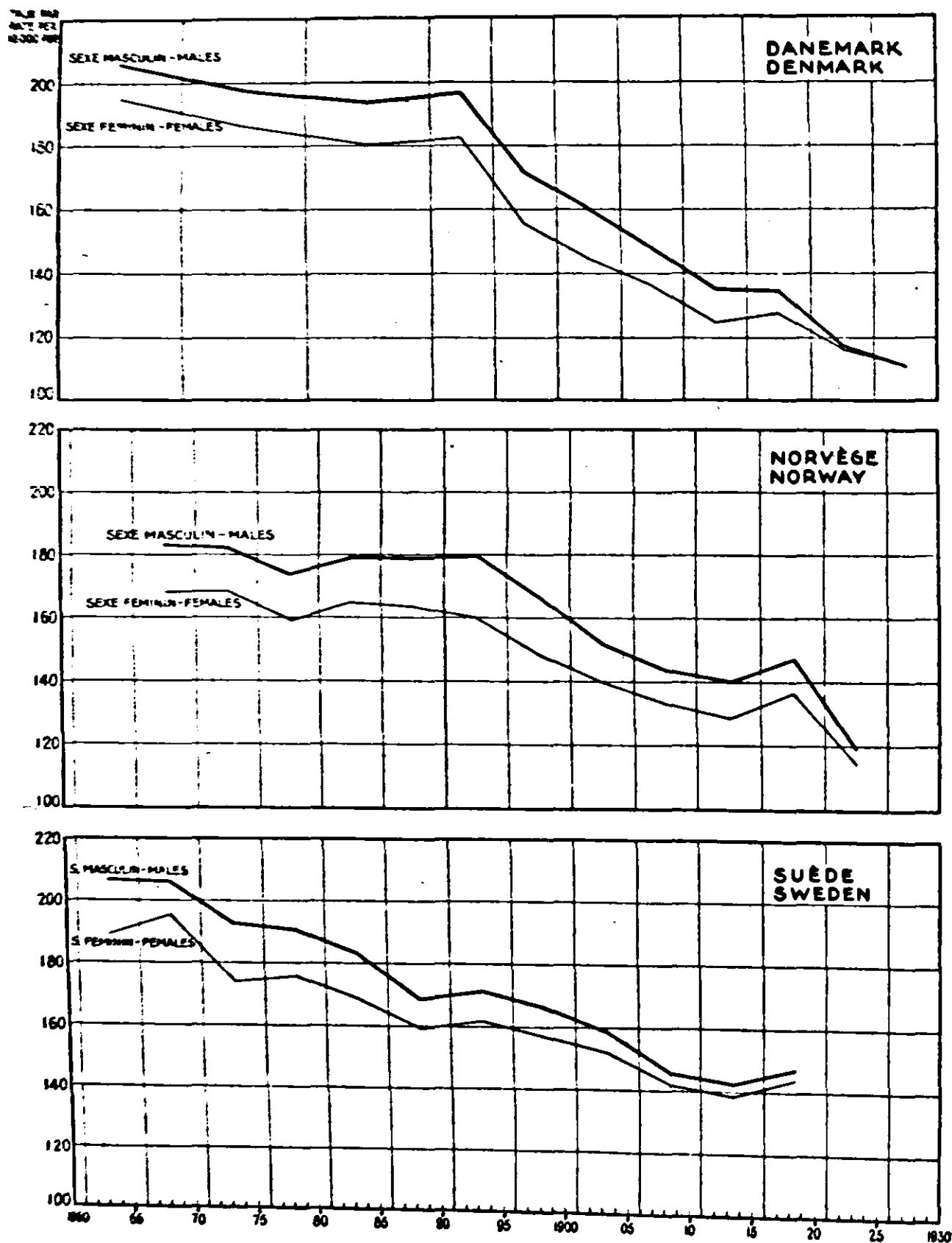
On examining, in the first place, the general death-rate *among the population of the entire country* (Table 1), it will be seen that mortality fluctuates greatly from one year to another. This is particularly the case in that part of the period under investigation which falls in the last century. After 1900, the fluctuations from year to year in all three countries are much less pronounced. On the whole, there has been a decline in the death-rate, which is most clearly illustrated by the figures for the five-year periods. This decline is interrupted only by a temporary increase in Norway and Sweden in 1916-1920, due exclusively to the influenza epidemic of 1918-1919. This great increase in the general death-rate was not so pronounced in Denmark, where, however, influenza was also very prevalent in these years.

In the years 1860-1895, Denmark had, throughout, the highest general death-rate and Norway the lowest. After 1900, the death-rates in the three countries approached each other so closely that they practically coincided.

¹ For easier reference, the tables are given together at the end of the volume.

Graph 1.

COURSE OF THE GENERAL MORTALITY IN THE THREE SCANDINAVIAN COUNTRIES.
(Rates per 10,000 Inhabitants for each Sex.)
(See Table I.)



In all three countries the mortality among males is somewhat higher than among females. If the death-rate among females is taken at 100 in each of the five-year periods, the following comparative figures are obtained for males:

		Denmark			Norway	Sweden
1860-1864	. . . }	105.1	1861-1865	. . .	—	109.1
1865-1869	. . . }		1866-1870	. . .	108.9	110.8
1870-1874	. . . }	105.9	1871-1875	. . .	108.2	110.5
1875-1879	. . . }		1876-1880	. . .	108.3	108.4
1880-1884	. . . }	107.5	1881-1885	. . .	108.4	108.9
1885-1889	. . . }		1886-1890	. . .	109.5	105.9
1890-1894	. . .	107.8	1891-1895	. . .	112.5	105.8
1895-1899	. . .	110.6	1896-1900	. . .	112.5	106
1900-1904	. . .	110.9	1901-1905	. . .	108.6	104.5
1905-1909	. . .	108.6	1906-1910	. . .	107.3	102.9
1910-1914	. . .	108.7	1911-1915	. . .	108.6	103.1
1915-1919	. . .	104.8	1916-1920	. . .	107.5	103.1
1920-1924	. . .	100.3	1921-1925	. . .	104.3	—
1925-1928	. . .	99.7				

The movements in the death-rates have throughout been the same for both sexes. In the 'eighties and 'nineties the decline in mortality was somewhat greater among females than among males in Norway and Denmark, while the decline of mortality among males in Sweden was greater than among women for the entire period under investigation. In later years, the fall of the death-rate among males was also more pronounced than among women in Denmark and Norway, so that the difference between the mortality of the two sexes is now much less than formerly. In Denmark, the rates have practically coincided since 1920.

A review of the general *death-rate among the rural and town populations* will be found in Tables 2 and 3.

(See Graph 2.)

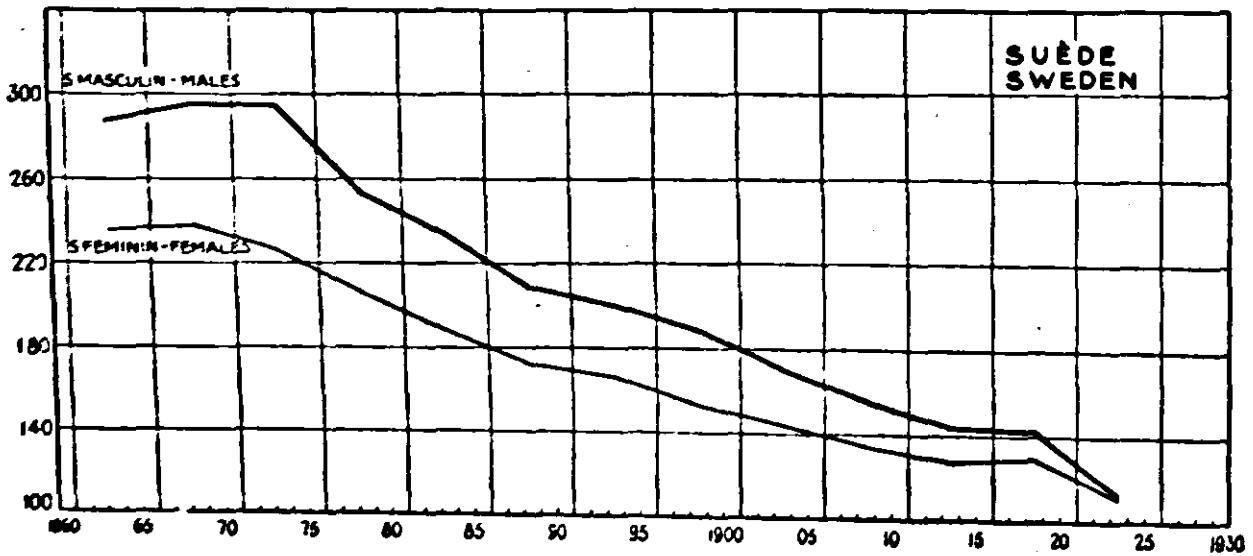
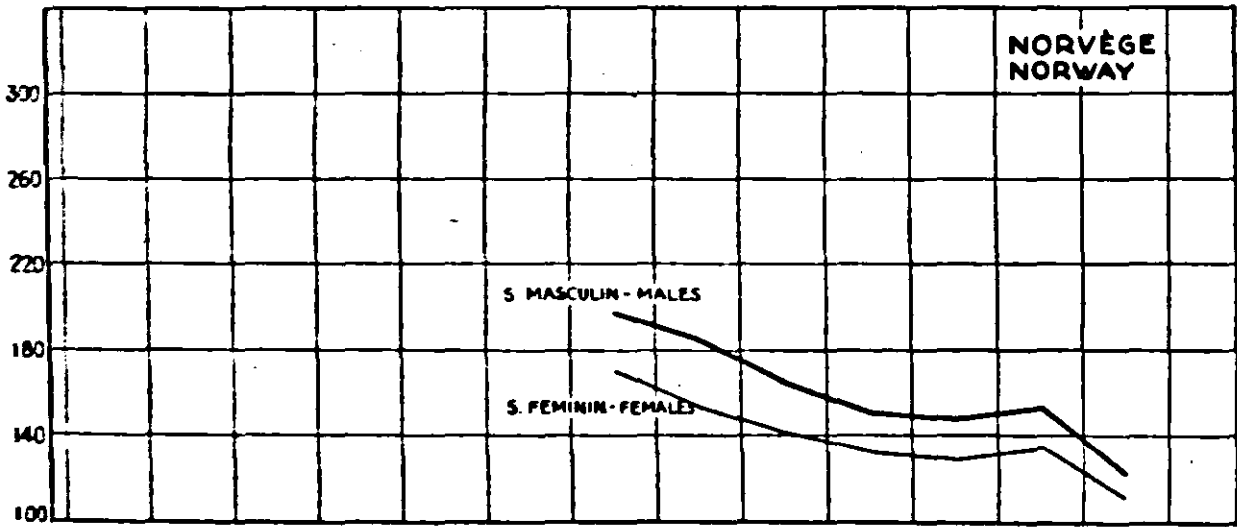
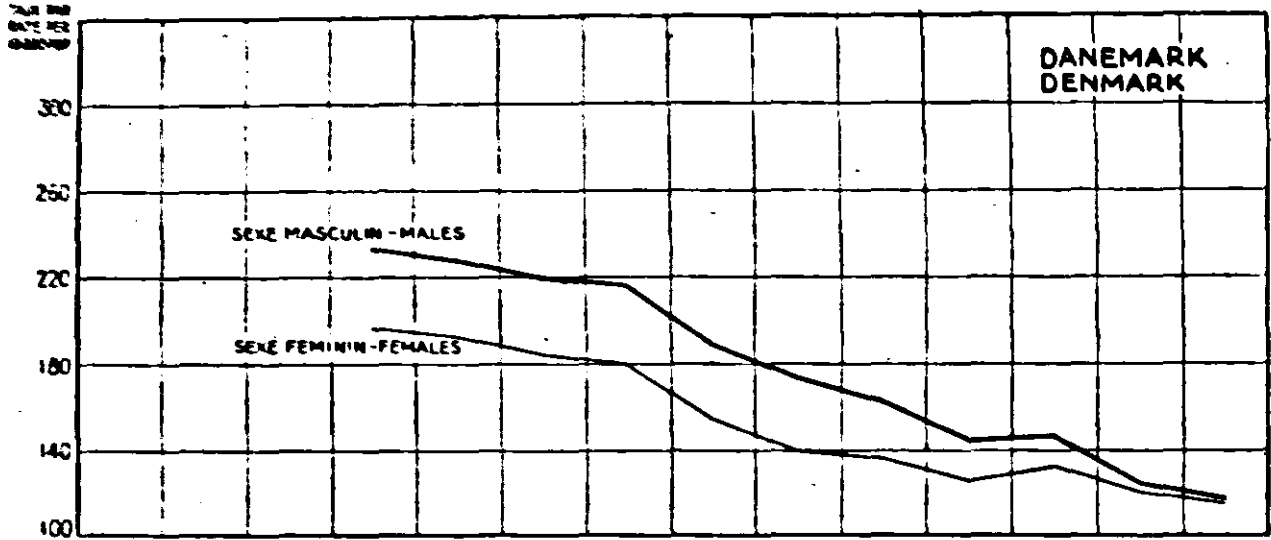
In all three countries mortality is lower in country districts than in towns; the difference is, however, much less pronounced now than formerly, since the death-rate had declined to a greater extent in towns than in rural districts. The death-rates quoted, however, only give an idea of the *tendency* of development, as a detailed comparative study of conditions in town and country would, as already stated, require to take into consideration the variations in the distribution of the town and country population by age in the various periods. This circumstance is of less importance when comparing the mortality of the country population with that of the town population in the three countries, since the distribution by age in general coincides.

When investigating mortality among the *rural population* alone in the three countries (Table 2), it will invariably be found that the position is the same as that already described for the general death-rate of the country as a whole (Table 1). With regard to the *town population* (Table 3), the general death-rate is rather higher in Sweden than in Norway from 1860 to 1885; while the mortality among the rural population of Denmark from 1876 to 1885 lies between the death-rates of the other two countries. In the years previous to 1885, there were great fluctuations in the death-rate from year to year in all three countries;

Graph 2.

COURSE OF THE GENERAL MORTALITY IN THE URBAN POPULATION OF THE THREE SCANDINAVIAN COUNTRIES.

(See Table 3.)



these fluctuations gradually decreased, and from the middle of the 'nineties the death-rates in the three countries closely approach each other. In 1918, there was a great increase in mortality in Sweden and Norway (due to influenza). The same difference is not found in Denmark, though there were many deaths from the disease. In recent years, the general death-rate has been lowest in Sweden.

The death-rate among males and females in the town population is shown in Tables 3 and 4.

After 1890, the rates closely approach each other among both males and females in the three countries, with the exception of the above-mentioned difference caused by influenza in Norway and Sweden in 1918. The death-rate among males is considerably higher than among females in all three countries. If female mortality is taken at 100 in each five-year period, the following comparative figures are obtained for male mortality:

	Denmark		Norway	Sweden
1861-1865 . . .	—	1861-1865 . . .	—	122.5
1866-1870 . . .	—	1866-1870 . . .	—	123.8
1871-1875 . . .	—	1871-1875 . . .	—	130.5
1876-1880 . . .	119.9	1876-1880 . . .	—	123.3
1880-1884 . . .	118.8	1881-1885 . . .	—	125.4
1885-1889 . . .	119.2	1886-1890 . . .	—	121.5
1890-1894 . . .	119.7	1891-1895 . . .	115.9	120.2
1895-1899 . . .	123.2	1896-1900 . . .	120.6	123.8
1900-1904 . . .	123.7	1901-1905 . . .	116.2	118.2
1905-1909 . . .	119	1906-1910 . . .	113.1	115.5
1910-1914 . . .	114.1	1911-1915 . . .	114.1	112.1
1915-1919 . . .	110.4	1916-1920 . . .	113.7	108.6
1920-1924 . . .	104.4	1921-1925 . . .	110.9	101.4
1925-1928 . . .	101.5			

The movements in the death-rate were approximately the same for both sexes in the last century. In the present century, however, mortality has declined to a greater extent among males in the town population in Sweden and Denmark than among females, so that the male death-rate is now very close to the female death-rate. In Norway, on the other hand, the decline in mortality in the present century has been approximately the same for males and females.

Table 4 gives information regarding the general *death-rate in the three capitals*. From 1860 to 1890, the death-rate fluctuated greatly from year to year, but such fluctuations have become less pronounced in the present century. On the whole, mortality is highest in Stockholm and lowest in Oslo. After 1890, however, the death-rates have approached closely to each other, particularly in Stockholm and Copenhagen, while in Oslo mortality is somewhat lower.

Table 4 also gives a review of mortality in the *three capitals among males and females*. The death-rate among males is much higher than among females in the first part of the period under investigation, while male mortality has declined more than female mortality,

so that the rates continue to approach each other, particularly in Stockholm and Copenhagen.

If female mortality is taken at 100 in each five-year period, the following comparative rates are obtained for males:

	Denmark		Norway	Sweden
1880-1884 . . .	125.3	1881-1885 . . .	117.3	133.2
1885-1889 . . .	125.6	1886-1890 . . .	119.7	127.2
1890-1894 . . .	125.3	1891-1895 . . .	121.2	126.5
1895-1899 . . .	130.8	1896-1900 . . .	122.9	140.1
1900-1904 . . .	130.9	1901-1905 . . .	116.	129.2
1905-1909 . . .	126.3	1906-1910 . . .	113.7	126.8
1910-1914 . . .	119.8	1911-1915 . . .	112.9	123.2
1915-1919 . . .	114.8	1916-1920 . . .	110.7	117.2
1920-1924 . . .	107.6	1921-1925 . . .	112.6	104.5
1925-1928 . . .	102.8	1926 . . .	—	—

GENERAL MORTALITY BY AGE-GROUPS.

With regard to the general death-rate in the various age-groups, detailed reports are available for the entire population of Norway and Sweden, while the corresponding information from Denmark refers only to the town population.

Table 5 contains information regarding the general death-rate in various age-classes among males and females in Norway from 1867 to 1925 (the country as a whole).

Table 6 states the general death-rate in various age-classes among males and females from 1871 to 1921 in Sweden (the country as a whole).

Table 7 gives the general death-rate in various age-classes among males and females in the Danish urban population from 1890 to 1923.

Table 8 contains information regarding the general death-rate according to age among males and females in Oslo from 1871 to 1924.

Table 9 contains corresponding information for Copenhagen from 1890 to 1923.

NORWAY.

Among infants under 1 year, the death-rate has regularly declined throughout the entire period under investigation, with the exception of a slight increase in the 'nineties. The decrease is very pronounced after 1900 as a result of the improvement in child hygiene and also on account of the decrease in the number of births. The age-group 1-15 years shows a rise at the end of the 'eighties (due probably to epidemics of diphtheria which were prevalent at that time). Since the 'nineties there has been a constant

decrease of mortality. The influenza epidemic, however, made itself felt in this age-class as in all the succeeding classes.

A comparison of the death-rate among boys and girls shows that the movements were throughout identical. Among infants under 1 year, the death-rate is lower for girls than for boys, and the same applies to the age-group 1-4 years; on the other hand, girls show a higher death-rate than boys between the ages of 5 and 15 years. Among young men and women, on the other hand, developments are not so favourable as among children. Among males from 15 to 25 years the death-rate rose till the beginning of the 'nineties. For the age-group 25-30 years, there was a decrease in the 'seventies and at the beginning of the 'eighties, but there was a subsequent increase which continued till the beginning of the 'nineties. These four age-groups show a maximum mortality in the period 1891-1895. Since that period, the death-rate has declined, but a comparatively long time elapsed before it reached a level below that of 1870. For males over 35 years the death-rate has, on the whole, declined since 1866-1870; but in all groups there is a tendency to increase in the 'nineties, while in 1918 the influenza epidemic brought about an increase in the death-rate amounting to as much as 33 per cent among young men, though the older men were only slightly affected by the epidemic.

For women between the ages of 15 and 25, the movement of the death-rate has been similar to that of the corresponding age-classes among men — *i.e.*, it rose to a culminating point in 1891-1895. For the age-groups 25-40 years, the death-rate at first varied comparatively little and reached its highest point as far back as the end of the 'eighties. Since then it has constantly declined, though the decrease in the rate among women from 15 to 30 years, particularly in recent times, has been less pronounced than among men, while in the ages from 15 to 25 years it has shown a slight tendency to increase. In the age-class 15-19 years in 1921-1925, the mortality among women was, unlike the previous periods, greater than among men.

The movement in the death-rate among women over 40 years has been the same as among men. In the period 1916-1920, influenza greatly increased mortality among young women, while the death-rate among elder women was not affected.

The relatively high death-rate between the ages of 20 and 30 years in Norway, as in Denmark and Sweden, is largely accounted for by the prevalence of tuberculosis in those age-groups. In the case of men, the death-rate is also affected by accidents — in Norway, particularly, by drowning.

It is of interest to investigate mortality in the various age-groups separately for the town and country population. It has only been possible to examine this question in respect of Oslo (see Table 8). This table shows that the death-rate in Oslo has moved on largely the same lines as in the country as a whole. The decline in infantile mortality has, however, been more pronounced in Oslo, while developments in the case of young people have been more favourable in Oslo than in the rest of the country.

If the death-rate among the town population is compared with that among the country population for the various age-classes, it will be seen that mortality among children from 10 to 15 years was formerly higher in the towns than in the country, while for the period round about 1920 the opposite was the case.

The decline in infantile mortality, especially in the case of children under 1 year, has been much greater in the towns than in the country, so that there is now little difference between the two. This is apparently due principally to the fact that child hygiene has made greater progress in the towns than in the country. The same phenomenon is also apparent in Denmark and Sweden.

The relatively low death-rate in the towns among men between 20 and 30 years and among women between 20 and 40 years is also noteworthy. Among men over 30 years and women over 40 years the death-rate is lower in the country than in the towns. There is reason to believe that these facts regarding Norway also apply to Denmark and Sweden.

The following table shows the death-rate per 10,000 about 1920 for the entire country, the rural population, the town population and Oslo:

Age	Males				Females			
	The country as a whole	Rural population	Town population	Oslo	The country as a whole	Rural population	Town population	Oslo
0-1 year . .	613.4	606	720.9	756.6	484.3	464	544.6	513.6
1-4 years . .	67.6	62.3	83.9	87.1	60.1	57	69.3	76.3
5-9 " . . .	31.9	31.4	33.1	30.1	28.8	28.5	29.5	26.8
10-14 " . . .	23.3	24.1	21	17	26.8	27.4	25	21
15-19 " . . .	48.3	48.5	47.9	42.6	49.1	52.7	41.9	38.9
20-24 " . . .	80.6	84	73.5	57.9	63.4	69.1	54.1	49.5
25-29 " . . .	75.3	75.5	74.9	67.3	63.4	68	55.5	49.3
30-39 " . . .	66.8	61.8	77.5	76.4	63.4	66	57.9	54.9
40-49 " . . .	76.4	66.5	98.8	110.3	71.7	69.2	76.4	75.8
50-59 " . . .	125.5	110.6	163.7	183.7	111	105.1	123.4	125.1
60-69 " . . .	266.2	237.2	355.9	374.6	221.5	210.5	247	261.7
70-79 " . . .	646	599.3	821.9	911	563.8	536.9	634.8	634.3
Over 80 years	1,849.8	1,807	2,080.8	2,456.3	1,661.3	1,644.8	1,716.2	1,829.6
Total . .	128.1	126.3	132.6	128.5	122.3	124.4	117.5	113.8

For children under 5 years, Oslo has a higher mortality than all the other towns and the country districts, except for girls under 1 year, who have a lower death-rate in Oslo than in other towns, but not so low as in the country districts.

From 5 years to 40 years for males and to 50 years for females the death-rate in Oslo is very low; but, with regard to the higher age-groups, the capital is in a worse position than the remainder of the country. From the age of 30 years, the mortality among men is higher in Oslo than in the country districts, and from the age of 40 this is also the case for women.

The lower mortality in the towns, especially in Oslo, for young people is possibly caused by the above-mentioned numerous migrations to the towns. Their effect is, in the first place, that a stream of healthy people go from the country to the town, reducing the death-rate in the towns for the particular age-groups of these persons.

Many of the migrants, however, cannot adapt themselves to town life. If they fall ill, they often go back to their homes, and thus further increase the mortality among young people in those places. If they fall ill after the lapse of several years, however,

they remain in the towns and thus increase the death-rate for the older age-classes in the towns.

The importance of these factors cannot, however, be shown by statistics.

SWEDEN.

Table 6 contains information regarding the general death-rate in the country as a whole for various age-classes, separately for males and females, in five-year periods from 1891-1895 to 1916-1920. The death-rate in the last five-year period was greatly affected by the outbreak of the influenza epidemic in that period. This extraordinary circumstance resulted in an increase in the death-rate in many of the groups investigated.

Apart from this circumstance, there has been a pronounced decline in the mortality of children under 10 years, regularly distributed over the entire period under investigation. In the age-group 10-14, there was a decided decline in the death-rate of boys, whereas the decline in the mortality of girls only began after 1905.

In the case of males in the age-group 15-24 years, the death-rate has remained on the same level during the period under investigation, while for young women in the same age-group mortality declined from 1900 onwards. The mortality in these groups is much higher in Norway than in Sweden. In all the other age-groups there is a more or less pronounced tendency towards a constant and regular decline in the death-rate, both in the case of men and women.

DENMARK.

Table 7 contains a review of the general death-rate for the town population of the country as a whole. Generally speaking, there was a regular decline in the mortality of all age-classes for the whole period under investigation (1890-1894 to 1920-1923). Among young people there was, however, a rise in the death-rate during the years of the influenza epidemic, while the decline in the mortality of young women is always less pronounced than in the case of the older age-classes.

If conditions in Copenhagen alone are considered (Table 9), it will be seen that, in the age-class 0-4 years, there was a great decline in mortality both among boys and girls, which was much more pronounced than in the urban population as a whole. Among males, the decline in the death-rate in Copenhagen was approximately the same as in the urban population elsewhere, and it is only in the older age-classes that the decline in the death-rate is less marked in Copenhagen.

Among women, the decline in the death-rate in Copenhagen is less pronounced from 15 to 19 years, while in the following groups the decline is approximately the same, and therefore inconsiderable. Among elder women, the decline in the death-rate is practically the same in the two groups.

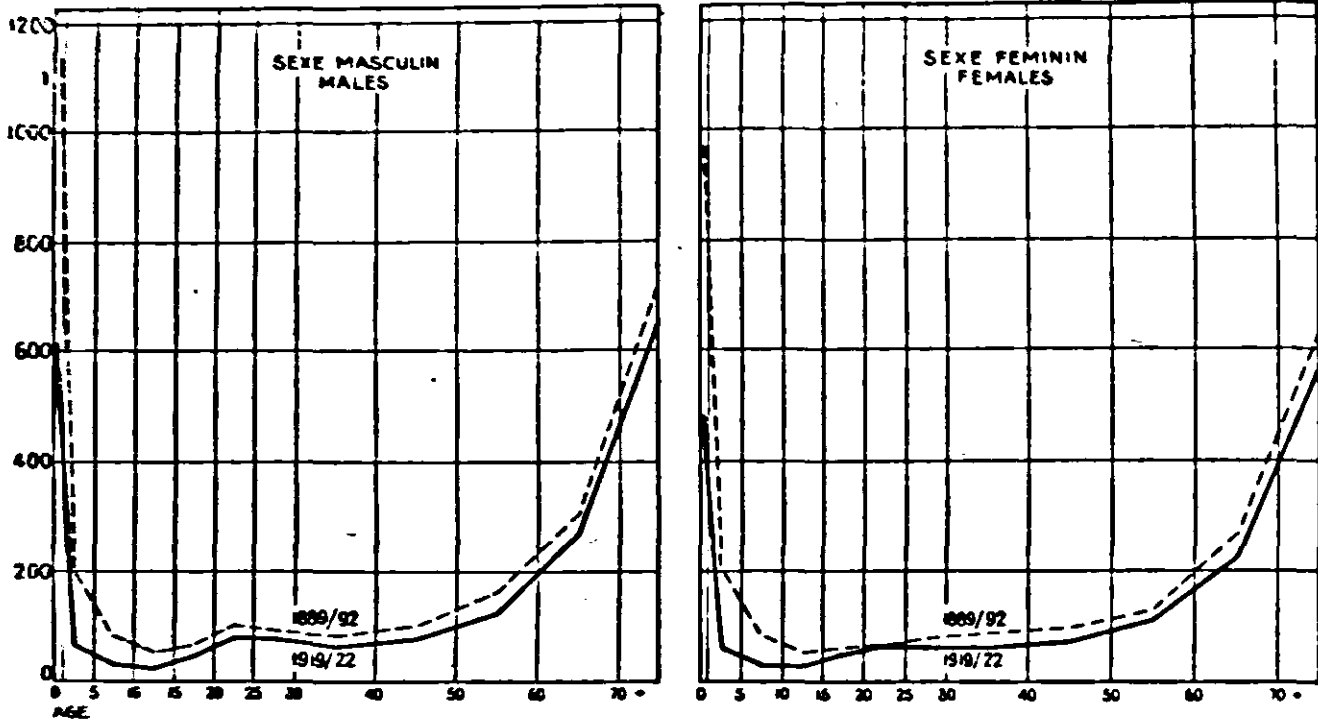
Table 10 contains a comparison of the general death-rate in 1920-1924 in the various age-classes in the country as a whole, in the rural population, in the provincial towns and in the capital, so that it is possible to make a comparison in this respect with Norway for the same period. This table shows that, for children under 5 years, the death-rate is lower in the country than in the towns. Among the male population, the death-rate in the age-group 5-14 years is practically the same in the three groups, while in the following

Graph 3.

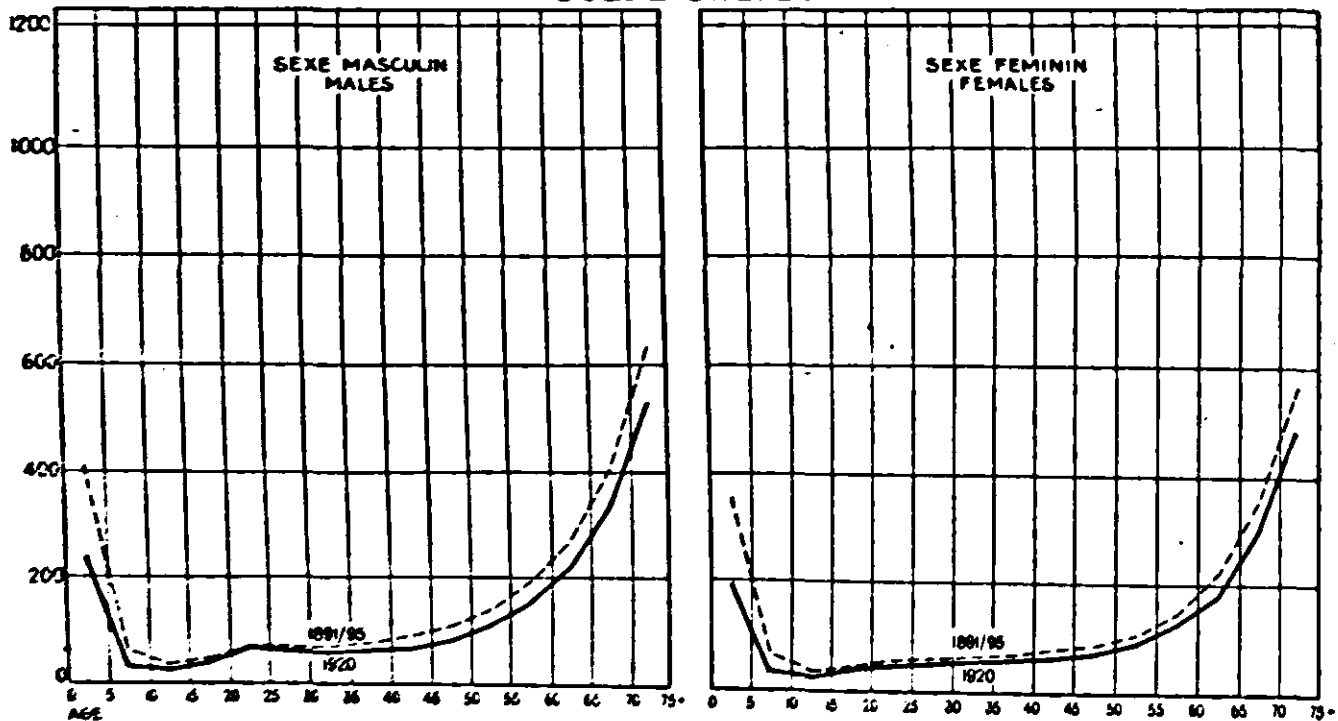
DECREASE OF THE GENERAL MORTALITY BY AGE AND SEX, FROM 1889-1892 TO 1919-1922 IN NORWAY, AND FROM 1891-1895 TO 1920 IN SWEDEN (WHOLE COUNTRY).

(See Table II.)

NORVÈGE - NORWAY



SUÈDE - SWEDEN

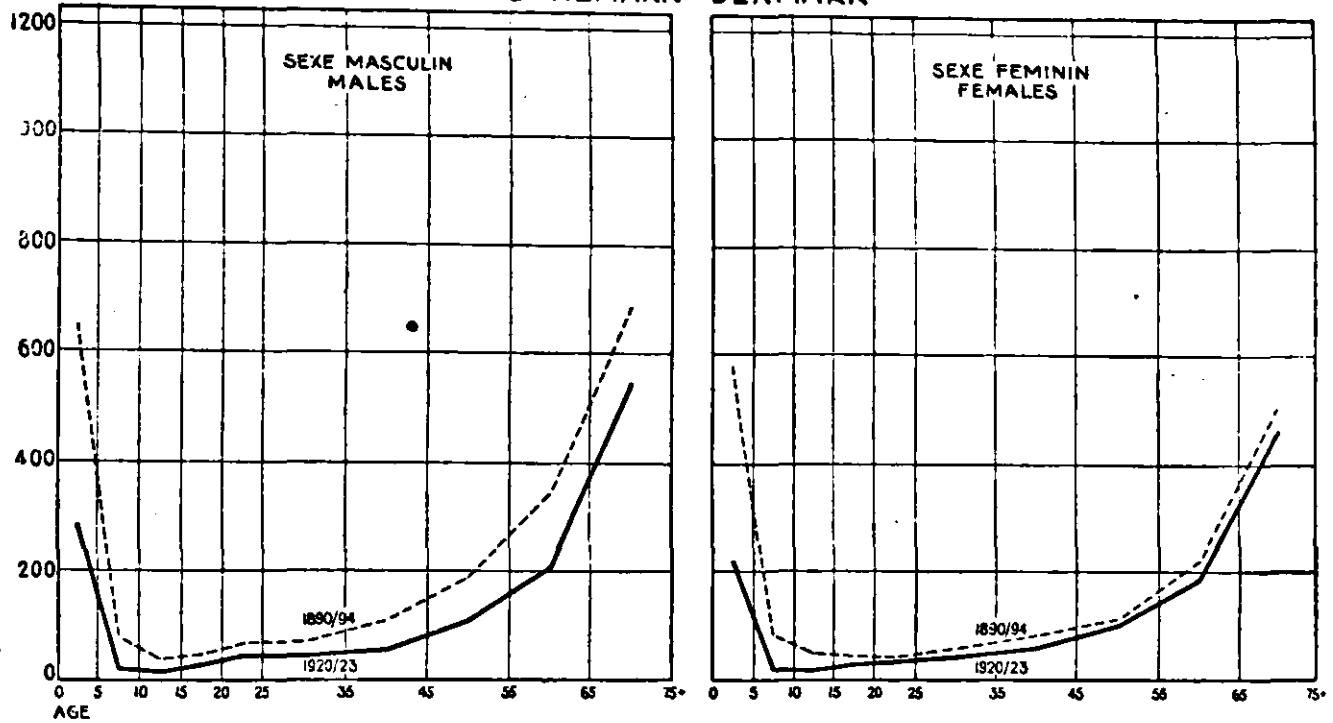


Graph 4.

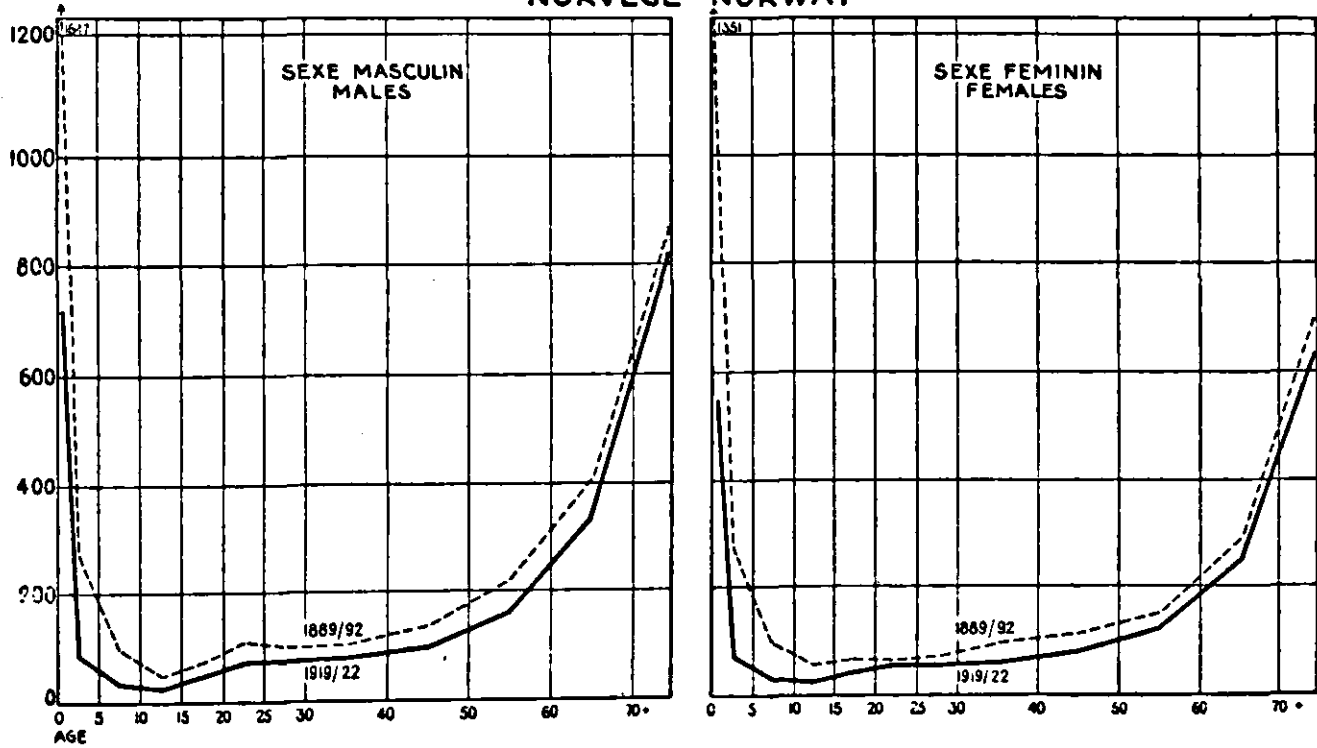
DECREASE OF THE GENERAL MORTALITY BY AGE AND SEX IN THE URBAN POPULATION OF DENMARK FROM 1890-1894 TO 1920-1923 AND IN NORWAY FROM 1889-1892 TO 1919-1922.

(See Table II.)

DANEMARK - DENMARK



NORVÈGE - NORWAY

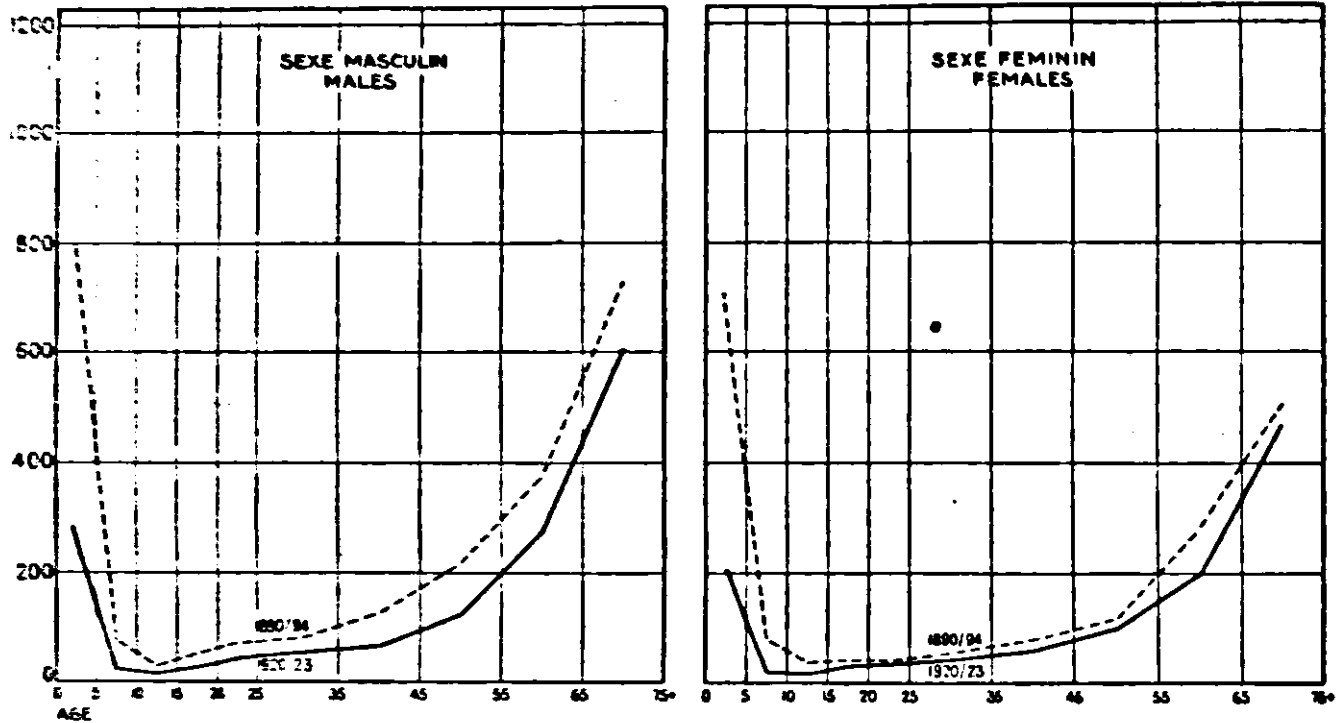


Graph 5.

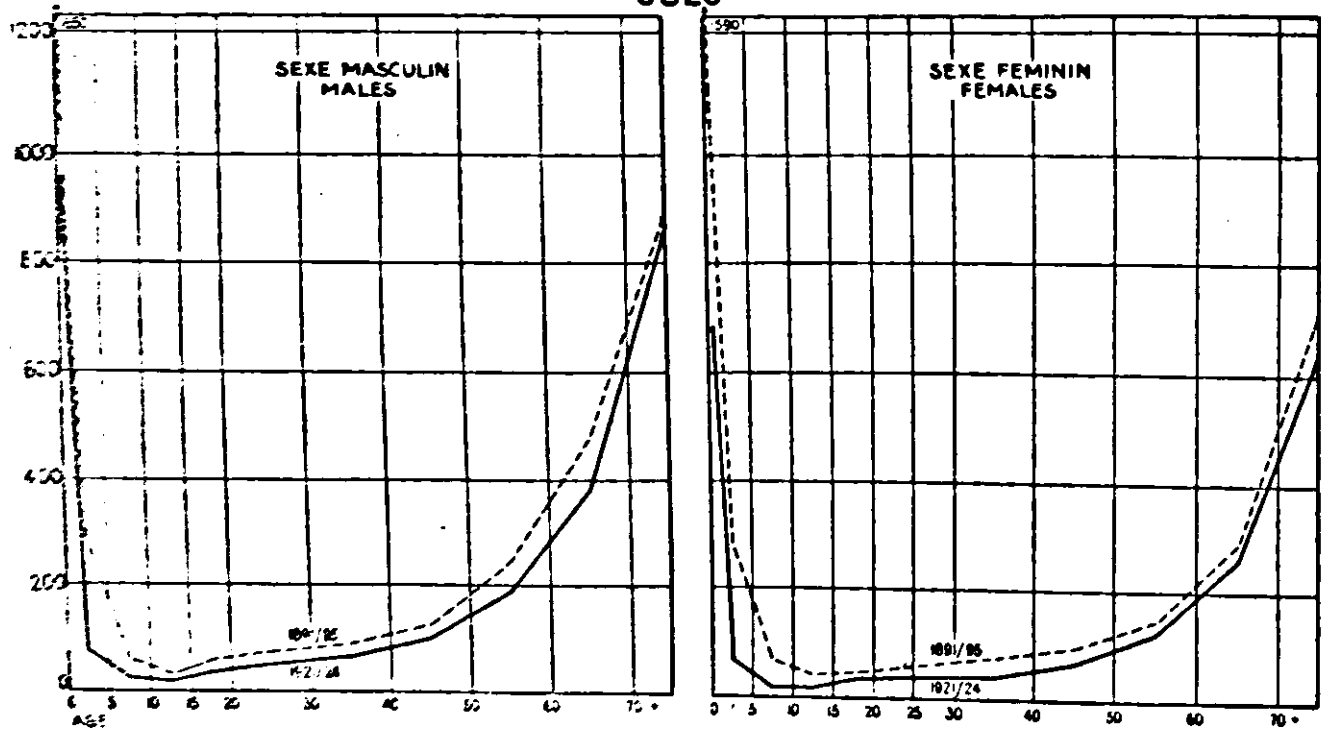
DECREASE OF THE GENERAL MORTALITY BY AGE AND SEX AT COPENHAGEN FROM 1890-1894 TO 1920-1923 AND AT OSLO FROM 1891-1895 TO 1921-1924.

(See Table 12.)

COPENHAGUE-COPENHAGEN



OSLO



age-classes mortality is higher in the towns than in the country; after 35 years, mortality among males is greater in the capital than in the provincial towns.

With regard to females, the death-rate is the same in the age-classes in all three groups until the age of 45, while in the older groups the towns show greater mortality than the country, and the death-rate in the capital rises until it greatly exceeds that of the provincial towns.

(See Graphs 3 and 4.)

Table 11 contains a summary of the proportional decline in the death-rate according to age in Norway and Sweden (in Norway, 1889-1892 to 1919-1922; in Sweden, 1891-1895 to 1920). The decline among men is, on the whole, more pronounced in Norway than in Sweden, and the same also applies to women, with the exception of the age-group 20-24 years.

The table also contains a comparative summary of the percentage decline in the death-rate among the town population according to age, in Denmark and Norway (in Denmark, 1890-1894 to 1920-1923; in Norway, 1889-1892 to 1919-1922).

Among the male population, the decline is greatest in Norway among children up to 4 years, while in all other groups the proportional decline in mortality is more pronounced in Denmark.

With regard to females, the death-rate among girls up to 4 years is declining in Norway to a greater extent than in Denmark. In the age-group 5-24 years, the decline is most pronounced in Denmark, while for subsequent groups Norway shows a greater decline in mortality.

(See Graph 5.)

Finally, Table 12 contains a comparison of the decline in the death-rates in Copenhagen and Oslo. Except for the age-group 0-4 years, the decline is greater among males in Copenhagen than in Oslo.

With regard to females, the position is somewhat uneven. In the age-group 0-4 years, the decline is greatest in Oslo, and from 5 to 14 years in Copenhagen, while in the older groups the decline is greater in all cases in Oslo.

GENERAL MORTALITY BY PROVINCES IN EACH COUNTRY.

NORWAY.

The most detailed information is available for Norway. In this country, where the natural conditions, climate and living conditions are so diverse, the death-rate will, of course, vary in different parts of the country. In Tables 13, 14 and 15 the death-rate is calculated in each province (Fylke) from 1867-1870 to 1916-1920, and is given separately for town and country from 1881-1885. When comparing the provinces with each other,

it must be remembered that a difference in the general death-rates does not necessarily imply that the mortality is actually higher in one province than in another. It may be caused by a different distribution of the population according to age in the two provinces. The general death-rates may, however, serve to illustrate the main lines in the development of mortality in various parts of the country.

The following remarks refer to the figures for the rural population.

In 1861-1870, the death-rate was comparatively low in the eastern inland provinces and high on both sides of the Oslo Fjord, and particularly so in the southern districts, both along the coast and inland. In the western districts and in Trøndelagen, the death-rate was at that time very low. Farther north it was considerably higher. In the 'seventies, the death-rate declined greatly in most of the eastern provinces, but rose again in the 'eighties. In the southern provinces, there was a steadily declining tendency in the 'seventies and 'eighties, with the greatest decline in Aust-Agder and a smaller one in Vest-Agder. There were very small changes in the western provinces from 1870 to 1890. In Trøndelag the death-rate declined, and also, though to a less extent, in Norrland. In Tromsø and Finmark in this period the position appreciably improved.

In 1891-1895, the above-mentioned position was considerably changed. There was a low death-rate in all the eastern districts. In the southern districts it was relatively high and in the west was favourable. In Trøndelagen the position became worse, however; but on the whole mortality was declining.

The Central Statistical Bureau has undertaken a standard system of calculating death-rates in the provinces (Fylke), with the entire population of the country as a standard population, divided into age-groups in accordance with the census of 1920.

	Males			Females		
	1890	1900	1920	1890	1900	1920
Östfold	177.8	151.7	129.4	172.6	152.6	116.5
Akershus	185.1	154.4	129.6	171.8	145.2	110.5
Hedmark	167.9	137.9	119.6	153.8	136	111.7
Upland	147.5	121.6	111.3	140.8	119.1	109.7
Buskerud	163.3	143.9	119.3	159.4	142.5	114.3
Vestfold	167.8	163.2	130.8	151.9	140.3	112.9
Telemark	162.8	152.8	135	160.6	153.4	122.3
Aust-Agder	189.5	160.9	118.3	187.2	150.4	113
Vest-Agder	192.2	164	126	180.4	156.6	118.7
Rogaland	164.4	145	114.7	147.8	137.3	112.3
Hordaland	161.9	155.1	123.7	141	132.4	111.4
Sogn Fjordane	143.1	140.3	121.4	130.7	115.8	106
Møn	161.6	136.5	115.8	140.7	117.4	111.9
S. Trøndelag	184.8	160.9	129.7	168	141.7	125.2
N. Trøndelag	178.5	126.3	123.8	145.5	121.9	110.4
Norrland	191.9	145.9	132.3	172.9	127	118.2
Tromsø	179.6	162.8	151.4	175.3	154.8	134.8
Finmark	258.7	216.8	199.1	221.6	187.1	190.9
Total	172.2	147.6	125.8	157.9	135.6	115.5

In all three periods mortality was lowest among both males and females in Upland and highest in Telemark and Vest-Agder. The second lowest rate was in the western provinces, in Sogn Fjordane and in Mön, and the second highest in Sör Tröndelag, and a rising death-rate in the three northernmost provinces.

During the lapse of time there has been a great equalisation of the mortality figures, although there are still differences between the various parts of the country.

The death-rate in individual provinces may have been affected by overseas emigration, which was very pronounced at the turn of the century, particularly from the three southernmost provinces — Aust-Agder, Vest-Agder and Rogaland. The effect of emigration on mortality cannot, however, be shown by statistics. The figures would have to be divided to such an extent that they would become too small for statistical purposes.

Tables 16 and 17 contain a summary of the general death-rate in the *provinces* (Län) in Sweden from 1911 (town and country), and separately for towns and country districts from 1919. It will be observed that mortality everywhere shows a decline, and that the death-rates gradually approach each other; further, in the northern districts the death-rate is not particularly high, so that, on the whole, a considerable equalisation of death-rates in the various provinces has taken place.

The general death-rate among the rural population is lowest in Central Sweden, and is somewhat higher in some of the southern provinces and in North Sweden. In 1923-1926, the general death-rate was lower in the towns than in the country in twenty-three provinces, while it was higher in only one province — Upsala.

The general death-rate among the town population in Sweden is on the same level as among the town population in Denmark, while the death-rate among the rural population in Denmark is, on the whole, lower than in Sweden.

Table 18 gives a summary of the general death-rate in the *Danish provinces* (Amter), for both country and town after 1920. Among the country population there is very little difference in the total mortality between the various provinces. Mortality appears, on the whole, to be lowest where living conditions are most difficult, where the soil is poor and the climate inclement — e.g., Western and Central Jutland.

With regard to mortality among the urban population in Denmark, the death-rate does not appear to be affected by the position or size of the towns, the largest towns having perhaps a slightly higher death-rate. If the general mortality in the rural and urban population of the same province is compared, very little difference is found. Taking discrepancies of not less than 10 per 10,000, we find that the rural population in three provinces has a higher death-rate than the town population; in ten provinces the opposite is the case, and in the remaining thirteen provinces there is no decided difference.

4. MORTALITY FROM TUBERCULOSIS OF ALL FORMS AND FROM PULMONARY TUBERCULOSIS.

The following information is available in respect of the death-rate from tuberculosis:

(1) Death-rate from tuberculosis of all forms and from pulmonary tuberculosis in the whole of Norway, separately for males and females, in five-year periods from 1876-1880 to 1916-1920 (Table 19). The figures are calculated on the statistical basis described in the introduction.

(2) Tables 20 to 27 give information regarding the death-rate from tuberculosis of all forms and from pulmonary tuberculosis in the towns of the three countries, partly in respect of the entire population and partly for males and females separately. The figures are based, in respect of Denmark and Sweden exclusively, and in respect of Norway predominantly, on certificates of causes of death issued by physicians. The figures for the Danish towns go back to 1876 or 1860, for Norway to 1891 and 1885, and for Sweden to 1891 or 1876.

(3) Tables 28 to 35 contain information regarding the death-rate from pulmonary and other tuberculosis in the capitals of the three countries, based exclusively on death certificates issued by physicians. For Denmark the tables comprise the period from 1876 or 1860 to 1927, for Norway from 1871 and for Sweden from 1891 or 1876.

(See Graph 6.)

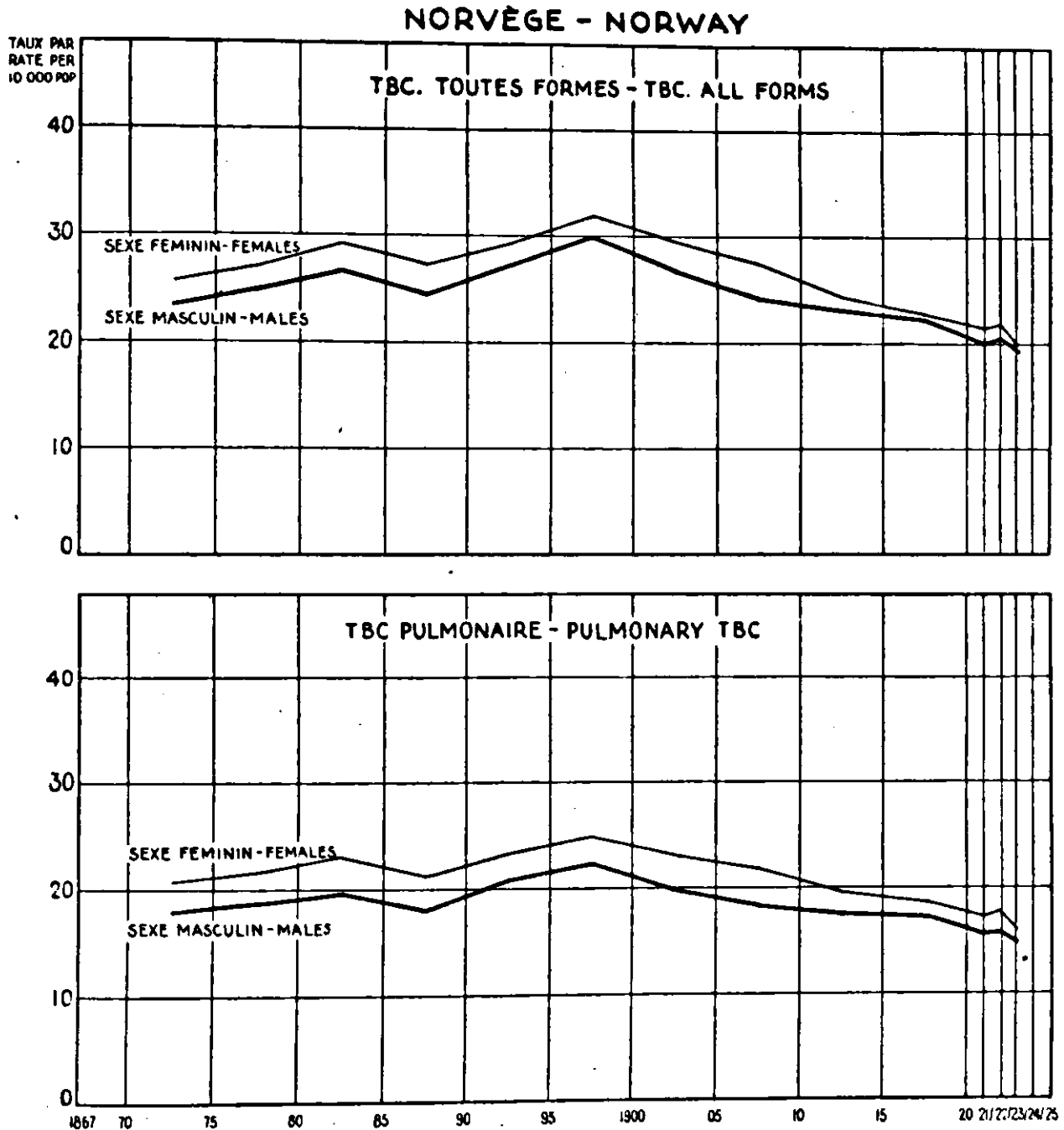
It is apparent from Table 19 that *the death-rate from pulmonary and other tuberculosis in the entire population of Norway (town and country)* showed a rising tendency from 1870 on, and reached its culminating point in 1896-1900. The same tendency is shown in the figures for each sex separately. From the highest point in 1896-1900 until 1921-1925 the death-rate from all forms of tuberculosis declined from 31 to 20.3 per 10,000 — *i.e.*, by 34.5 per cent. The death-rate from pulmonary tuberculosis declined in the same period by 32.1 per cent. The general death-rate in this period declined by 27 per cent.

When the figures for the two sexes are examined, it will be found that the death-rate from all forms of tuberculosis in the entire country has always been somewhat higher among females than among males. The same applies to pulmonary tuberculosis. In Oslo, however, the opposite is the case (Tables 28-35).

Graph 6.

CHANGES IN THE TUBERCULOSIS MORTALITY (ALL FORMS), AND FROM PULMONARY TUBERCULOSIS BY SEX IN NORWAY (WHOLE COUNTRY) FROM 1867-1870 TO 1923

(See Table 19).



URBAN POPULATION.

Table 20. In Denmark the death-rate from tuberculosis remained at the same level from 1876 to 1890. From that time it began to decline, and continued to do so until 1915. In the following two years there was a great rise, followed by a further considerable decline. From 1890-1894 to 1925-1928 the death-rate from tuberculosis dropped 68.2 per cent.

In Norway, the death-rate from tuberculosis in 1891 was higher than in Sweden and Denmark, and remained approximately at the same level until 1900. It declined considerably, approximately at the same rate as in Denmark and more quickly than in Sweden. In 1915 and the immediately succeeding years, the death-rate from tuberculosis was approximately the same in Norway and Sweden, but after 1915 the decline was greater in Sweden than in Norway. In 1916, there was a rise in mortality both in Norway and Denmark; in Norway it was confined to that particular year, whereas in Denmark it continued during 1917. From 1891-1895 until 1926-1927 the death-rate from tuberculosis in Norway dropped 54.8 per cent.

In Sweden the death-rate from tuberculosis in 1891 stood at the same level as in Denmark. It remained practically stationary until 1901, after which there was a regular and steady decline, which, after 1915, became more pronounced than in Denmark. From 1891-1895 until 1926-1928 the death-rate from tuberculosis in Sweden dropped 55.6 per cent.

Table 21. The death-rate from pulmonary tuberculosis among the town population in Denmark remained, with greater or smaller fluctuations from year to year, at the same level, or showed a rising tendency from 1860 to 1875. There was a slight decline in the following ten years, with a further rise at the end of the 'eighties. In 1888, mortality was as high as in 1860. From 1888, a steady and regular decline took place, only interrupted by a rise in 1916 and 1917, which was followed by a very marked decline in the succeeding years.

In Sweden the death-rate from pulmonary tuberculosis in 1876 was considerably higher than in Denmark. The decline appears to have begun in 1881 and to have continued slowly until 1896. In the following years — till 1901 — there was a slight increase in mortality; but from 1901 there was a further decrease, which took place more slowly than in Denmark until 1915 and more rapidly after that year.

In Norway, the death-rate from pulmonary tuberculosis in 1891 was rather higher than in Sweden. The decline began in 1899 and continued at practically the same rate as in Denmark, and in a more pronounced manner than in Sweden. From 1910 to 1919, the mortality figures in Norway and Sweden practically coincide, but after 1919 the decline is more pronounced in Sweden than in Norway.

From 1890-1894 to 1920-1924, the death-rate from pulmonary tuberculosis dropped 60 per cent in Denmark, 47.7 per cent in Sweden and 45.5 per cent in Norway.

A comparison of the decline in the general death-rate and in the death-rate from pulmonary and other tuberculosis (Table 22) shows that the decline in general mortality was practically the same in all three countries. The decline in the death-rate from pulmonary and other tuberculosis in all three countries was more pronounced than that of the general death-rate. This difference is most marked in Denmark.

Graph 7.

EVOLUTION OF TUBERCULOSIS MORTALITY BY SEX IN THE URBAN POPULATION OF THE THREE COUNTRIES

(See Tables 23 and 25.)

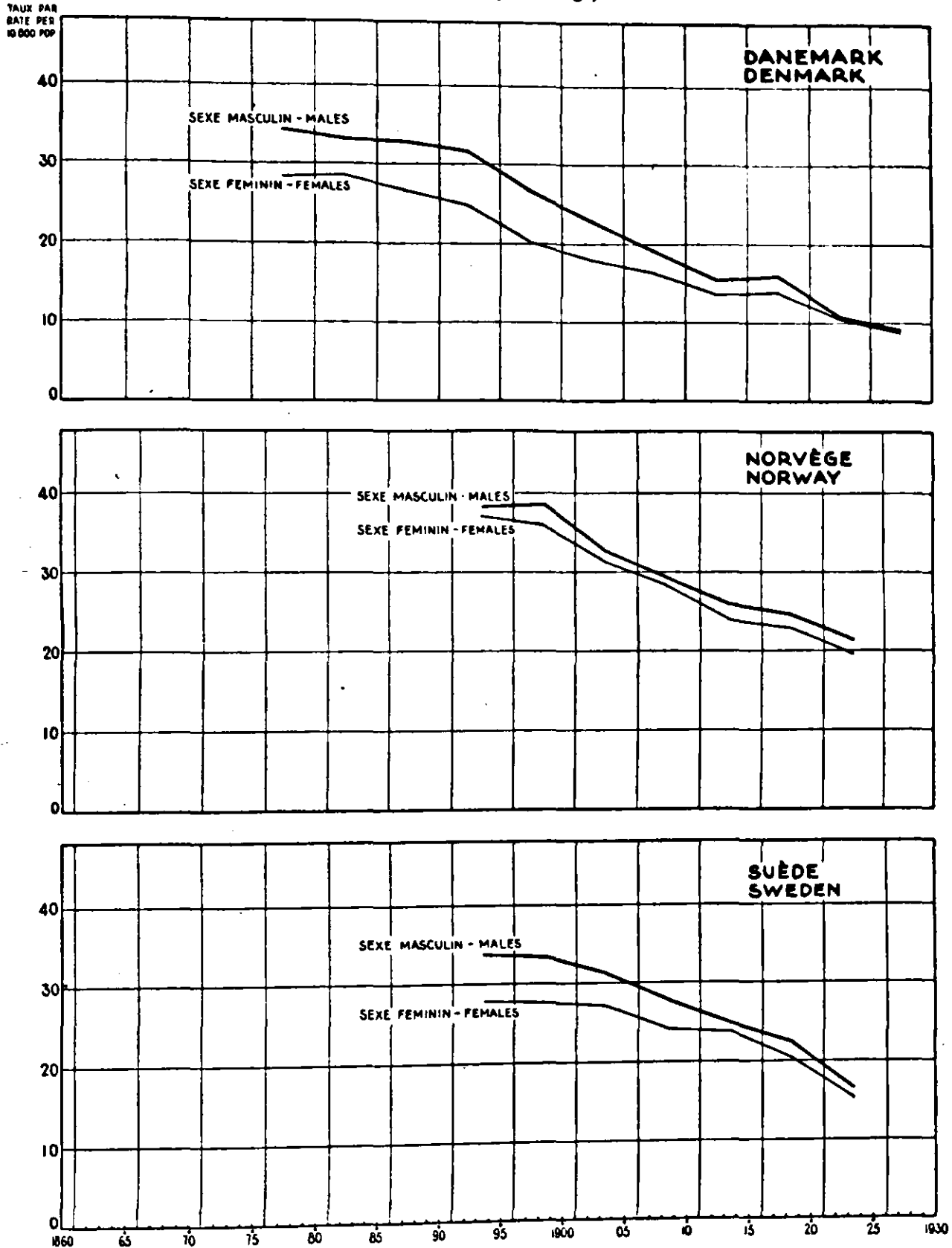


Table 23 and 24. Death-rate from pulmonary and other tuberculosis among the male population of the towns.

In Denmark the death-rate from tuberculosis remained at the same level from 1876 to 1891. Subsequently, except for slight fluctuations from year to year, it declined regularly and rapidly until 1915. In 1916 and 1917, there was a considerable temporary rise, followed by a heavy permanent fall. In Sweden the death-rate from tuberculosis in 1891 was not quite as high as in Denmark; it remained practically stationary until 1900 and then constantly declined — until 1915 not so rapidly as in Denmark, and after 1915 more rapidly. In Norway, the death-rate from tuberculosis was higher than in Sweden in 1891. Here also the decline began about 1900 and ran parallel with that in Denmark, and more rapidly than that in Sweden. The rates in Sweden and Norway therefore approached each other closely and practically coincided from 1910 to 1915. In 1916, there was a temporary rise in the death-rate, followed by a decline in succeeding years, though less pronounced than in Sweden and Denmark.

The movement in the death-rate from pulmonary tuberculosis has taken place practically in the manner described above (Table 23).

(See Graph 7.)

Table 27 gives a comparison between the decline in the general death-rate and that of pulmonary and other tuberculosis. While the decline in the general rate is equally rapid in Denmark and Sweden, it is somewhat less pronounced in Norway. The death-rate from tuberculosis in all three countries has declined more rapidly than that of the general death-rate.

Table 25. — Death-rate from tuberculosis among females in the town population.

In Denmark, the death-rate from tuberculosis remained at practically the same level from 1876 to 1890. This was followed by a steady and regular decline, which continued until 1915. In 1916 and 1917, the death-rate rose, and afterwards again fell heavily.

In Sweden the death-rate from tuberculosis in 1891 was approximately the same as in the preceding years in Denmark, but mortality remained practically stationary in Sweden until 1901. In 1902 it began to fall, somewhat more slowly than in Denmark until 1915, and more rapidly after 1915.

In Norway in the 'nineties, the death-rate from tuberculosis was considerably higher than that of Sweden. The rates fluctuated greatly from year to year, but there was no appreciable decline before 1900. After 1900, the death-rate fell more rapidly than in Denmark and Sweden until 1915, and somewhat more slowly after 1915.

Table 26 contains figures illustrating the course of mortality from pulmonary tuberculosis among the female population of the towns. The fall in the rate began perhaps somewhat earlier than the fall in the general death-rate from tuberculosis, but in other respects conditions were approximately the same as those stated above for the death-rate from tuberculosis.

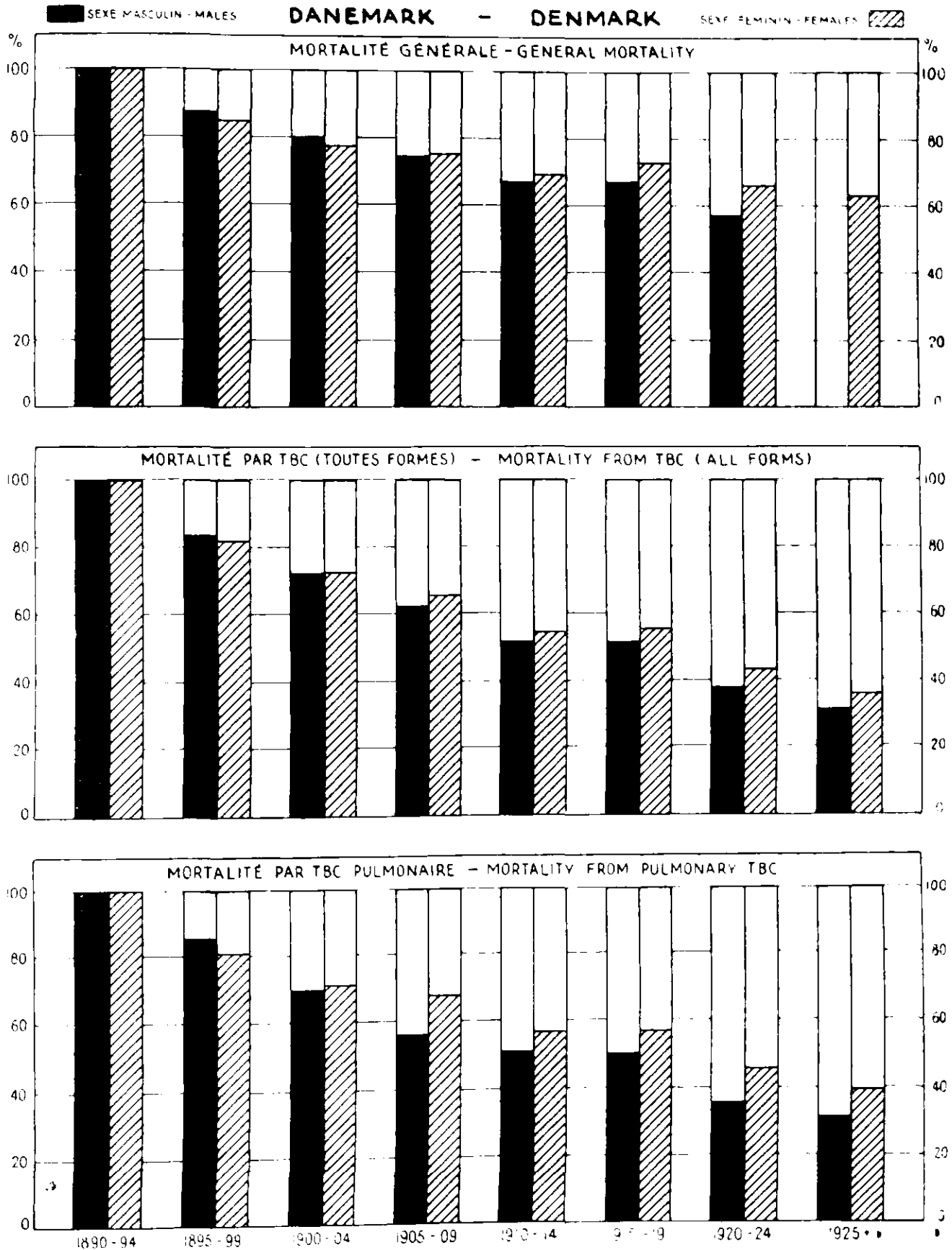
(See Graph 8a, 8b and 8c.)

Graph 8a.

COMPARATIVE DECREASE OF THE GENERAL MORTALITY, OF MORTALITY FROM TUBERCULOSIS OF ALL FORMS, AND OF PULMONARY TUBERCULOSIS, BY SEX, IN DENMARK FROM 1890-1894 (OR 1891-1895) TO 1921-1924.

(The figures for the first five-year period are taken as 100.)

(See Table 27.)

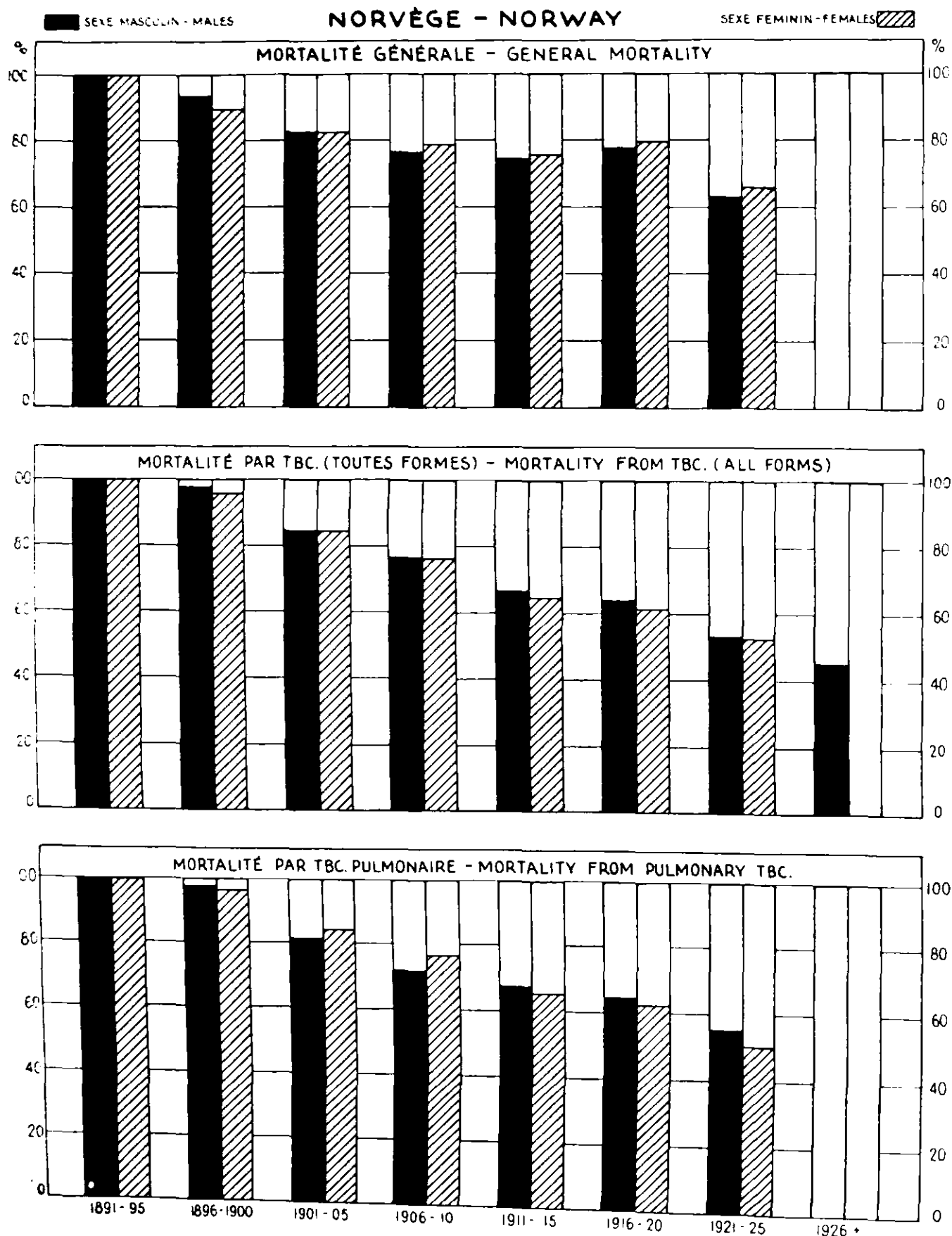


Graph 8b.

COMPARATIVE DECREASE OF THE GENERAL MORTALITY, OF MORTALITY FROM TUBERCULOSIS OF ALL FORMS, AND OF PULMONARY TUBERCULOSIS, BY SEX, IN NORWAY FROM 1890-1894 (OR 1891-1895) TO 1921-1924.

(The figures for the first five-year period are taken as 100.)

(See Table 27.)

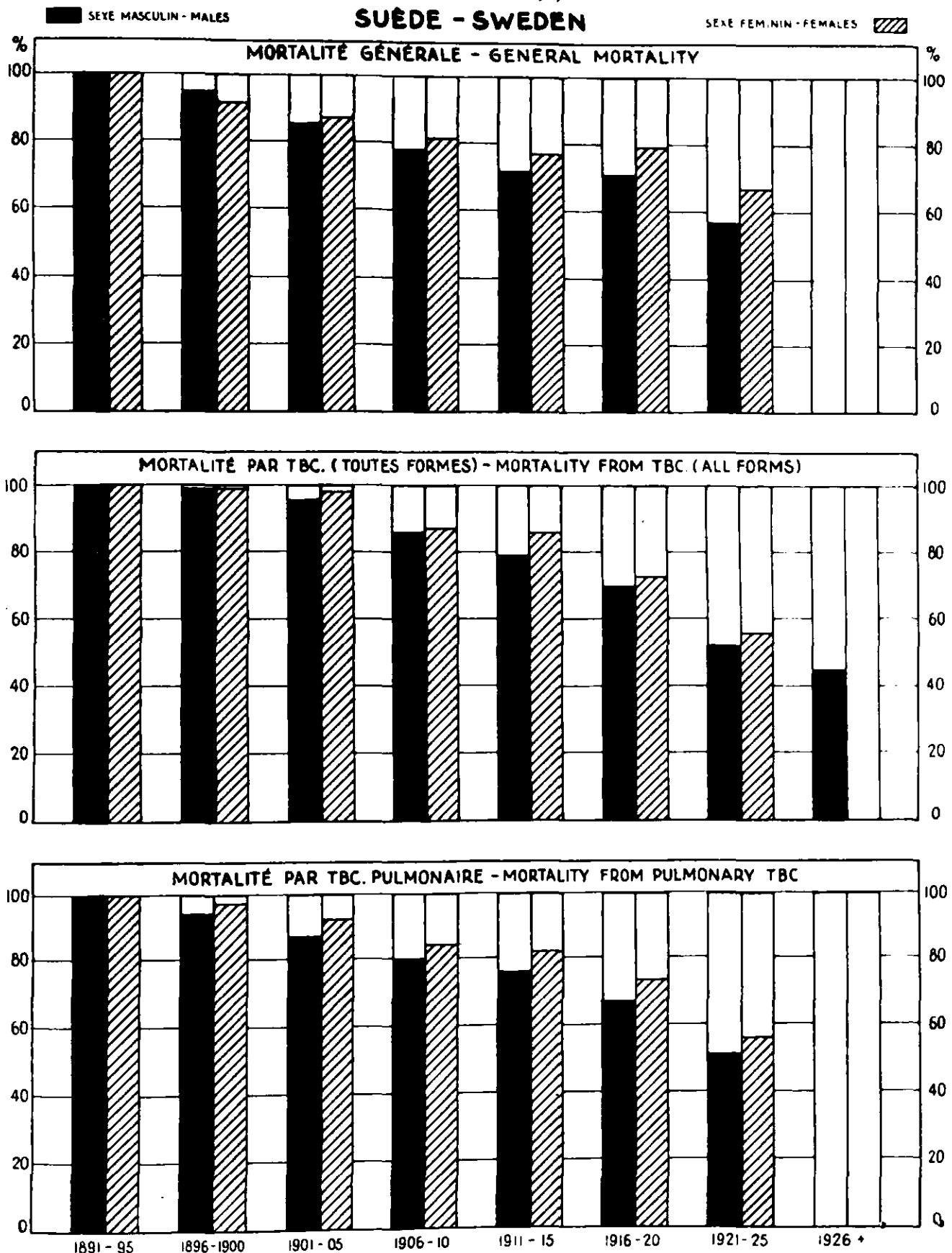


Graph 8c.

COMPARATIVE DECREASE OF THE GENERAL MORTALITY, OF MORTALITY FROM TUBERCULOSIS OF ALL FORMS, AND OF PULMONARY TUBERCULOSIS, BY SEX, IN SWEDEN FROM 1890-1894 (OR 1891-1895) TO 1921-1924.

(The figures for the first five-year period are taken as 100.)

(See Table 27.)



Graph 9.

**CHANGES IN THE TUBERCULOSIS MORTALITY (BOTH SEXES COMBINED) IN COPENHAGEN
OSLO AND STOCKHOLM**
(See Table 28.)

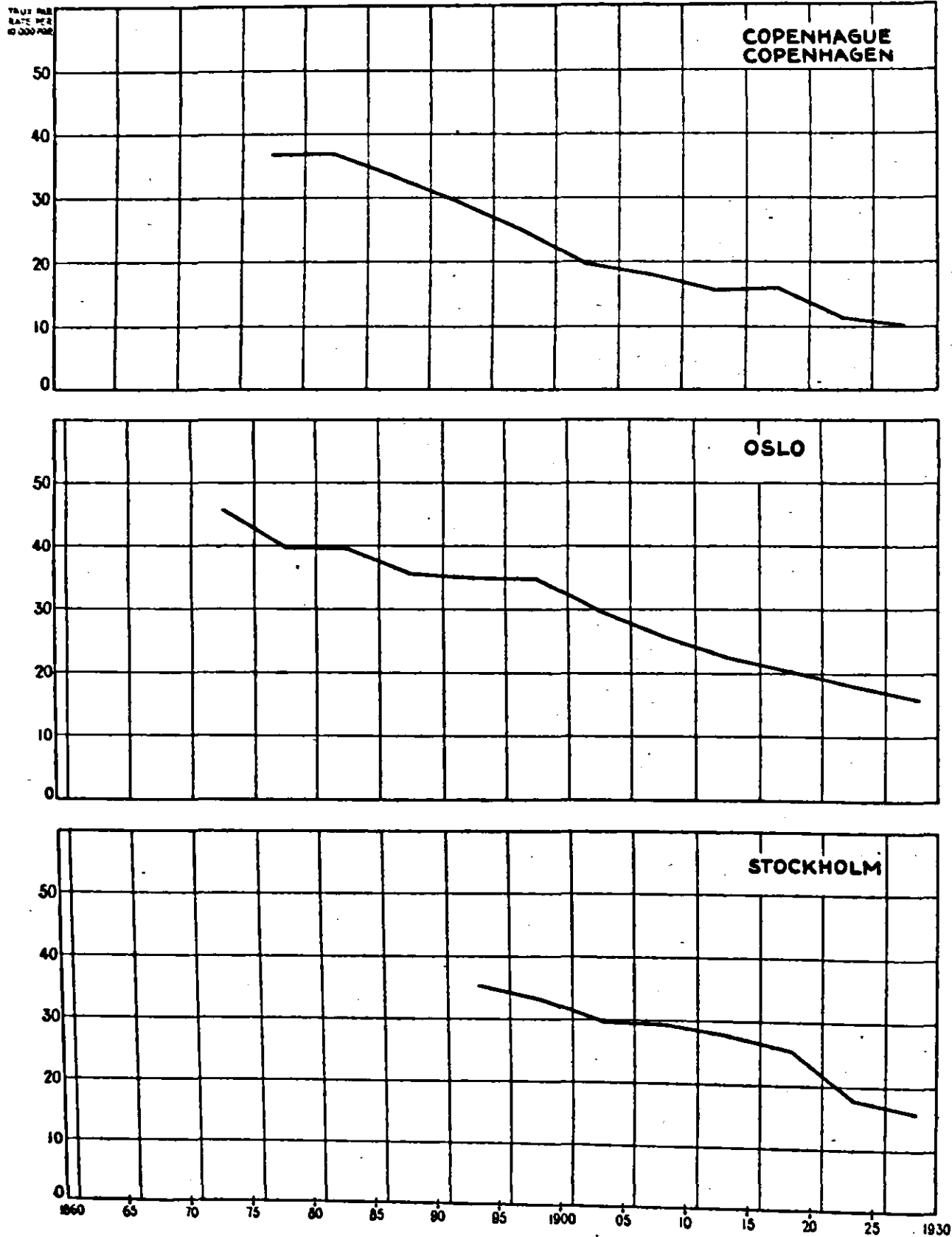


Table 27 gives a summary of the decline in the general death-rate as compared with that from tuberculosis. While the decline in the general rate was equally pronounced in the three countries, the death-rate from tuberculosis fell more rapidly; this decline was most pronounced in Denmark.

Tables 28 to 35 illustrate the death-rate from pulmonary and other tuberculosis in the three capitals.

(See Graph 9.)

In Copenhagen (Table 28) the rates from 1876 to 1888 were a little lower than in Oslo. From 1888 there was a constant, rapid and fairly regular decline until 1915, and the rates became more and more divergent from those of Oslo and Stockholm. In 1916 and 1917, there was a great increase in the death-rate from tuberculosis in Copenhagen — this was before the introduction of rationing—while after 1917 there was again a pronounced decline.

In Oslo there was a slight fall in the 'seventies and from 1891 to 1906, although in some years the rates fluctuated widely. From 1905 to 1917 there was a great decrease in mortality — greater than in Copenhagen — while after 1917 the decline was steady, though not so rapid as formerly.

In Stockholm, as in Oslo, the death-rate from tuberculosis in 1891 was considerably higher than in Copenhagen. It decreased regularly though slowly until 1915, with no marked fluctuations in any individual year. After 1915, the decline became more rapid and was more pronounced than in Copenhagen or Oslo.

The death-rate from pulmonary tuberculosis (Table 29) for the entire period under investigation is lowest in Copenhagen. It remained at approximately the same level from 1860 to 1880, though with great fluctuations from year to year. From 1882 to 1915 the decline in the death-rate was regular and rapid. In 1916 and 1917 there was a rise, followed by a further great decrease.

In Oslo there were great fluctuations in the rates, and no regular and steady decline began until 1895; it then continued slowly until 1905. After that year the decline was rapid and constant until 1924, though after 1917 it was not so rapid as in Copenhagen.

In Stockholm the rates varied greatly from 1876 to 1890, with a distinct decline from 1881. Until 1890, mortality was much higher than in Oslo and Copenhagen. From 1890 to 1906 there was a regular and distinct decline, so that the death-rate gradually became lower than, or coincided with, that of Oslo. In succeeding years there was again a rise and a stationary period until 1915, after which the death-rate fell more rapidly than in Oslo and Copenhagen.

(See Graph 10.)

Table 30 shows that the fall in the general death-rate was equally great in the three capitals, and that the decline in the death-rate from tuberculosis was approximately the same in Stockholm and Oslo, but was, on the other hand, more pronounced in Copenhagen. In all three capitals the death-rate from tuberculosis declined more rapidly than the general death-rate.

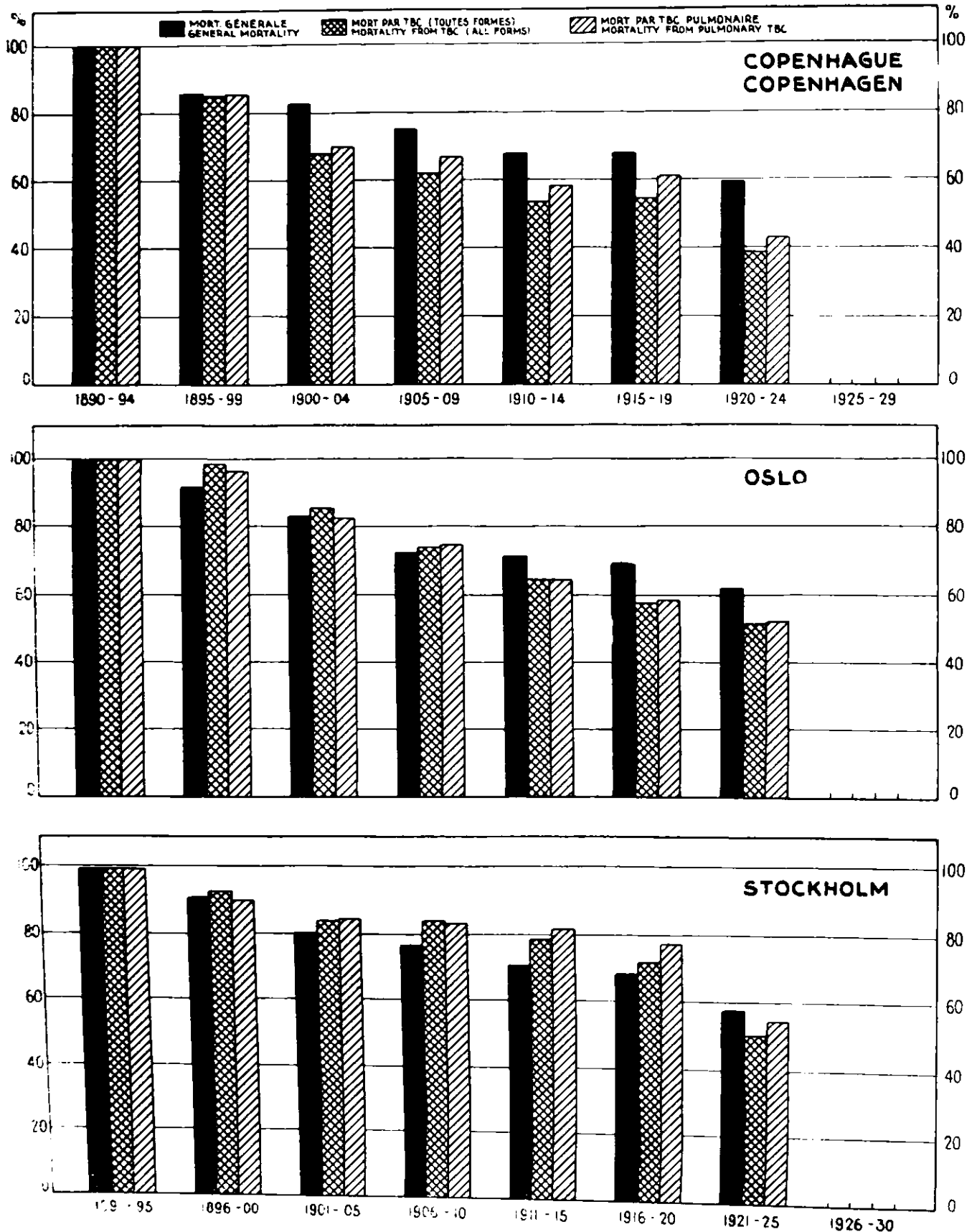
Information is available from Oslo and Copenhagen (Tables 31-35) regarding the death-rate from pulmonary and other tuberculosis among males and females in those capitals.

Graph 10.

COMPARATIVE DECREASE OF THE GENERAL MORTALITY, THE MORTALITY FROM TUBERCULOSIS OF ALL FORMS AND PULMONARY TUBERCULOSIS IN THE THREE CAPITALS, FROM 1890-1894 (OR 1891-1895) TO 1924-1925.

(The figures for the first five-year period are taken as 100.)

(See Table 30.)



In the case of males, apart from fluctuations in individual years (e.g., 1905 and 1916-17), there was a steady and rapid fall in Copenhagen from the beginning of the 'eighties.

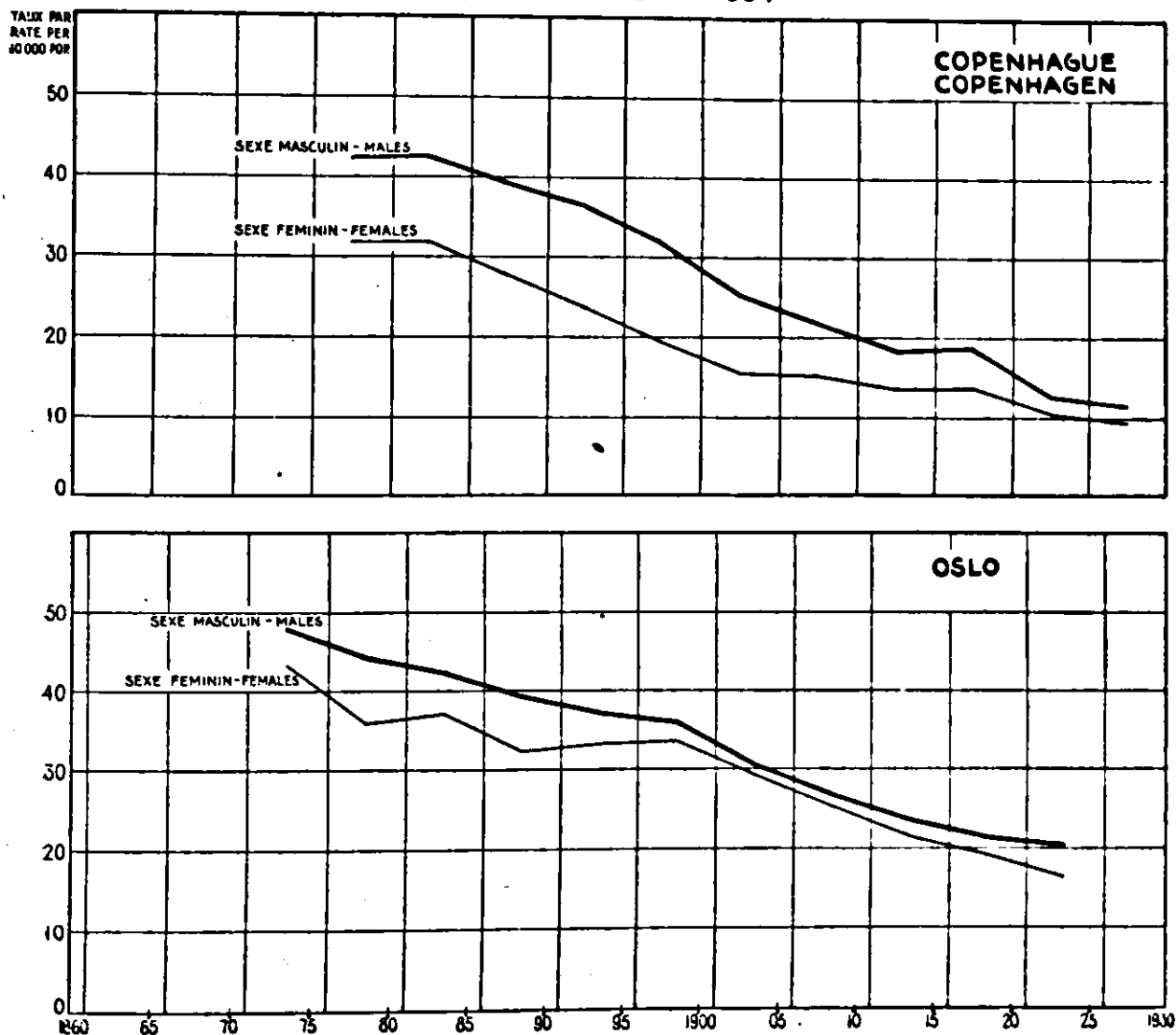
In Oslo the death-rate among males from 1890 to 1896 stood approximately at the same level as in Copenhagen, but the decline became rapid only about 1900, although the rates in Oslo were throughout higher than in Copenhagen. In 1917, mortality was lower in Oslo than in Copenhagen, but after that time there was a great reduction in Copenhagen, while the rate in Oslo was practically stationary.

Tuberculosis among females in Copenhagen declined greatly from 1884 to 1902, after which there was a long stationary period which lasted until 1917. In 1916 and 1917, the death-rate from tuberculosis increased, though the rise was not so pronounced as among males. After 1917 there was again a great decrease.

Graph 11.

CHANGES IN THE TUBERCULOSIS MORTALITY OF EACH SEX IN COPENHAGEN, OSLO AND STOCKHOLM.

(See Tables 31 to 33.)



In the 'nineties, the death-rate from tuberculosis among females in Oslo was considerably higher than in Copenhagen, and it remained almost stationary, with considerable yearly fluctuations, until 1905. From 1905 to 1915 there was a great decrease in mortality, but the decline in the rates became less pronounced after 1915.

(See Graphs 12a, 12b and 12c.)

Both among males and females (Table 35) the death-rate from tuberculosis has undergone a greater decline than the general death-rate; in respect of Copenhagen, this movement has been particularly pronounced among males.

On comparing the death-rate from tuberculosis among the rural and urban populations, the towns show throughout a higher mortality than the country districts. The difference has, however, in recent years been much less pronounced than formerly.

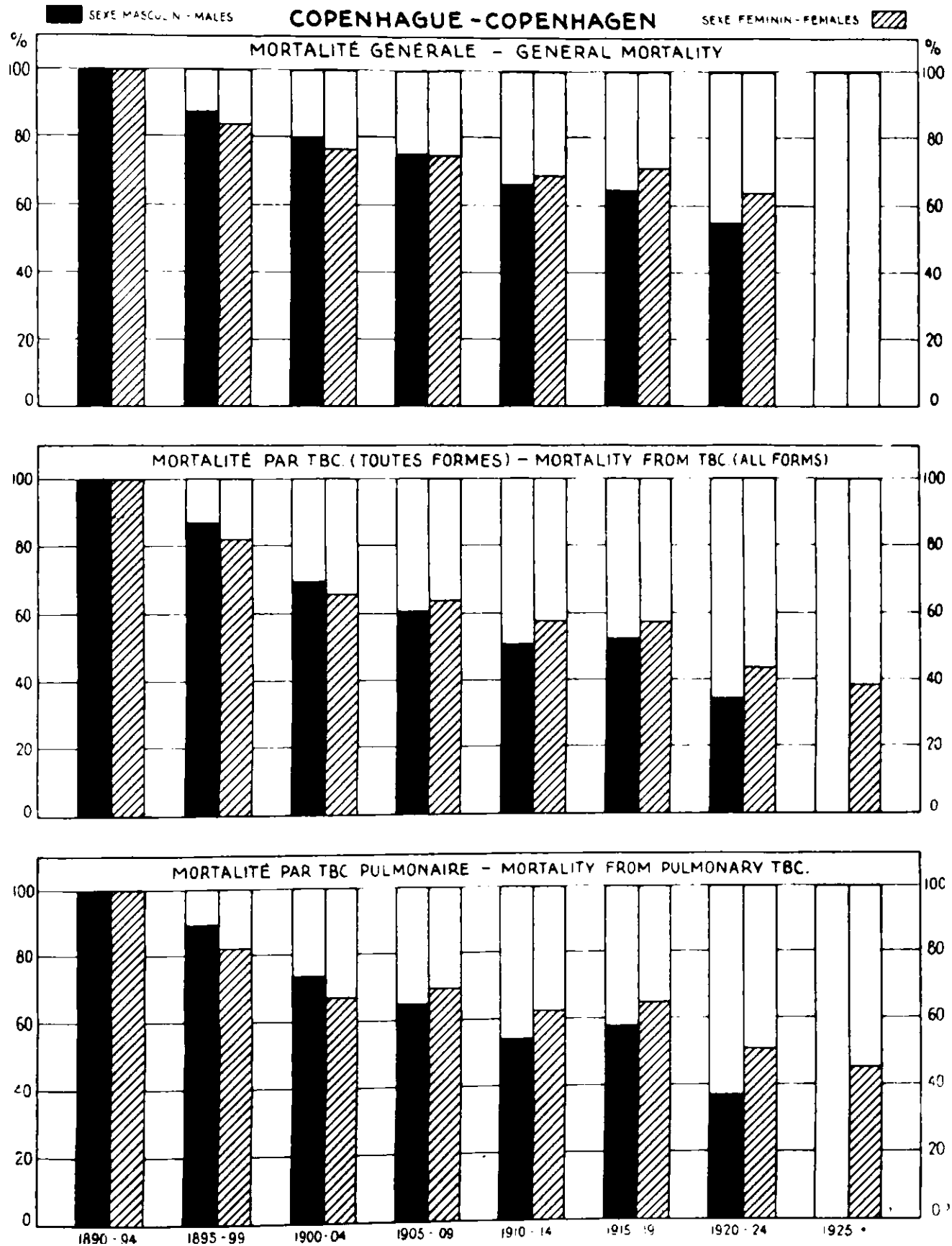
Year	The country as a whole	Rural districts	Provincial towns	Capitals
Denmark				Copenhagen
1920	10.6	9.8	11.4	11.9
1921	9.7	8.9	10.2	11.4
1922	9.5	9	9.6	10.6
1923	8.9	8.5	9.1	10.1
1924	9.9	9.3	9.6	12.5
1925	9.2	8.6	9.3	10.6
1926	8.1	7.5	7.5	10.3
1927	7.8	7.5	7.2	9.4
1928	7.5	6.9	7.2	9.2
Norway				Oslo
1886-1890	25.8	22	38.7	35.6
1891-1895	28.3	25	37.6	35
1896-1900	31	28.7	37	34.6
1901-1905	28.2	26.8	31.9	29.8
1906-1910	26	24.9	28.7	25.9
1911-1915	23.6	23	25.1	22.5
1916-1920	22.6	22	23.9	20.1
1921-1925	20.3	20.1	20.2	17.8
Sweden				Stockholm
1911	19.1	17.6	23.7	21.3
1912	19.5	17.9	24.4	23.3
1913	18.4	16.8	23.2	21.3
1914	19.1	17.5	23.8	22.6
1915	20.3	18.8	24.5	23.1
1916	20.3	19.2	23.5	21.1
1917	19.3	18.1	22.7	19.9
1918	17.8	16.5	20.8	21.4
1919	16.4	15	20	20.5
1920	16.2	15.3	18.6	18.4
1921	15.4	14.8	16.8	14.5
1922	14.9	14.3	16.5	14.4
1923	13.9	13.4	15.3	12.9
1924	15	14.8	15.1	14.2
1925	14.5	14.2	15.3	14
1926	13.2	13.1	13.6	

Graph 12a.

COMPARATIVE DECREASE OF THE GENERAL MORTALITY, OF THE TUBERCULOSIS MORTALITY (ALL FORMS), AND THE MORTALITY FROM PULMONARY TUBERCULOSIS, BY SEX, IN COPENHAGEN, FROM 1891-1895 (OR 1894-1895) TO 1920-1921 (OR 1924-1925).

(The figures for the first five-year period are taken as 100.)

(See Table 35.)

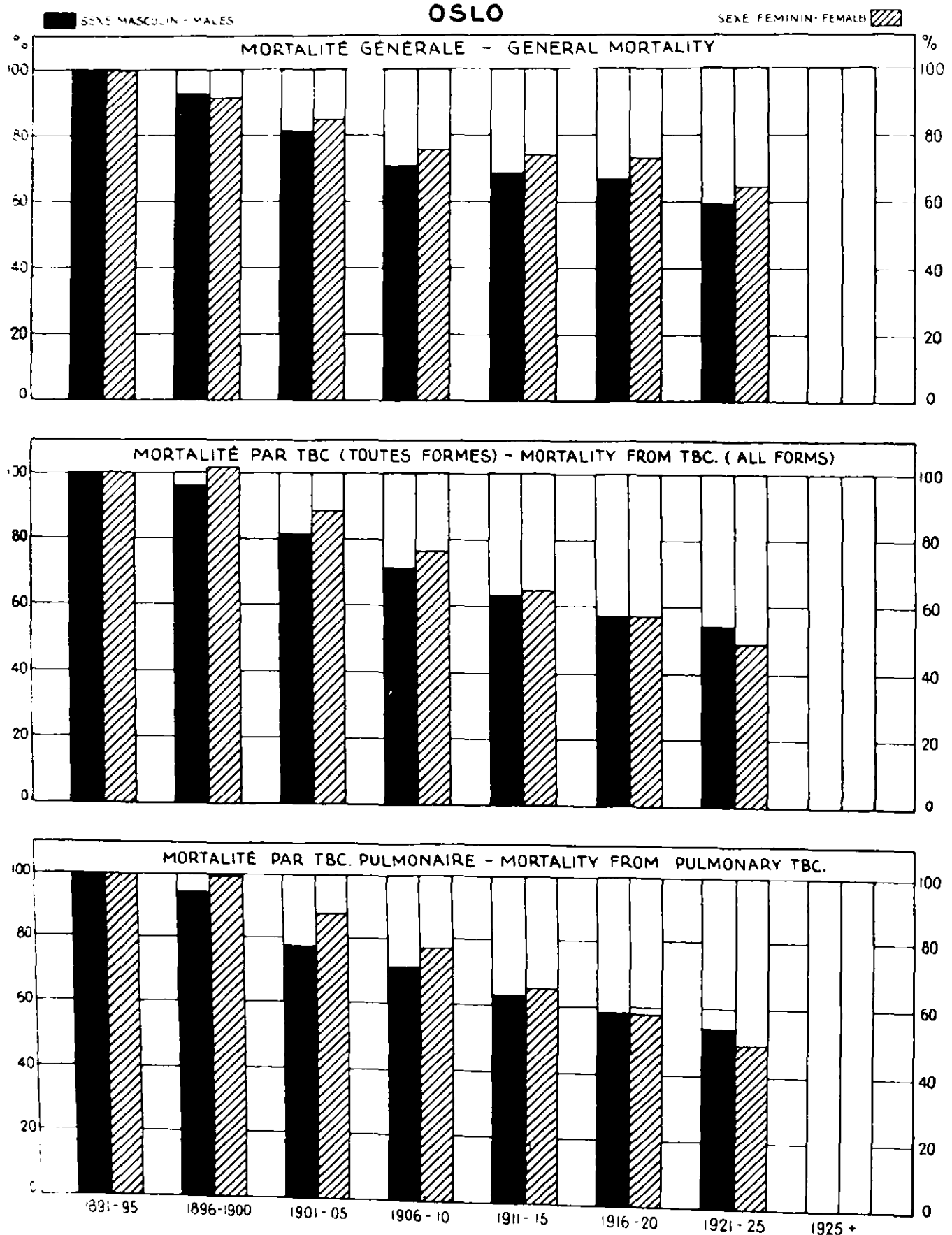


Graph 12b.

COMPARATIVE DECREASE OF THE GENERAL MORTALITY, OF THE TUBERCULOSIS MORTALITY (ALL FORMS), AND THE MORTALITY FROM PULMONARY TUBERCULOSIS BY SEX, IN OSLO, FROM 1891-1895 (OR 1894-1895) TO 1920-1921 (OR 1924-1925).

(The figures for the first five-year period are taken as 100.)

(See Table 35.)

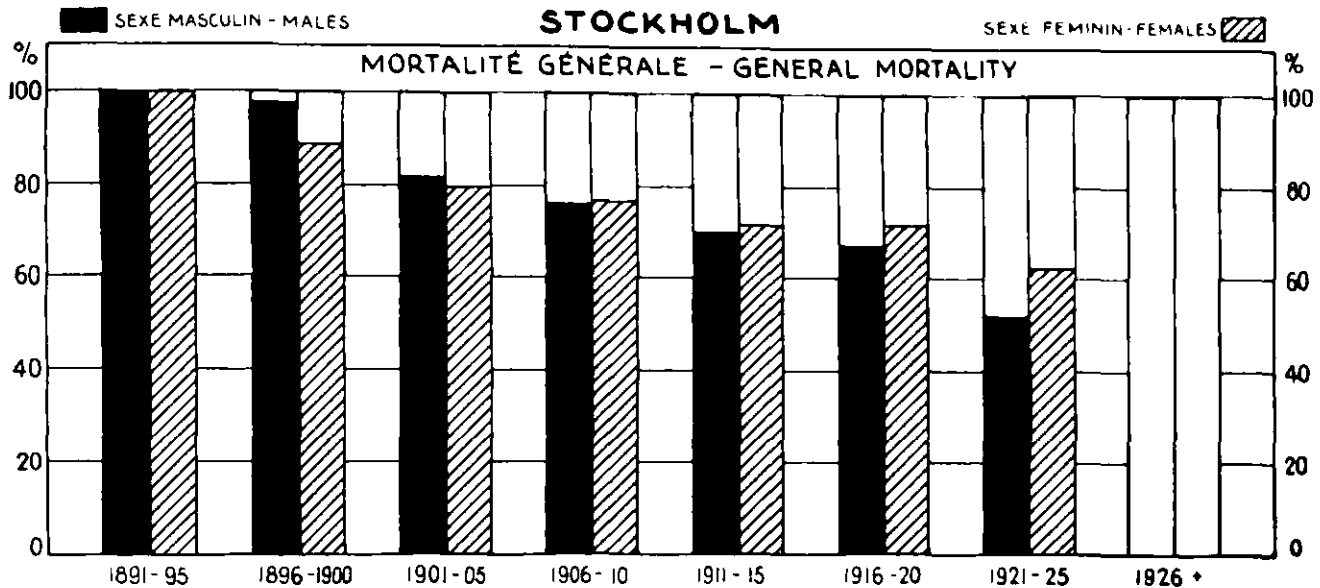


Graph 12c.

COMPARATIVE DECREASE OF THE GENERAL MORTALITY, OF THE TUBERCULOSIS MORTALITY (ALL FORMS), AND THE MORTALITY FROM PULMONARY TUBERCULOSIS BY SEX, IN STOCKHOLM, FROM 1891-1895 (OR 1894-1895) TO 1920-1921 (OR 1924-1925).

(The figures for the first five-year period are taken as 100.)

(See Table 35.)



The Danish figures only go back to 1920. While the mortality in the first few years was somewhat higher in the provincial towns than in the rural districts, this difference was eliminated in later years. In the capital, however, the death-rate from tuberculosis was considerably higher than in other parts of the country.

The following figures show the difference in respect of the two sexes:

Denmark. — Males.

Year	The country as a whole	Rural districts	Provincial towns	Copenhagen
1920	9.7	8.4	10.4	12.9
1921	8.9	7.6	9.1	13.2
1922	8.6	7.5	8.9	11.3
1923	8.3	7.2	8.3	11.9
1924	9.2	7.9	8.9	13.5
1925	8.1	7.1	7.8	11.7
1926	7.3	6	7.2	11.7
1927	6.8	5.9	6.3	10.5
1928	6.6	5.6	6.8	10.2

The male mortality is highest in the capital, while the provincial towns, too, have a somewhat higher death-rate from tuberculosis than the country population.

Denmark. — Females.

Year	The country as a whole	Rural districts	Provincial towns	Copenhagen
1920	11.5	11.3	12.3	11.2
1921	10.4	10.2	11	10
1922	10.4	10.6	10.3	10.1
1923	9.6	9.8	9.8	8.7
1924	10.7	10.6	10.2	11.6
1925	10.2	10.2	10.7	9.6
1926	8.8	9	7.9	9.2
1927	8.7	9.1	7.9	8.4
1928	8.2	8.4	7.6	8.4

Female mortality is higher in the country as a whole than male mortality. This is due to the fact that women have a higher death-rate than men in the rural population. Further, female mortality in the provincial towns and also in the capital has gradually become less than female mortality in the country districts. This is probably due to the fact that tuberculosis patients are isolated to a greater extent during the infectious stages of the disease in towns than in country districts. Of all deaths from pulmonary tuberculosis in Copenhagen, 75 to 80 per cent take place in hospitals or sanatoria. In the provincial towns this is the case with half the number of deaths, and in the country districts with only about 25 to 30 per cent.

In Sweden, mortality used to be lower in the country districts than in the towns or in Stockholm; the difference is gradually disappearing, and, since 1922, the death-rate in Stockholm has been less than in the country districts.

In Norway the mortality in the three groups has been calculated as far back as 1896-1900. The figures are, however, based on calculations and not in all cases on certificates issued by physicians stating the cause of death (see Introduction: "Statistical Basis"). A comparison of the movements in the death-rate among the country and town population shows the same falling tendency for the rural population as for the country as a whole. Among the urban population the death-rate has been declining since 1886-1890. In Oslo the statistics go back to 1871-1875 and show that, in that city, the death-rate from tuberculosis was falling in the 'seventies but rising from the beginning of the 'eighties until 1900. The decline in Norway appears to have begun earlier in the towns than in the country districts. The difference between the three groups has been gradually decreasing and had practically disappeared in the last five-year period. In the last three five-year periods mortality was lower in Oslo than in the country districts or in the other towns.

It should, however, be noted that no account has been taken of the variations in the distribution of the population by age. Reference is made to this factor in the following investigation of the death-rate from tuberculosis in various age-classes.

MORTALITY FROM TUBERCULOSIS BY AGE AND SEX.

On this subject detailed figures are available, particularly from Norway — namely, a review of the death-rate from tuberculosis in 1921-1925 compared with the death-rate from other diseases and the number of deaths from accidents. Similar figures are also available for Denmark for the years 1920-1925. Information is also available for Norway regarding the death-rate from tuberculosis in the country as a whole, in the rural districts, in the towns and in the capital for the years 1919-1922, and for Denmark for 1920-1925. In addition, there are calculations of the movement in the death-rate from tuberculosis for the entire population in Norway from 1871-1875 to 1927, and corresponding figures for Oslo alone and, in respect of Denmark, for Copenhagen alone. Finally, figures are available regarding the movements in the death-rate from tuberculosis in various age-classes in Norway among the town and country population separately from 1889-1892 to 1919-1922. Corresponding figures for the Danish town population are available from 1890-1894 to 1920-1924 and for the Swedish urban population from 1892-1893 to 1919-1922.

Tables 36 and 37 show in summarised form the prevalence of tuberculosis as a cause of death in various age-groups as compared with deaths from "other diseases" and from accidents.

The death-rate from tuberculosis is comparatively high in both Denmark and Norway for ages under four years; it declines in the next two age-classes and then increases and reaches its maximum in both countries in the age-group 20-24 years, after which it again regularly declines. The death-rate is very different for the two sexes. In the first age-group the death-rate from tuberculosis is greater among boys. From 5 years until 34 years in Denmark, and until 20 years in Norway, mortality is higher among females; but in Norway male mortality stands at a higher level from 20 years until the older age-classes. There is very little difference between the two sexes for the older age-classes in both countries.

Mortality in Denmark is considerably less than in Norway in all age-classes.

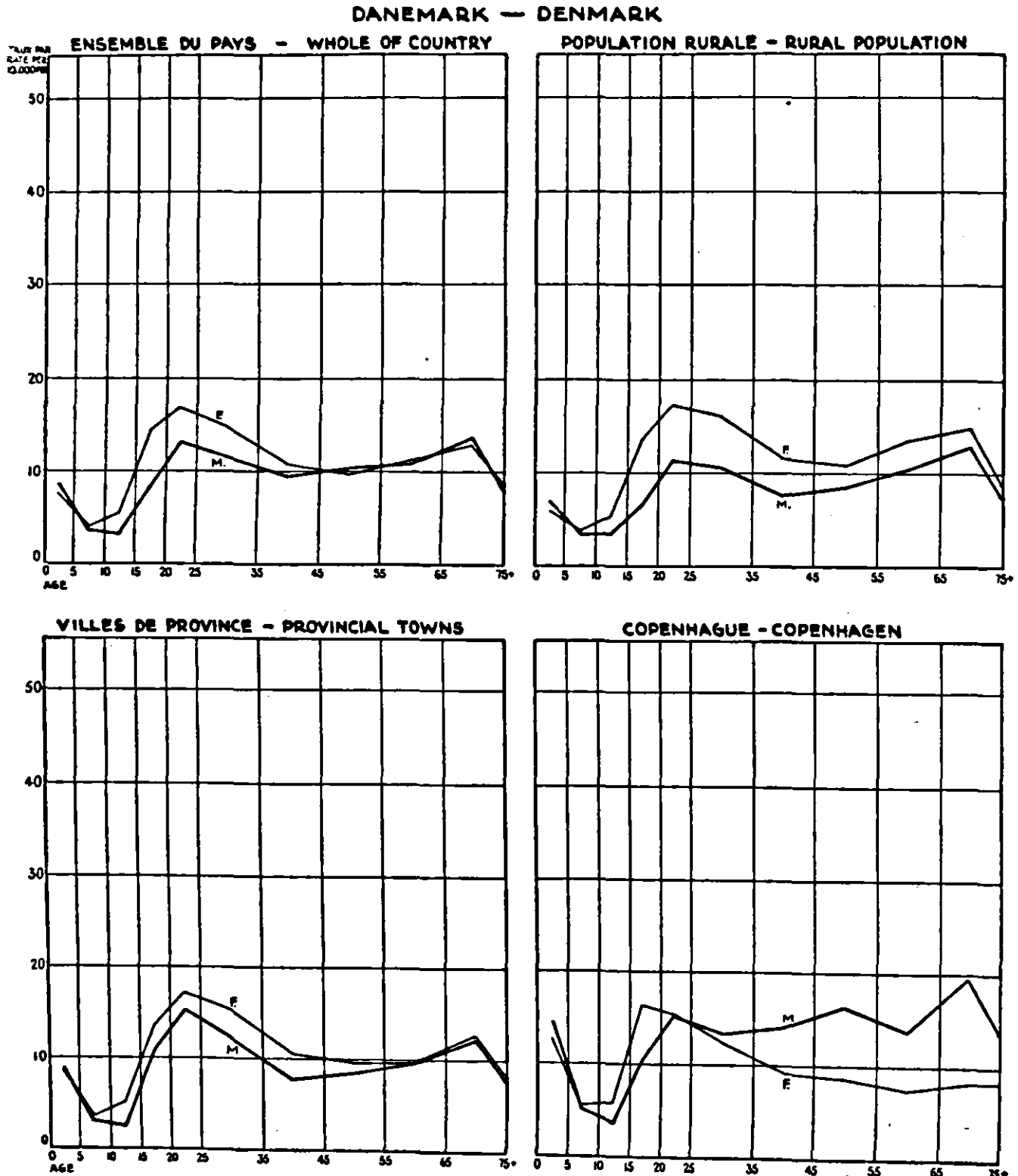
(See Graphs 13a and 13b.)

When compared with mortality from other diseases, tuberculosis is comparatively unimportant in Denmark among children under 5 years, and in Norway among children under 1 year. In other ages of childhood and among adults up to 45 or 50 years, however, tuberculosis is a very important factor; this is especially the case from 15 to 30 years, when the mortality from other diseases is comparatively small. As will be seen, the disproportionately high death-rate among young persons is to a great extent due to tuberculosis. This is most pronounced among young women from 15 to 24 years; in this age-class, about three-quarters of all deaths in Norway and about half the total number of deaths in Denmark are due to tuberculosis. After 40 years, other illnesses are more frequent causes of death, and tuberculosis is therefore of less importance.

For children under 5 years there is a very considerable excess of mortality from other illnesses than tuberculosis in the case of boys; in other respects, there is no pronounced difference between male and female mortality in Denmark. For the age-classes over 50 years, male mortality is greater than female mortality in Norway.

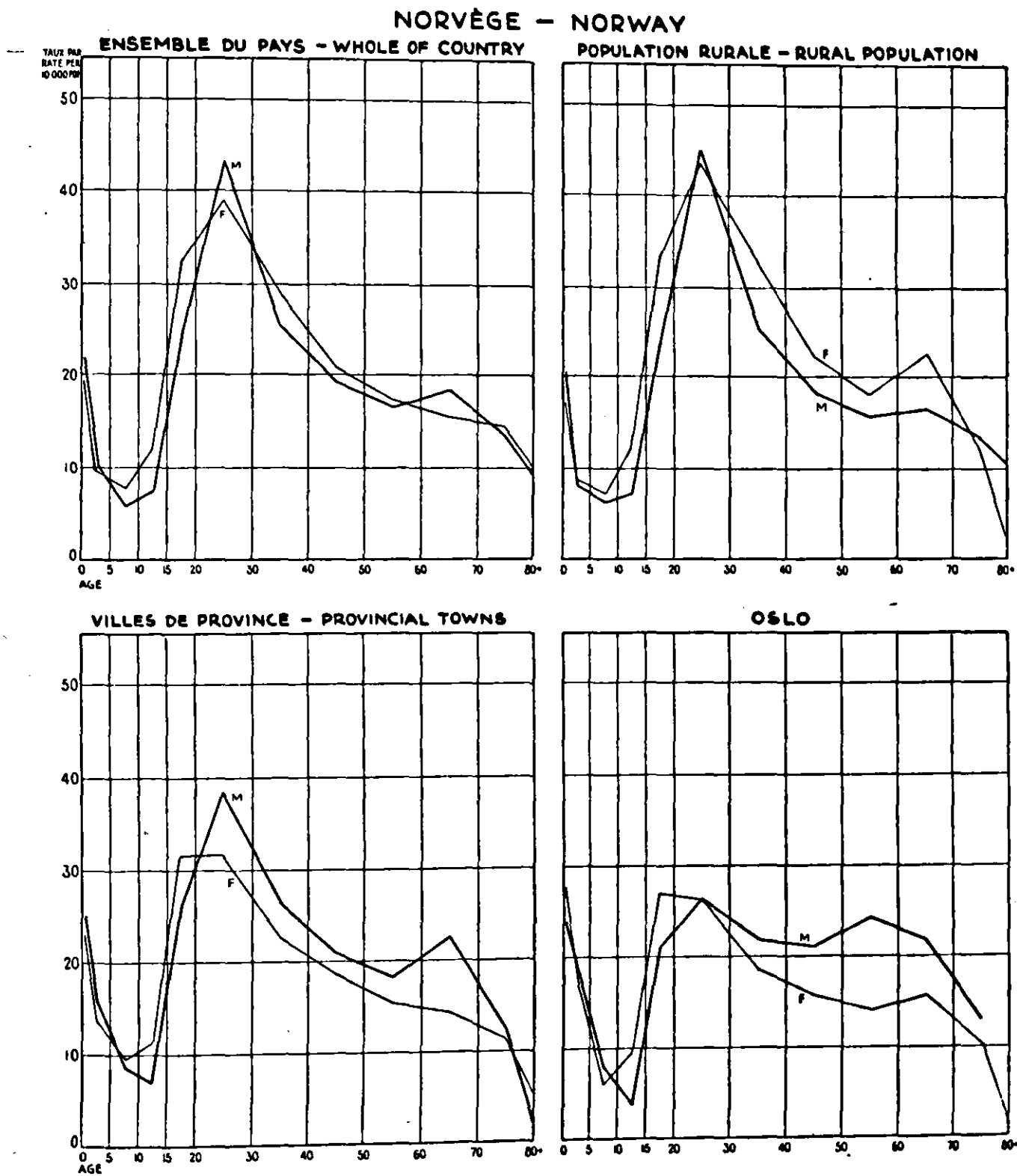
Graph 13a.

TUBERCULOSIS MORTALITY, BY AGE AND SEX, IN DENMARK (1920-1925) IN THE WHOLE COUNTRY, IN THE RURAL POPULATION, IN THE URBAN POPULATION AND IN THE CAPITALS.
(See Table 38.)



Graph 13b.

TUBERCULOSIS MORTALITY, BY AGE AND SEX, IN NORWAY (1919-1922) IN THE WHOLE COUNTRY, IN THE RURAL POPULATION, IN THE URBAN POPULATION AND IN THE CAPITALS.
(See Table 38.)



Deaths from accidents are much more frequent in Norway than in Denmark. The excess of male mortality in Norway in the ages from 20 to 50 years is largely due to the fact that men are more liable than women to suffer death from accidents (drowning).

Table 38 contains a review of the death-rate from tuberculosis among the country and town populations in Denmark and Norway, and compares the death-rates for each age-class for males and females in the country as a whole, among the rural population, the urban population and in the capital, based, in the case of Norway, for the years 1919-1922 on the 1920 census and, in the case of Denmark, for the years 1920-1925 on the 1921 census.

In Norway, mortality is higher in the towns than in the country in the case of children up to 10 years, and in Denmark up to 5 years. In Norway the same applies to males from 15 to 19 years and from 30 to 70 years.

In Denmark the death-rate from tuberculosis among males is higher in the towns than in the country districts up to the age of 45 years, after which it stands at the same level, except in Copenhagen, where male mortality is higher than in the country districts for the older age-classes too. With regard to females, the death-rate from tuberculosis in Norway is higher in country districts than in towns from the age of 10 years. The low mortality in the Norwegian towns among males and females from 20 to 30 years and among females from 30 to 40 years is particularly worthy of notice. From 20 to 30 years the death-rate from tuberculosis among women in country districts is 36 per cent higher than in towns, and from 30 to 39 years 43 per cent higher.

In Denmark the death-rate from tuberculosis among women is approximately the same in town and country until the age of 55, while from 55 to 74 it is higher in the country than in the towns.

In Oslo the death-rate from tuberculosis in the first five years of life is higher for both sexes than in the other towns or in the country districts. From 5 to 10 years Oslo is most favourable with regard to girls, while boys, on the other hand, show a higher mortality in Oslo than in country districts, but lower than in other towns. Oslo has a lower death-rate from tuberculosis than the rest of the country for the age-groups 10 to 40 years for males and up to 60 years for females. The same applies in part to females in Oslo in the highest age-classes. For men over 40 years, the death-rate from tuberculosis is throughout higher in Oslo than in country districts and partly also than in other towns.

In Copenhagen also the death-rate from tuberculosis for the first five years of life is much higher than in the other towns or the country districts; the same is the case, though to a less pronounced extent, for the age-group 5-9 years.

There is a higher death-rate among men of all ages in Copenhagen than in the country districts. In the provincial towns and Copenhagen the male death-rate is the same until 34 years, but in all the succeeding age-classes mortality is considerably higher in Copenhagen than in the provincial towns. Among females in the age-group 15-19 years, the death-rate from tuberculosis is greater in Copenhagen than in the country districts or in the other towns. But for other ages it is lower among women in Copenhagen than in the country districts or the provincial towns.

In discussing the general death-rate it was stated that the favourable mortality rates among young persons in the Norwegian towns, and particularly in Oslo, was possibly connected with the removal of healthy persons from the country to the town and the removal back to the country of migrants who had become ill and were no longer able to stay in the towns. It might be assumed that this factor would affect the death-rate

from tuberculosis among the country and town population to an even greater extent than mortality from other causes.

It is, however, uncertain whether this factor (removals from town to country) is of any importance in this connection. According to an investigation into the subject carried out at Oslo by de Besche and O. Jørgensen, migrations are of slight importance, nor is the theory described above borne out by conditions in Denmark. As already pointed out, there are many removals in Denmark, and not least to Copenhagen; but there is no proof that the death-rate from tuberculosis is greater among the persons moving into the town than among the native population, and, in point of fact, the death-rate from tuberculosis is greatest in the districts in Denmark where migrations are relatively least frequent.

(See Graphs 14 a and 14 b.)

The movements in the death-rate from tuberculosis in Norway are *calculated* in Table 39 for males and females in the country as a whole, with various age-groups in five-year periods from 1871 to 1925, and for the years 1926 and 1927 separately. It should, however, be noted that the rates for the earlier periods have a less reliable basis than those for the later periods (see Introduction: "Fundamental Statistical Elements").

From the 'seventies until about 1900, the death-rate from tuberculosis showed a rising tendency for all age-groups with the exception of children under 5 years, and in some cases under 10 years. The highest death-rate from tuberculosis is to be found, with few exceptions, in the five-year period 1896-1900. For females from 15 to 30 years the death-rate from tuberculosis, however, continued to rise still further, and reached its highest point for the group 15-19 years in 1901-1905, and for the group 20-30 years in 1906-1910. Among children under 5 years, the decline apparently began much earlier. For infants the table shows that the absolute death-rate from tuberculosis was highest in the 'eighties, after which it regularly declined, with the exception of a temporary rise in 1896-1900. The statistical basis, however, is particularly slender in respect of children.

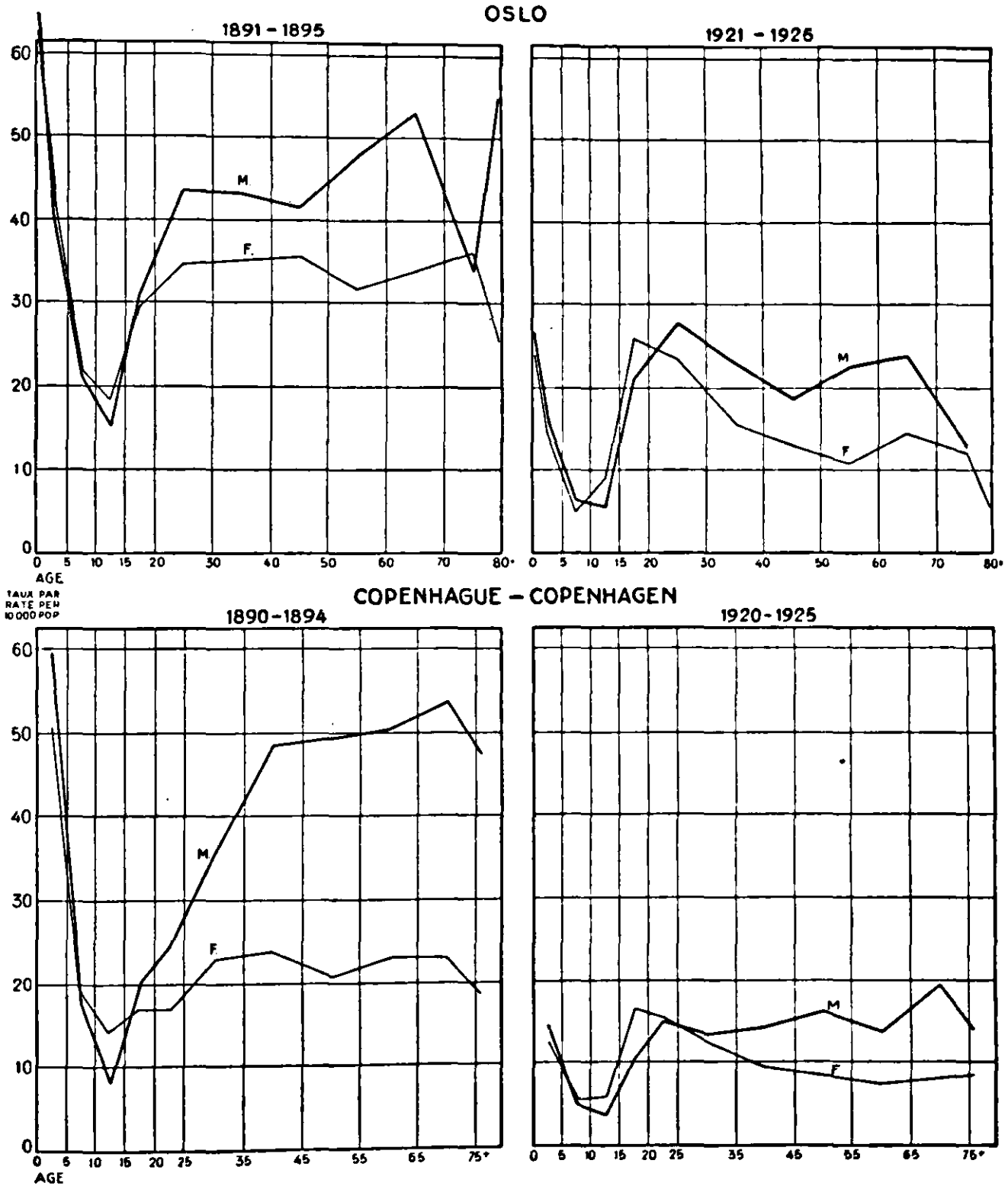
The decline in the death-rate from tuberculosis in the country as a whole from 1896-1900 to 1921-1925 is as follows:

	Per cent
0-1 year	57
1-4 years	67
5-9 "	62
10-14 "	48
15-19 "	21
20-29 "	13
30-39 "	35
40-49 "	40
50-59 "	45
Over 60 years	41

The greatest decline is therefore among children under 15 years.

Graph 14b.

DECREASE OF THE TUBERCULOSIS MORTALITY, BY AGE AND SEX, IN OSLO FROM 1890-1894 TO 1920-1925 AND IN COPENHAGEN FROM 1891-1895 TO 1921-1925.



If the corresponding conditions in Oslo are examined it will be found that the movements in the death-rate from tuberculosis were more uneven; but there is evidence that the decline in tuberculosis, as in Copenhagen, began earlier than in the rest of the country. Among children up to 10 years, the death-rate fell regularly from the beginning of the 'seventies, and the same is true, with few exceptions, for all age-groups over 30 years. In the age-groups 15 to 29 years the death-rate from tuberculosis fluctuated greatly after 1900, while in the last twenty years the mortality curve has steadily declined.

The movements in the death-rate from tuberculosis in Copenhagen (exclusively based on certificates of causes of death issued by physicians) are shown in Table 41. There was a regular decline for all age-groups among men, and the same is true of women with the exception of the ages between 15 and 24 years, where the decline was very slight.

(See Graph 15.)

Tables 42, 43 and 44 show the movements in the death-rate from tuberculosis in Norway, among the urban and rural population, from 1889-1892 to 1919-1922; in Denmark, among the urban population, from 1890-1894 to 1920-1924; in Sweden, among the urban population, from 1892-1893 to 1919-1922.

In Norway, mortality was higher in the towns for all age-groups in 1890 than in the three succeeding periods, and the same is true of Denmark and Sweden. In all three countries the decline was greatest among children, and was in all cases least pronounced among young women.

In the country districts in Norway the death-rate from tuberculosis was higher about 1900 than 1890, except for infants.

For all age-groups together, the death-rate from causes other than tuberculosis in Norway has shown a declining tendency since 1871. The period 1916-1920 alone shows a rise, due to the influenza epidemic. The death-rate from tuberculosis, however, moved in the opposite direction until 1900, after which it also declined, and since that time — in Denmark even since the 'nineties — the decline has been more pronounced than that in mortality from other causes.

A comparison of the decline in the death-rate from tuberculosis with that of the general death-rate in the three countries from 1890 until about 1920 will give an idea of the movements which took place, the death-rate in the first period being taken as 100.

As will be seen from Tables 45 and 46, the death-rate from tuberculosis in the country districts in Norway only began to decline at a late period, but the decline is much more strongly pronounced than that of the general death-rate.

(See Graph 16.)

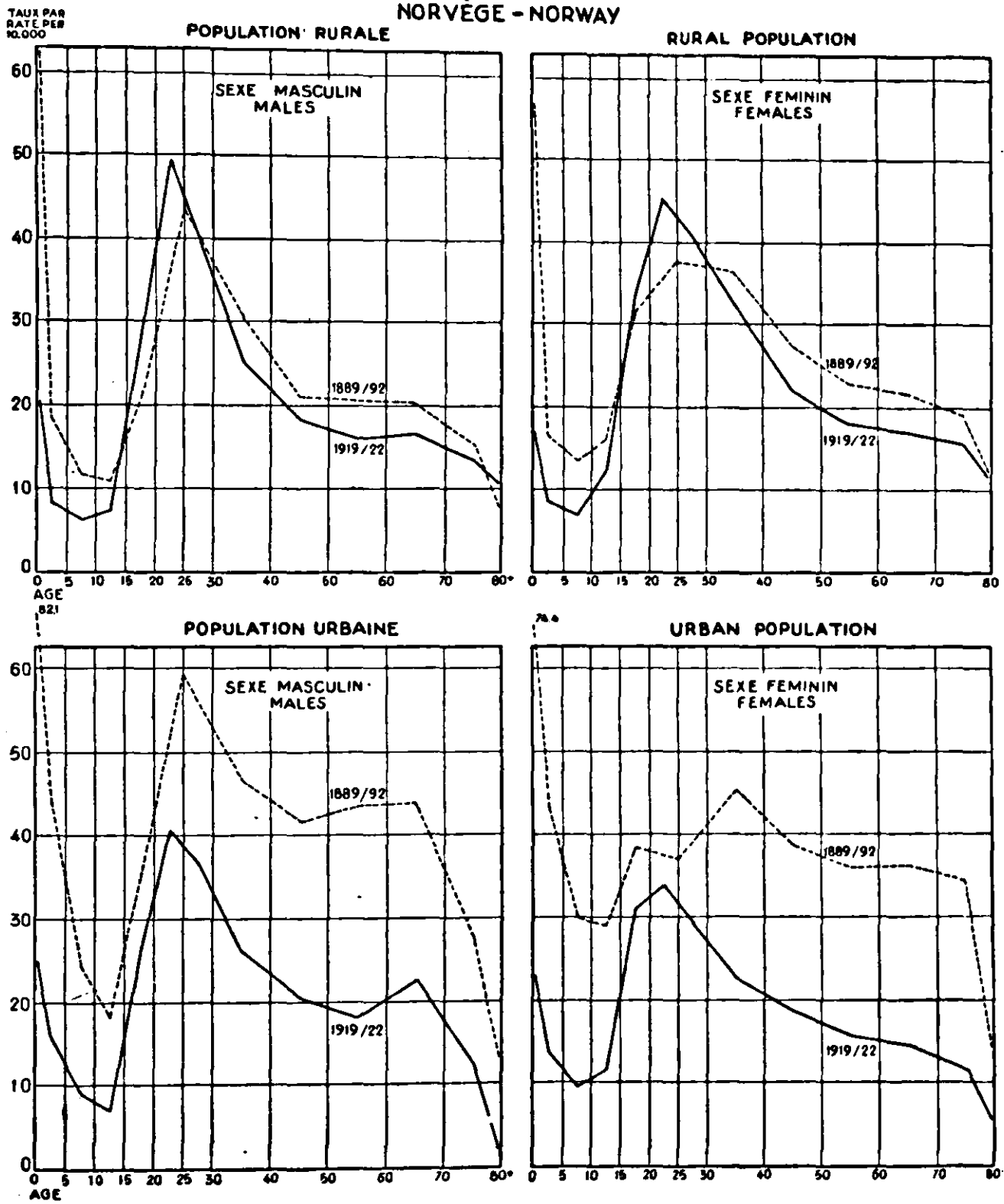
Table 44 shows the decline in the death-rate from tuberculosis for all age-groups in Sweden. Among males, the decline was greatest before 15 years and after 40 years; among females, before 15 years and after 30 years. The smallest decline was among males from 20 to 30 years, and females from 15 to 20 years.

The decline was most pronounced in Denmark.

Graph 15.

DECREASE OF THE TUBERCULOSIS MORTALITY, BY AGE AND SEX, IN NORWAY
FROM 1889-1892 TO 1919-1922.

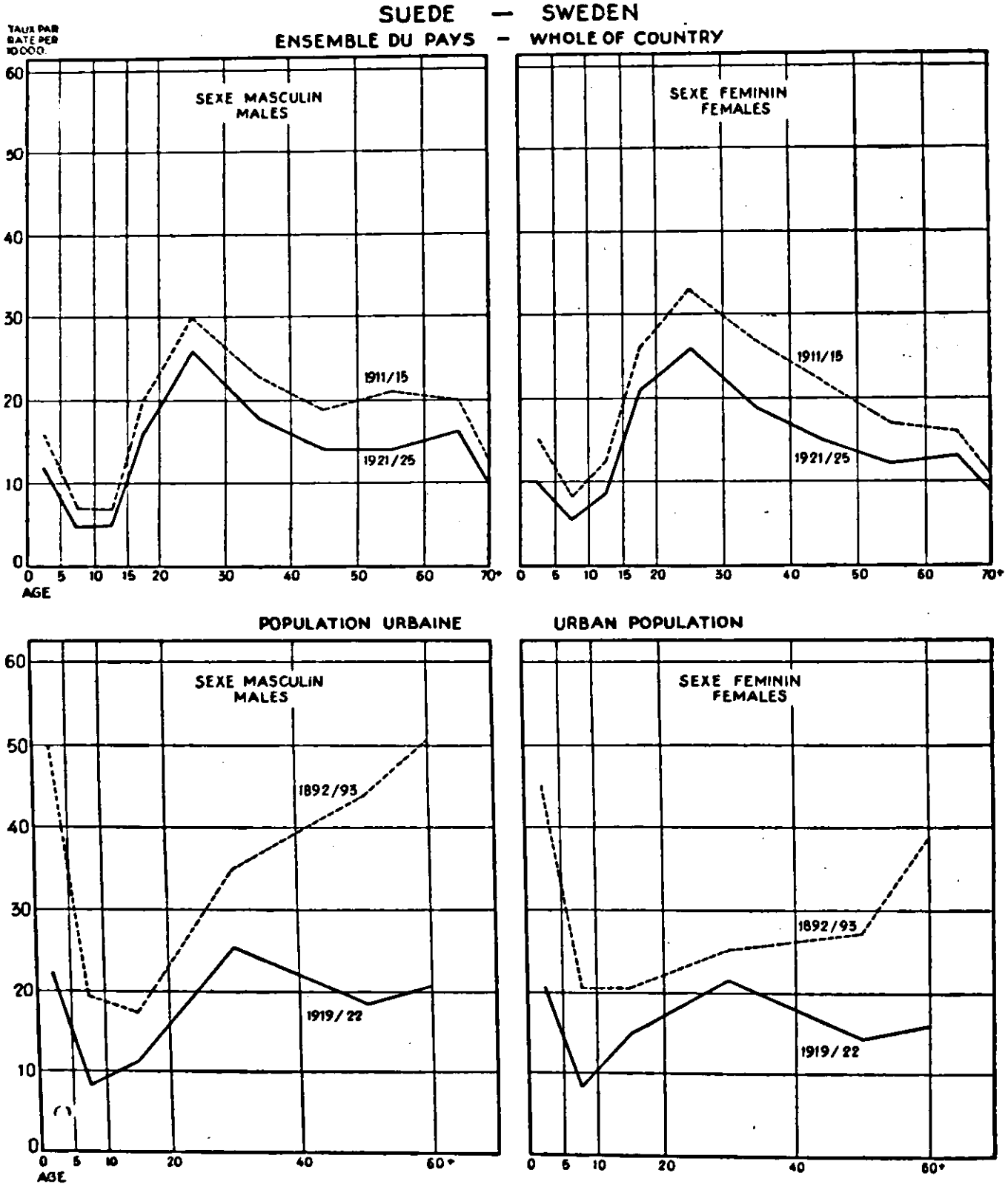
(See Table 42.)



Graph 16.

DECREASE OF THE TUBERCULOSIS MORTALITY IN SWEDEN, BY AGE AND SEX, IN THE WHOLE COUNTRY FROM 1911-1915 TO 1921-1925 AND IN THE URBAN POPULATION FROM 1892-1893 TO 1919-1922.

(See Table 44.)



MORTALITY FROM TUBERCULOSIS BY ADMINISTRATIVE DIVISIONS (FYLKER, LÄN, AND AMTER) IN THE THREE COUNTRIES.

NORWAY.

In order to give an idea of the death-rate from tuberculosis in various parts of the country, Table 47 provides a *calculation* of these rates (in summary form) for the provinces (Fylker), in five-year periods from 1881-1885 to 1916-1920.

(See Map 1.)

The figures are calculated in the manner described above (see Introduction: "Fundamental Statistical Elements"). The nearer we approach to the present time the more reliable are the figures, as they are now almost entirely based on death certificates issued by physicians. At the beginning of the 'eighties, mortality was relatively low in the inland eastern provinces of Opland and Hedemark. The death-rate from tuberculosis rises further south, and during this period reaches its maximum in the two southernmost provinces — *i.e.*, Aust-Agder and Vest-Agder. Towards the west it again declines, and reaches its minimum in the northernmost provinces of the west — *i.e.*, Sogn, Fjordane and Møn; in Trøndelag it again rises. In northern Norway, mortality at the beginning of the 'eighties was approximately the same as in the east.

In the 'eighties and 'nineties, there was little change in the death-rate from tuberculosis in the east, but since that time there has been a regular decline.

In Telemark and Aust-Agder mortality has been on the decline since the beginning of the 'eighties, or possibly even earlier. In Vest-Agder and Rogaland the highest mortality was in 1891-1895, in Hordaland in 1896-1900, after which there was a decline; but it is impossible to state definitely whether this was an actual maximum or merely a temporary rise.

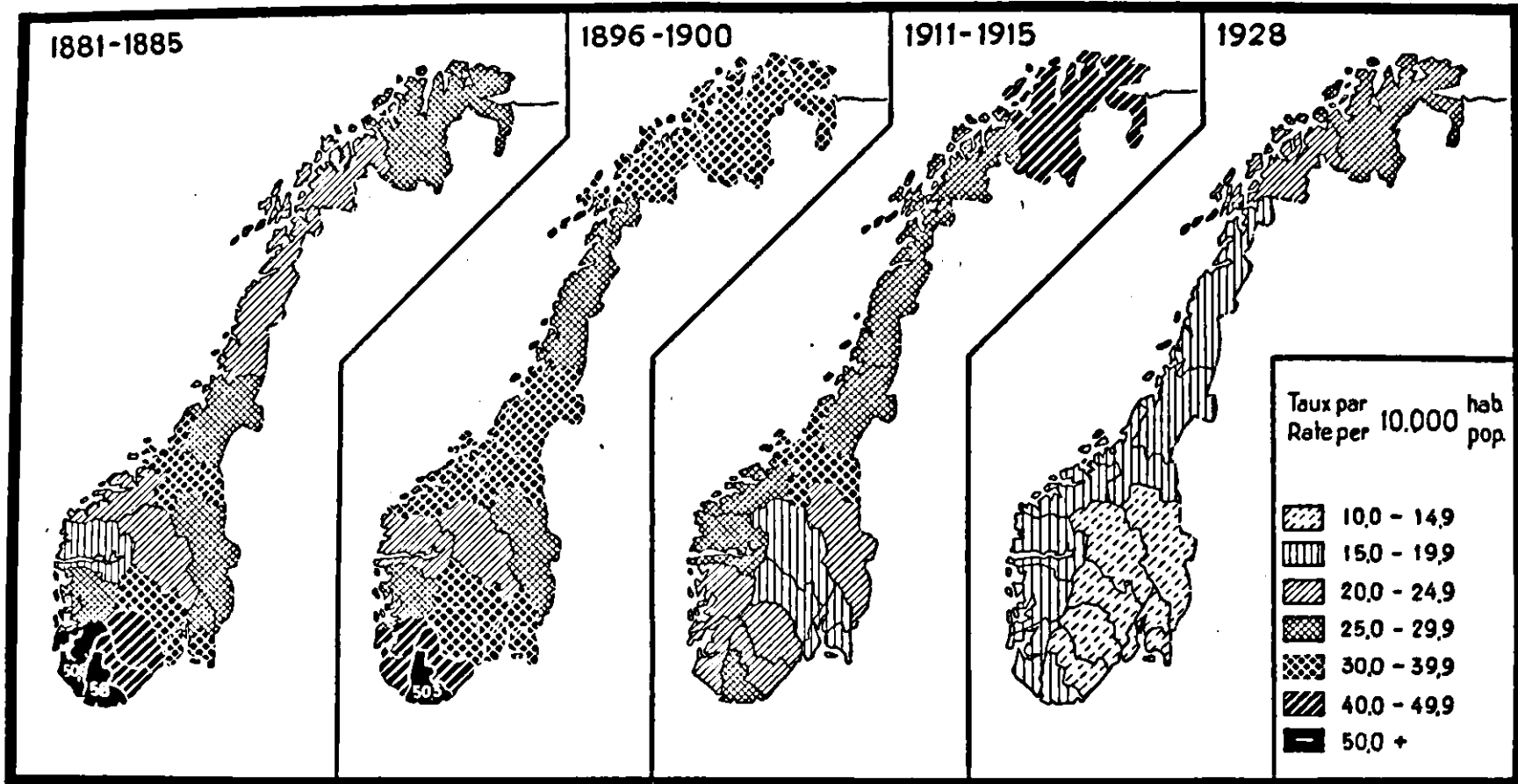
In the other provinces the death-rate from tuberculosis showed a decided tendency to rise, in Møn, Nord Trøndelag and Troms until 1896-1900, in Sør Trøndelag and Finmarken until 1906-1910, in Sogn and Fjordane until 1911-1915 and in Norland until 1916-1920.

The disease therefore spread at different times, and with varying intensity, to the different parts of the country. There was no decided maximum about 1900, as was the case with the country population as a whole. The figures, however, do not go far enough back and are really not sufficiently reliable to enable a clear idea of the tendency of the movement to be obtained or to show definitely when the decline began in the various provinces. Probably, however, the decline began in Telemark, Vest-Agder and Aust-Agder long before the turn of the century. In Sogn and Fjordane, Sør Trøndelag and northern Norway, however, the rise continued during the present century, and the decline is of quite recent date.

During the last twenty-five years the differences in the death-rate from tuberculosis in the various provinces have been to a great extent eliminated, so that in 1921-1925 there was a regular rise proceeding westwards through the southern districts to Trøndelag, with a maximum in Sør Trøndelag, after which there was a further rise northwards to Norland and Troms.

Map 1.

TUBERCULOSIS MORTALITY BY PROVINCES IN NORWAY, IN 1881-1885, 1891-1895, 1906-1910 AND 1921-1925.
(See Table 47.)



In Finmarken, where the disease is at an earlier stage of development than in the other provinces, the death-rate in 1921-1925 was at an extraordinarily high level compared with the other provinces.

SWEDEN.

Accurate figures regarding the death-rate from tuberculosis in the provinces of Sweden are available from 1911¹ (see Tables 50 and 51 and Maps 2 a and 2 b). The rate is lowest in Southern and Central Sweden and rises towards the North. In 1923-1926, the mortality in fifteen provinces was greater among the population of the towns than of the country districts. With regard to the development of the death-rate from tuberculosis in Sweden, the influential factor has most probably a purely biological one — *i.e.*, among the population in which tuberculosis has been widely prevalent for several generations an increasing resistance to the infection has gradually grown up, which has resulted in a declining death-rate from the disease. Moreover, this decline apparently began before any direct measures were taken against tuberculosis, and without any rise in the standard of living or any increase in the knowledge of hygiene. In other words, the cause was purely biological, and was based exclusively on a change in the reactive capacity of the human organism.

If we carefully investigate the death-rate from tuberculosis in various parts of Sweden for the period for which figures are available, we can obtain an outline of the historical development and the geographical prevalence and distribution of tuberculosis for that period in Sweden.

At the beginning of the nineteenth century the death-rate from tuberculosis appears to have increased steadily and uninterruptedly, and the disease was very unevenly distributed throughout Sweden. The highest mortality existed in the neighbourhood of Stockholm and other coastal districts — in Blekinge, for instance. In Norrbotten, on the other hand, the mortality from tuberculosis was small; the disease gradually spread in ever-widening circles, and finally reached the northern provinces, which had previously been unaffected.

The death certificates for the towns show, further, that the death-rate from tuberculosis as far back as the 'sixties began to decline in Stockholm and various towns in Central Sweden, while it constantly increased in the northern towns. In the parts of the country which were the earliest to be infected, there was thus a spontaneous decline, while a great increase took place in the districts last infected.

When the disease was left to itself it apparently spread rapidly and intensively until it reached a maximum; it then became stationary for a period of three or four generations, and afterwards again spontaneously declined.

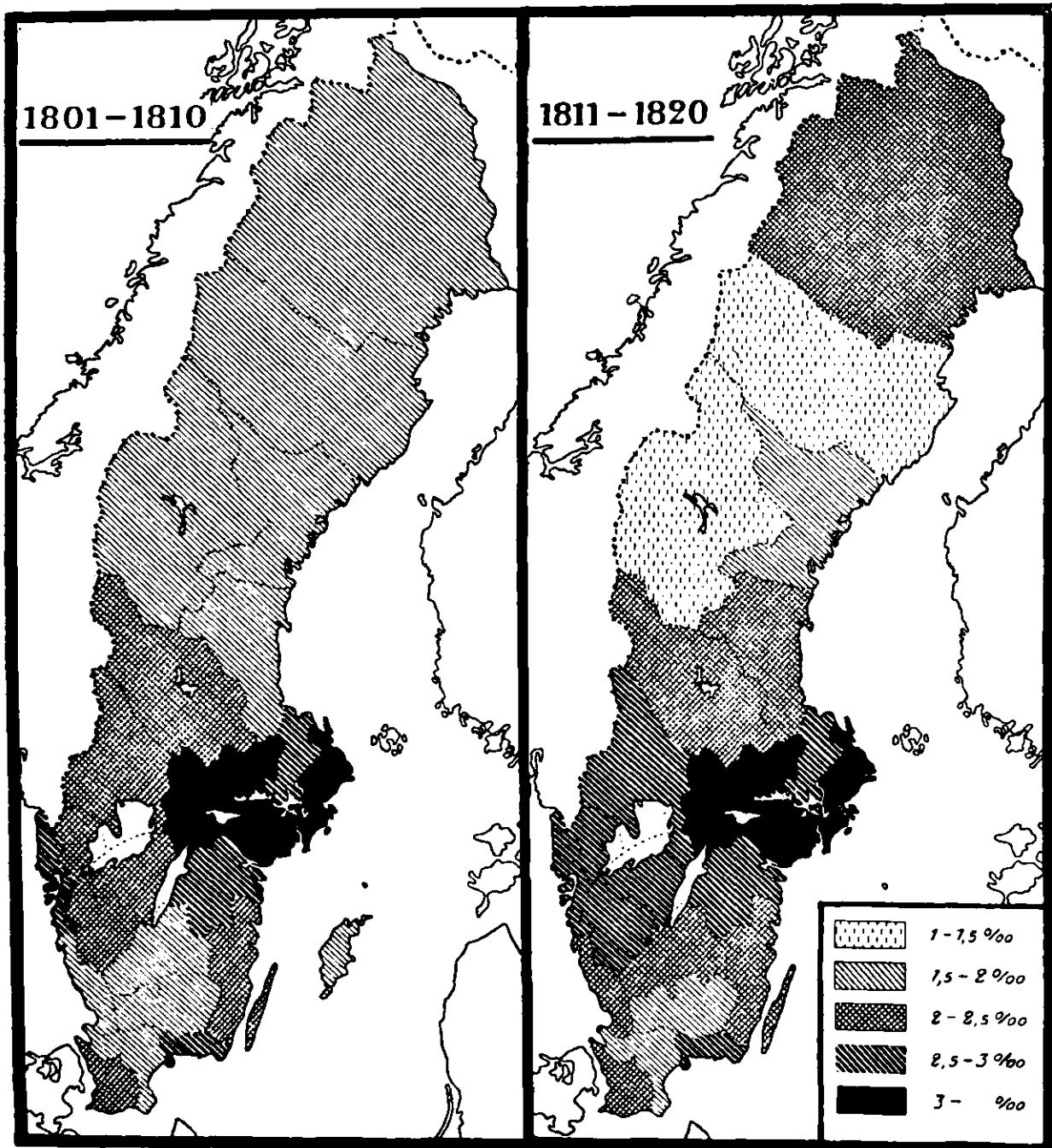
On comparing the distribution of mortality from tuberculosis in various parts of Sweden about 1800 with that in 1900 (see Maps 2 a and 2 b), we find a great change in conditions. A hundred years ago the highest death-rate from tuberculosis was in Södermanland, where it is now the lowest; while Norrbotten, which a hundred years ago was relatively free from the disease, is now especially affected. Södermanland was the first to receive the disease and Norrbotten the last.

¹ A valuable retrospective study on the tuberculosis mortality since 1750 exists, nevertheless; this study is based upon extracts from the parish records: SUNDBÄRG, *Statistisk Tidskrift*, 1903, pages 163-197.

Map 2a.

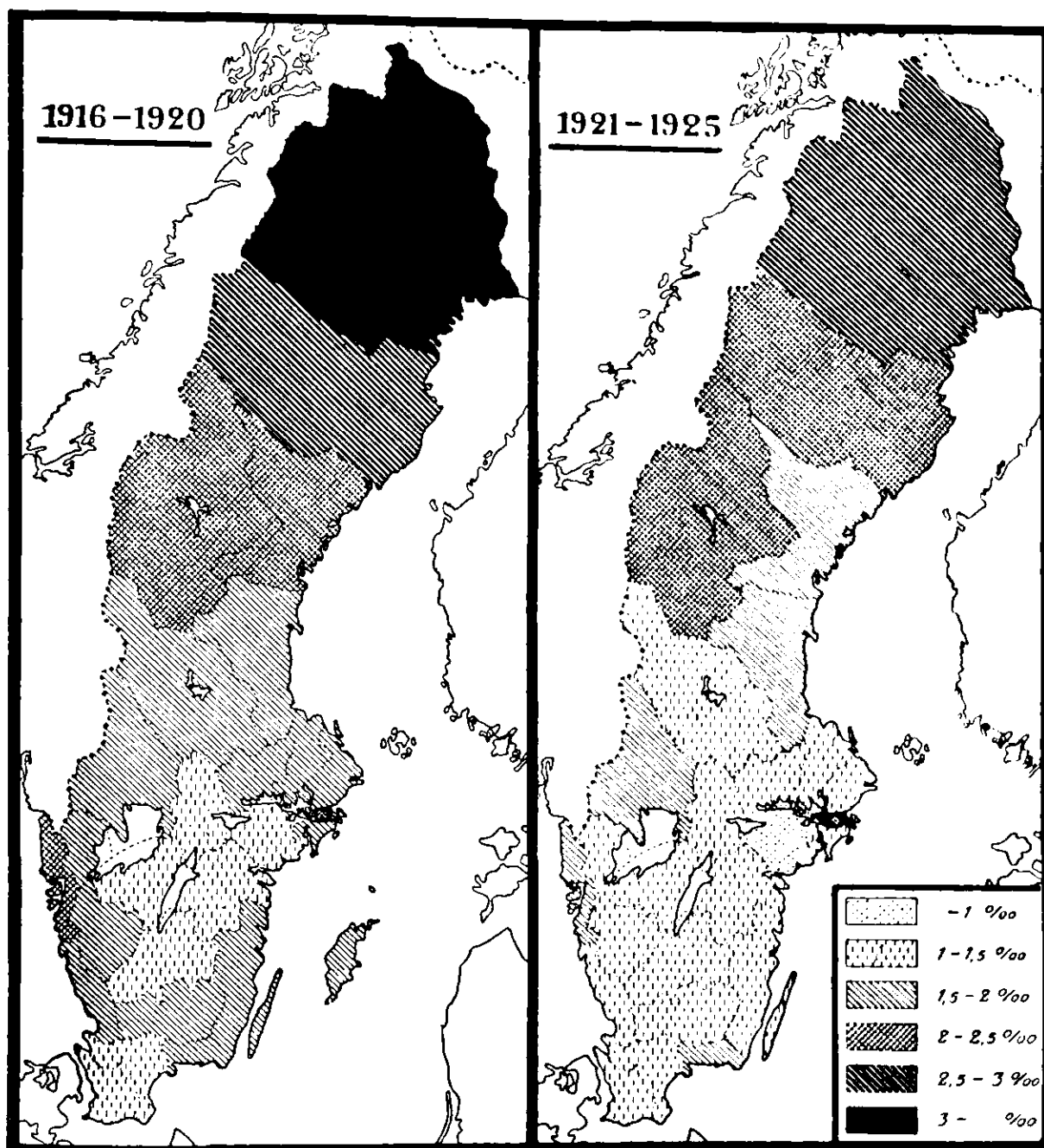
TUBERCULOSIS MORTALITY IN THE PROVINCES OF SWEDEN IN 1801-1810 AND 1811-1820.

(From "*The Hälsan Institute in Norbotten*" by G. NEANDER, Stockholm, 1928.)



Map 2b.

TUBERCULOSIS MORTALITY IN THE PROVINCES OF SWEDEN IN 1916-1920 AND 1921-1925
(From "*The Hälsan Institute in Norrbotten*", by G. NEANDER, Stockholm, 1928.)



At the present time tuberculosis is declining in *all* parts of Sweden. From 1911-1915 to 1921-1925 the decline was most pronounced in Södermanland and Central Sweden, where the disease is the oldest established, while the smallest decline took place in Norrbotten, where the disease was last established; yet in recent years the decline appears to have been particularly great in this district.

Norrbotten contains districts where the population is still relatively unaffected by tuberculosis. In such districts the death-rate from the disease is increasing at present, but if we take the entire province as a whole tuberculosis is declining.

All parts of the country have thus experienced the same development — *i.e.*, introduction of the infection, development to a maximum, and then a spontaneous decline.

There is reason to hope that mortality is gradually declining to very small proportions in Sweden, but there will still remain the question whether the population will again be subject to a fresh infection accompanied by a renewed increase of morbidity and mortality. The future alone can decide.

But, although there is reason to believe that the above described development of the disease through the various periods is due to two factors — *i.e.*, (1) resistance or relative immunity, and (2) the possibilities of infection — one of these two factors — resistance — appears to change very slowly when conditions are allowed to develop naturally, while the possibilities of infection may change much more quickly. The possibilities and risks of infection therefore always constitute the primary factor to be reckoned with and combated.

On examining conditions in Denmark, we find that the area is small in comparison with the other two countries, and that the disease has been enabled in the course of time to spread to the entire population, so that there can be little difference between the power of resistance. At the same time, tuberculosis shows a very varying intensity, probably due principally to the possibilities of infection.

DENMARK.

Table 52 gives figures regarding the death-rate from tuberculosis since 1920 in the various provinces (Amter), among the population as a whole and among the town and country population separately.

Among the country population the death-rate from tuberculosis is throughout lowest on the islands and greatest in North Jutland, West Jutland, South Jutland and the Faroes. On the islands the highest rate is found in the provinces of Copenhagen, Frederiksborg and Odense. Among the town population the position is approximately the same, but not quite so pronounced, as accidental circumstances to some extent come into play, where for instance a province only has small towns.

There is no decided difference between the death-rate from tuberculosis in the towns and country districts in the same province. In 1920-1925, the rate was higher in the country districts than in the towns in two provinces — namely, Sønderborg and Assens (difference amounting to over one per 1,000); in nine provinces it was higher in the towns, and in fifteen provinces the difference was less than one per 1,000.

Mortality from pulmonary tuberculosis is approximately in the same general position. Pulmonary tuberculosis accounts for 75 per cent of the general death-rate from tuberculosis.

When investigating conditions in Denmark in respect of the two factors mentioned above (under Sweden) as exerting an influence over the development of the disease, we find the following features.

In Denmark the death-rate from tuberculosis is greatest in the capital and lowest among the country population, while provincial towns occupy an intermediate position. In recent years, however, mortality has been on the same level in provincial towns and rural districts, while in some parts of the country it is higher among the rural population than in the towns, particularly in the northern part of Jutland, where the death-rate from tuberculosis in 1920-1925 was 12.4 per 10,000 — *i.e.*, higher than in Copenhagen, whereas it was only 7.6 on the islands, exclusive of Copenhagen.

When examining the death-rate from tuberculosis according to sex and age (Table 43), we find that, in 1920-1925, mortality was higher in Copenhagen among males than among females (12.4 and 10.1). In the country population it was lower among males (7.4) than among females (10.7). The difference between males and females is not so pronounced among the country population on the islands, where tuberculosis is least prevalent. On the other hand, the difference is considerably greater in Jutland. North-West Jutland, which is most affected by the disease, there is a male mortality of 10.3 and a female mortality of 14.4 per 10,000.

On examining conditions in the various age-groups, we find the same phenomenon that has been noticed in most other countries — namely, that the female death-rate from tuberculosis is particularly high between the ages of 15 and 24, while there is a less pronounced difference between the age-groups among males. On comparing town and country, however, we find very variable conditions in this respect.

Death-rate from Tuberculosis in 1920-1925 per 10,000 among Males and Females.

Age	Copenhagen		Total rural population		Rural population in North-West Jutland	
	Males	Females	Males	Females	Males	Females
0-4 years	14.6	12.7	6.9	5.9	8.3	7.3
5-9 „	5	5.4	3.3	3.7	4.7	4.9
10-14 „	3.6	5.9	3.4	5.2	4.9	7.8
15-19 „	10.6	16.3	6.7	13.7	10.2	20.2
20-24 „	15.1	15.3	11.3	17.3	18.3	26.7
25-34 „	13.3	12.5	10.6	16.1	13.8	23.7
35-44 „	14.2	9.3	7.7	11.4	10.1	16.1
45-54 „	16.2	8.5	8.5	10.7	11.5	13.4
55-64 „	13.8	7.3	10.4	13.5	14.4	16.6
65-74 „	19.6	8.2	12.9	14.9	13.8	15.3
75 and over	13.9	8.3	7.5	8.9	6.6	9.8
Total . .	12.4	10.1	7.4	10.7	10.2	14.4

The mortality in most age-classes in the capital is much greater for males than for females; it is a little higher among females only from the ages of 5 to 24 years. In the rural districts, however, the figures are throughout higher for females, with the exception

of the first year of life, in which boys have a higher mortality. Among the rural population of North-West Jutland, the difference is very considerable; in the age-classes 20-24 the death-rate from tuberculosis is 18.3 for males and 26.7 for females.

In examining causes we must, as previously stated, bear in mind two circumstances: first, endogenous, constitutional factors, — *i.e.*, a greater susceptibility to infection or a smaller power of resistance to the development of the disease; and, secondly, purely exogenous differentiating circumstances — *i.e.*, greater exposure to infection, whether in the form of primary infection or of re-infection — (super-infection).

In this connection, it will be of interest to observe the difference in the mortality from tuberculosis according to sex and age in the period when the disease was rapidly declining:

Copenhagen. — Per 10,000:

1890-1894	Males.	36.4	Excess for males . .	12.7
	Females.	23.7		
1905-1909	Males.	21.8	Excess for males . .	6.7
	Females.	15.1		
1920-1925	Males	12.4	Excess for males . .	2.3
	Females.	10.1		

Provincial towns. — Per 10,000:

1890-1894	Males.	29.4	Excess for males . .	2.5
	Females.	27.1		
1905-1909	Males.	15.9	Excess for females .	1.5
	Females.	17.4		
1920-1925	Males.	8.9	Excess for females .	1.8
	Females.	10.7		

Rural population of the country as a whole:

1920-1925	Males.	7.4	Excess for females .	3.3
	Females.	10.7		

If we divide the country into parts differently affected by the disease, we obtain the following result for the rural population in 1920-1925:

The islands:	Males.	6.4	Excess for females .	2.0
	Females.	8.4		

South-East Jutland: Males.	6.8	Excess for females .	3.7
Females.	10.5		
North-West Jutland: Males.	10.2	Excess for females .	4.2
Females.	14.4		

The conditions are thus quite opposed in town and country. The higher the death-rate has been in the towns, the more have deaths among males exceeded those among females; but the higher the mortality among the rural population, the greater is this excess among females.

The excess of male over female mortality began in Copenhagen in 1890-1894 at the age of 15 years, in 1920-1925 at the age of 25 years; in the provincial towns in 1890-1894 male mortality was in excess at the age of 20 years; in 1905-1909 this excess began only at 45 years, and in 1920-1925 female mortality was in excess for all ages after 5 years, exactly as in the case of the rural districts.

When considering the age-classes we find that, up to 5 years, the death-rate from tuberculosis is higher among boys, both for towns and for country districts during the whole of the period under investigation. On the other hand, mortality from tuberculosis is higher among girls than boys in the age-groups 5 to 14 years for the entire period.

Among children, therefore, there is a considerable difference in mortality from tuberculosis according to sex. As it can hardly be supposed that infection conditions differ for the two sexes at this age, it must be assumed that the cause lies in constitutional factors.

We also find that females show much less power of resistance during puberty. In 1920-1925, mortality in all groups of the population was greatest among females in the age-groups 15 to 24 years; the conditions are, however, not quite constant, as the death-rate from tuberculosis in 1890-1894 in Copenhagen was greater among males than among females in the age-classes 15 to 24 years, and in 1905-1909 in the age-class 20-24 years. In the case of the rural population, the excess of female mortality is particularly high in these age-groups.

The difference between the mortality of the two sexes in the various parts of the country cannot be considered as exclusively due to endogenous constitutional factors; other causes must be looked for too. When we consider that Copenhagen has a mortality of 12.4 for males and 10.1 for females, while the figures in the country districts are approximately 7.4 for males and 10.7 for females, this difference cannot be explained by inborn constitutional characteristics. It must be considered as due to external conditions; and, in particular, to the varying danger of infection in different places.

We must therefore look for conditions by which men are more exposed to infection than women in the capital and less exposed in country districts. There is an obvious cause.

In the towns, especially in the capital, men are particularly exposed to infection in factories and working premises, especially in the case of work in confined spaces. In country districts the men work principally in the fresh air, while women are particularly exposed to infection in the homes, where a part of their work may consist in tending sick persons in the household. This view is also supported by an investigation into the proportional reduction in tuberculosis in various age-groups.

Proportional Decline in the Death-rate from Tuberculosis from 1890-1894 to 1920-1925 in Percentages.

Age	Males		Females	
	Copenhagen	Provincial towns	Copenhagen	Provincial towns
0-4 years	75.5	70.4	75	70.7
5-9 "	72.2	82.2	72.3	82.5
10-14 "	56.1	79.1	43.4	78.9
15-19 "	47.5	57.5	4.1	51.4
20-24 "	37.9	54.3	8.4	26.8
25-34 "	62.6	60.2	45.7	49.3
35-44 "	70.7	74.5	69.3	66.5
45-54 "	67.4	90	59.1	60.9
55-64 "	72.6	78	68.3	74.9
65-74 "	63.5	74.7	64.2	60.7
75 years and over	70.7	73.2	55.6	57.6

The greatest proportional decline in the disease is found everywhere among children. In the case of young men the reduction is much less, particularly in the capital; this is even more true of young women, whose mortality has been almost stationary. After twenty-five years the decline is again considerable, but for the higher age-groups it is lower among women than among men.

In the provincial towns the position is similar but less pronounced.

The greatest decline is therefore found in the towns among children of both sexes, and among male adults. In childhood there is no difference between the two sexes in the degree of exposure to infection. Among adults it is probable that infection at the place of occupation was formerly predominant and that the measures taken against such infection have been so effective that the difference in the mortality of the two sexes has been almost eliminated.

As this particular source of infection of males disappeared the risks of contagion at home became predominant and consequently the excess of female mortality over the male greater. Thus did the excess of male mortality disappear in the provincial towns as early as 1905-1909.

Among the country population we have figures only for 1920-1925. As the danger of infection in the homes is the predominant factor, the excess of female mortality is particularly great. It is less usual for country patients to enter hospitals or tuberculosis homes, and there is also less realisation of the danger of infection and the importance of isolation than in the towns.

These views are confirmed by an investigation into the decline of tuberculosis in various occupations.

Death-Rate from Tuberculosis per 10,000 in Various Occupations in the Capital.

	1865-1874	1890-1899	1915-1924
Bakers, confectioners.	26	19	16
Carpenters	39	46	24
Saddlers, upholsterers	39	50	16
Bricklayers	44	31	12
Cabinet and chair makers	46	51	14
Painters, varnishers	47	37	21
Smiths, metal-workers	50	44	19
Shoemakers	51	48	33
Tailors	71	60	17
Printers, bookbinders.	78	65	19
Tobacco workers.	86	68	30
Average.	51	46	19

• It will be noticed that persons working in confined spaces are particularly affected, but that the decline has been greatest in these occupations. In 1915-1924, the differences between the various occupations were much less pronounced than formerly, and the decline has been greatest in the last twenty-five years, during which systematic measures have been taken against tuberculosis.

These facts lead to the conclusion that the great decline in the death-rate from tuberculosis is due to the reduced danger of infection. Undeniably, other factors may also have come into play, such as the improvement in the standard of living and housing conditions; but these factors affect both sexes and all occupations. Addiction to alcohol has also been greatly reduced, though less in the country than in the towns. Again, in the rural districts dwellings and economic conditions have been improved, though, as already stated, the result is quite different.

Among the country population the great excess of female mortality in being reduced by the drastic measures taken against the danger of infection in the homes. In support of this view we may mention the well-conducted experiment carried out in Norrbotten by the Swedish National Association.¹ We may also refer to the work of the Danish National Association in a part of the province of Vejle since 1922 in co-operation with medical practitioners and nurses working in the district. Information was obtained of all existing cases of tuberculosis and steps were taken to isolate them in hospitals or in the home, where all necessary measures were used to prevent infection. The result was that mortality dropped from 10.6 to 5.8 in the period from 1923 to 1928. The decline in mortality was particularly great among women.

Death-Rate from Tuberculosis of all Forms in the Province of Vejle, per 10,000.

Year	Whole population	Males	Females
1923	10.6	7.1	14.2
1924	7.8	5.2	10.6
1925	7.3	5.2	9.5
1926	5.2	3.4	7.2
1927	4.9	4.2	5.6
1928	5.8	5.1	6.5

¹ G. NEANDER: *The Hälsan Institute in Norrbotten*, Centraltrykkeriet, Stockholm, 1928.

Death-Rate from Pulmonary Tuberculosis in the Province of Vejle, per 10,000.

Year	Whole population	Males	Females
1923	8.5	5.3	11.9
1924	5.3	4.7	6.4
1925	5.9	4.3	7.6
1926	4.5	2.7	6.3
1927	3.9	3.3	4.7
1928	3.9	3.3	4.7

The measures taken to overcome the danger of infection, both in town and country, tend to eliminate the difference between the death-rate from tuberculosis in the two sexes.

Direct measures against infection are therefore an important factor, and an account is given below of the direct steps taken in the three countries to combat tuberculosis.

5. THE ORGANISATION OF ANTI-TUBERCULOSIS WORK.

DENMARK.

After Robert Koch discovered the tuberculosis bacillus in 1882, it was quickly recognised among the Danish population that tuberculosis was an infectious disease. At the initiative of the Danish General Medical Association (Almindelige Danske Lægeforening), pamphlets and posters were prepared giving information regarding the dangers of infection, together with advice and instructions for preventing the spread of the disease. The effect of these measures may be seen in the mortality curves, the downward movement of which began about 1890. Interest in preventive measures was, moreover, quickly aroused in Denmark. In 1875, the seaside hospital at Refsnaes, the first institute for treating children suffering from scrofula or tuberculosis of the bones, was erected at the initiative of Dr. S. ENGELSTED. In 1895, Niels R. FINSSEN succeeded in curing the first case of lupus by means of his light treatment. Thus the foundations were laid for Finsen's Light Institute, which afterwards became world-famous, and a method of treatment was introduced which has been more and more widely applied and disseminated. Simultaneously with the above-mentioned informatory work, a movement was started for building curative institutions for patients suffering from pulmonary tuberculosis, and in 1900 the first Danish pulmonary tuberculosis sanatorium — Vejle fjord sanatorium — was opened, mainly through the efforts of Christian SAUGMAN. The erection of this sanatorium, which is intended for the wealthier classes, was followed in 1901 by the first sanatorium for the general public, and in the same year the National Anti-Tuberculosis Association (Nationalforeningen til Tuberkulosens Bekaempelse), was formed with the following programme:

- (1) To disseminate knowledge to the greatest possible extent regarding the nature and infectiousness of tuberculosis and the means for overcoming it;
- (2) To promote the establishment of popular sanatoria in which poor people may be treated cheaply or, if possible, free of cost;
- (3) As far as possible to support the patient and his family.

In the very next year the Government, principally on the initiative of the National Association, appointed a commission to investigate how the State might support the anti-tuberculosis campaign by means of legislative measures and suitable subsidies. The commission's work resulted in draft legislation on tuberculosis, which was passed by the Rigsdag in 1905. These laws, which have on several subsequent occasions been revised,

clearly define the measures for combating tuberculosis in Denmark and provide a broad basis on which the work has since been carried out. We will therefore briefly describe them.

As tuberculosis is an infectious disease, it was considered necessary, in the first place, that tuberculous patients, particularly those suffering from pulmonary tuberculosis, should be given the widest facilities for curative treatment and isolation, so that the sources of infection might be eliminated from their homes and the patients trained to take the necessary precautions on returning home. With this object, the laws on tuberculosis contain extensive provisions for the grant of assistance by the State and communes, so that *all* patients without exception may obtain treatment. The question of cost plays *no part whatever* in this connection, as all indigent persons are treated at sanatoria or hospitals free of cost.

The State thus grants subsidies for establishing tuberculosis institutes and hospitals, sanatoria and nursing-homes for treating or nursing pulmonary tuberculosis patients, seaside hospitals for patients suffering from tuberculosis of the bones or so-called surgical tuberculosis, and also seaside sanatoria for treating children suffering from scrofula. The State subsidy for establishing these institutes at present amounts to 2,500 kroner per bed.

The help given by the State towards the maintenance of State-recognised tuberculosis institutes is even more extensive. The State provides up to three-quarters of the amount fixed by law for the treatment and nursing of all patients whose financial position would be considerably impaired if they had to pay the full amount. The remaining quarter is paid either by the patient himself or by his sick fund, if he is a member of such a fund. If he is not, and is unable to pay this part of the charge for treatment, the commune in which he lives must pay it. Such payment is not regarded as poor relief and the patient does not lose his civil rights.

Public relief does not stop here however. If the head of a household, whether the husband or the wife, is treated in a State-recognised tuberculosis institute, and if the family cannot obtain a livelihood by its own means, the commune must grant the family sufficient relief for its maintenance, and such help, again, is not regarded in any way as poor relief.

Assistance may be granted in various ways. It may consist, for instance, of direct relief in money for maintaining the home, or it may take the form of a contribution for placing the children in healthy and good nursing-homes, children's homes, etc., while perhaps the mother is being treated in a hospital or sanatorium. Through these provisions no head of a family is compelled to suspend treatment at an unsuitable time and go back to work in order to maintain his home.

In short, the effect of the provisions is that, in Denmark, every patient requiring treatment for tuberculosis may receive it at a State-recognised institute without regard to his ability to pay.

In addition to the above-mentioned institutions, State recognition, which carries with it a State subsidy for maintenance, may be granted to tuberculosis stations (dispensaries) — *i.e.*, institutions supervising the hygiene of tuberculous patients and their families and homes, with the co-operation of medically trained persons. The station may

grant assistance by nursing, by providing healthier homes, and, in particular, by arranging for the isolation of patients; it may also assist by providing beds and bed-linen, washing the linen of infectious patients, etc. State contributions may be granted to private societies working with this object, to the amount of one-third of the expenditure involved, on condition that the local commune also contributes at least one-third towards expenditure. State subsidies may also be given to communes wishing to establish tuberculosis stations while those maintained by the communes receive State contributions amounting to half the cost of maintenance.

In addition to the extensive assistance granted by law as explained above, there are various other important regulations in the laws on tuberculosis, the most important of which are mentioned below. Medical practitioners must report to the local medical official every case of pulmonary or throat tuberculosis coming under treatment, and likewise all deaths from tuberculosis must be reported to the medical official on a special form. In the case of removal or death dwellings may be disinfected at the public cost. A number of regulations are devised especially for the protection of children. Women may not accept positions as wet-nurses unless it has been established by a special medical examination that they are not suffering from tuberculosis. Persons suffering from infectious tuberculosis may not be appointed for work in crèches, children's and other homes, etc. Children may be placed only in a home which can be shown to be free of infection by tuberculosis, and all children placed in homes must produce a medical certificate that they are not suffering from tuberculosis. School-children who have contracted infectious tuberculosis must be taught separately, and all concomitant expenses must be borne jointly by the State and the commune. No person may be appointed as a teacher in a school under the public authorities unless he can produce a certificate that he is not suffering from infectious tuberculosis. If a teacher contracts the disease, he may be dismissed, in which case he receives a pension amounting to two-thirds of his salary. This provision may also be applied to other officials who, in the exercise of their duty, come into such close contact with the population that they are likely to transmit infection. Finally, all physicians have unlimited power to have samples of expectorations examined for tuberculosis bacilli at the public cost, such examinations being carried out at diagnosis stations, which are established throughout the country.

From the above brief summary it will be seen that the laws on tuberculosis facilitate and also require co-operation from many quarters, with a view to overcoming the disease. Where arrangements are made by private initiative, the State subsidies granted are the same as those granted to communes. This work has grown rapidly, and has received valuable support in many quarters. In the first place, we may mention the National Anti-Tuberculosis Association (Nationalforeningen til Tuberkulosens Bekaempelse), while other private societies, such as the Sanatorium Society of the Co-operative Unions etc., have also taken part in the work. Urban and provincial communes throughout the country have taken a great part in the common work under the supervision and constant stimulus of the State and of the health authorities.

In the machinery set up on the basis of this legislation for combating tuberculosis in Denmark, the principal aim, as already stated, has been to create a large number of beds in special institutions for treating the disease in its various forms. How quickly and how extensively this work has been carried out may be seen from the following table:

Year	Sanatoria		Hospitals		Nursing-homes		Seaside sanatoria		Seaside hospitals		Total number of	
	Number	Beds	Number	Beds	Number	Beds	Number	Beds	Number	Beds	institutions	beds
1875	—	—	—	—	—	—	—	—	1	130	1	130
1895	—	—	—	—	—	—	2	55	1	130	3	185
1900	1	93	—	—	—	—	2	55	1	130	4	278
1906	9	763	3	268	—	—	4	106	2	182	18	1,319
1912	16	1,214	24	751	—	—	8	370	2	230	50	2,565
1920	16	1,338	31	919	4	127	9	450	2	230	62	3,064
1928	16	1,393	36	1,083	4	132	11	571	4	428	70	3,607

Of these seventy institutions, four sanatoria and one seaside hospital are under private management, while the remaining sixty-five are recognised by the State and obtain the above-mentioned considerable subsidies towards the cost of maintenance.

On comparing the number of beds in all tuberculosis institutions with the size of the population, we find that the number of beds has relatively greatly increased.

Year	Number of beds	Per 10,000 inhabitants
1900	278	1.1
1906	1,319	5.0
1912	2,565	9.3
1920	3,064	9.9
1928	3,607	10.1

The number of beds which a country should have available does not, however, depend entirely on the size of the population. The frequency of tuberculosis is an important factor. Accurate information regarding the number of deaths from tuberculosis in the country as a whole is available from 1920, and on calculating the number of beds available per hundred deaths from tuberculosis, we obtain the following result:

Year	Number of deaths from tuberculosis	Number of beds	Number of beds per hundred deaths
1920	3,277	3,064	93.4
1923	3,016	3,385	112.2
1926	2,811	3,500	124.5
1928	2,626	3,607	137.4

Both in relation to the size of the population, and particularly to the number of deaths from tuberculosis, Denmark is very well supplied with beds both for treating and for isolating infectious patients, and the available beds are in constant use. The

following numbers of patients suffering from pulmonary tuberculosis were treated in hospitals or sanatoria:

Year	Approximate number of patients
1912-13	4,570
1916-17	5,300
1920-21	5,600
1924-25	6,000
1927-28	6,400

In the period under review there was an increase of 40 per cent in the number of patients treated. The increase in the population in the same period amounted to about 23 per cent, but the death-rate from pulmonary tuberculosis dropped 40 per cent.

Tuberculosis hospitals must: (1) accept fresh cases as quickly as possible after the disease has been diagnosed; (2) give treatment until it can be continued, if desirable, at a sanatorium; (3) with a view to insolation, treat as many acute infectious cases as possible before death takes place.

Doubts have occasionally been raised whether the system of having a large number of small *tuberculosis hospitals* spread over the entire country is to be recommended. As a link in the general anti-tuberculosis campaign, however, the hospitals have undoubtedly been of great value. The extent to which they are used is, on the whole, satisfactory, though there have necessarily been great fluctuations in this respect, particularly in the small hospitals. The *sanatoria* are always full. They are intended especially for patients in the earlier stages of the disease, though they also accept many patients in the advanced stages. In the National Association's male sanatoria 20 to 30 per cent of the patients are in the first stage, 25 to 30 per cent in the second stage, and about 50 per cent in the third stage. In the female sanatoria, about 45 per cent are in the first stage, 25 per cent in the second stage, and 30 per cent in the third stage. Although the composition is thus very mixed, the final results are quite satisfactory.

The numerous patients annually passing through tuberculosis institutions not only receive curative treatment but learn what precautionary rules should be observed on returning home. This a very effective way of educating the public in regard to the measures for preventing infection.

Not the least part of the importance of these institutions lies in isolation. Its value may be gauged by investigating the number of deaths from pulmonary tuberculosis taking place in the institutions instead of at patients' own homes. In the capital in 1890, 19 per cent of all deaths from pulmonary tuberculosis took place in institutions; in 1900 the proportion had risen to 38 per cent, in 1912 to 68 per cent, and since that time 70 to 75 per cent of deaths from pulmonary tuberculosis in the capital occurred in hospitals. In provincial towns the proportion is about 45 per cent of the deaths, and among the rural population 30 to 33 per cent. No evidence is needed to prove the importance, from the epidemiological point of view, of removing so large a proportion of patients from their homes in the last stages of the disease.

After the work of establishing institutions was well advanced, the National Association began to erect tuberculosis stations (dispensaries). The first station was opened

in 1908 in Copenhagen, and was quickly followed by a station in another part of the city and one in the suburb of Frederiksberg. The system of work adopted is much the same as in other countries. Particular attention is paid to protecting healthy children growing up in homes affected by infectious tuberculosis. In all about 3,000 children have been kept in good healthy nursing-homes in Copenhagen so long as there appeared to be a danger of infection in their own homes. Further, the success of the tuberculosis stations has been ensured, more particularly by the practically limitless facilities which exist for treating tuberculous patients at institutions. Patients are not given any form of treatment at tuberculosis stations. At the initiative of the National Association, stations have gradually been erected in the larger and some of the smaller towns, and extensive assistance has been granted throughout the country by the National Association's local societies, one of which is to be found in each province, for administering the funds provided for this work by the central administration of the association.

There is, however, no hard and fast organisation of the work of tuberculosis stations in the country. The National Association undertook this work in 1922, and selected a certain section in the north of the province of Vejle, with a population of 62,000, as an experiment. It endeavoured to co-operate as closely as possible with local doctors, and awakened the interest of nurses in the work by holding classes, lectures, etc., with a view to investigating hygienic conditions in the home where the disease appeared; any shortcomings are remedied, if necessary with the help of the National Association. Steps are also taken to examine all members of the family in any home where a person contracts the disease and to place the patient himself as quickly as possible in a hospital or sanatorium. It will be seen *inter alia* from the following facts that the work has been very successful. Previously, scarcely more than half the patients affected by the disease were placed in tuberculosis institutions, whereas now 80 per cent of the patients are so placed. While, previously, 75 per cent of the deaths from tuberculosis took place in the patients' homes, at present about half the number take place in tuberculosis hospitals. This work has had a great effect on the death-rate from tuberculosis. The decline in that death-rate is more pronounced in the district referred to than among the rural population as a whole.

Mortality from Tuberculosis per 10,000.

Year	Rural population of whole country	Vejle province
1920	9.8	10.9
1921	8.9	9.9
1922	9.0	8.9
1923	8.5	10.6
1924	9.3	7.8
1925	8.6	7.3
1926	7.5	5.2
1927	7.5	4.9
1928	6.9	5.8

In recent years, on the initiative of the Government and in some cases with help from the National Association, provincial tuberculosis stations have been established in nine of the twenty-six provinces, and it is proposed to erect such stations in the remaining provinces as quickly as circumstances permit.

These tuberculosis stations work in connection with a central tuberculosis hospital, of which the head doctor is a tuberculosis specialist. He is also in charge of the various tuberculosis stations in the province; he visits them every week or every other week, gives public consultations to persons suffering from or suspected of having contracted tuberculosis, and directs the nurses' work. All homes infected with, and patients suffering from, tuberculosis are registered, and the homes are not only subject to supervision, but receive extensive assistance in respect of hygiene, isolation, beds, food, etc.

In addition to anti-tuberculosis work among human beings, measures are also taken against tuberculosis among domestic animals. The campaign against human tuberculosis is thus assisted through the reduction of infection among cattle. As far back as 1893, regulations were issued regarding tuberculosis among domestic animals. The State grants subsidies to farmers to enable them to cure their live-stock of tuberculosis by the method introduced by Bernhard Bang. Cows suffering from tuberculosis of the udder are slaughtered, and the State pays fixed compensation to the owner. Separated milk may only be delivered by the dairies after pasteurisation. Cream used for butter-making must also be pasteurised, while in most towns the population may obtain children's milk from live-stock which has undergone a tuberculin test and is under permanent veterinary control.

The extensive measures described above have involved heavy expenditure in proportion to the size of the population. The money has been raised by State subsidies under the laws on tuberculosis; in addition, the communes have expended considerable sums under the tuberculosis laws, and private initiative has also made large contributions.

Subsidies granted by the State under the Tuberculosis Laws.

Year	Annual subsidy Kroner ¹
1900-1904	73,900
1905-1909	1,017,000
1910-1914	1,449,000
1915-1919	2,318,000
1920-21	4,641,200
1921-22	3,621,000
1922-23	3,533,000
1923-24	3,730,000
1924-25	3,084,000
1925-26	3,560,600
1926-27	3,500,900
1927-28	3,262,000
1928-29	3,309,700

¹ The Danish crown is worth 1.39 gold franc at par.

In addition, the State has subsidised Finsen's Medical Light Institute for treating patients suffering from lupus or surgical tuberculosis, to the extent in recent years of 750,000 kroner per year. Further, the Danish Law of 1921 on disabled persons provides for pensions at present amounting to 540 kroner per year to all members of sick funds who are incapacitated for work — *i.e.*, whose capacity for work is reduced to one-third or less. The number of tuberculosis invalids in receipt of this pension may be estimated at present at 3,000 to 4,000. The State also in various ways subsidises other objects indirectly promoting the campaign against human tuberculosis, such as State-recognised sick funds, home-nursing organisations, and, last but not least, measures for combating tuberculosis in cattle.

The expenditure of the *communes* on anti-tuberculosis measures is also considerable. It is impossible to state the exact figure, but it may be estimated at close on one million kroner per year, while the expenditure of State-recognised sick funds for treating patients in tuberculosis institutes has, in recent years, amounted to about 600,000 kroner per year.

Lastly, *private initiative* has accomplished a great deal. Originally, the main burden was borne by private initiative, the State supplementing whatever was still needed; but, although the State now makes the largest financial sacrifice, the importance of private initiative must not be undervalued. The greatest contribution is made by the National Association, which directs seven tuberculosis sanatoria and six seaside sanatoria, with a total of 996 beds, in addition to the above-mentioned tuberculosis station work. The association has also erected a seaside hospital with fifty-three beds for adult patients suffering from surgical tuberculosis, and two small nursing-homes. During its existence, the National Association has collected over two million kroner in members' contributions, etc., while, through the sale of the "autumn flower" (Høstblomsten) — the Danish equivalent of the Swedish "May flower" (Maiblomman) — which takes place in the entire country on one day a year, the National Association has received nearly three million kroner. Moreover, the receipts obtained during the first year from the sale of Christmas Stamps (an idea which, as is generally agreed, originated in Denmark, having been suggested and put into practice by the late Postmaster E. HOLBÖLL in 1904) were used for erecting one of the above-mentioned sanatoria operated by the National Association — the large children's sanatorium known as the "Christmas Stamp Sanatorium" (Julemaerke Sanatoriet) for children suffering from pulmonary tuberculosis. After this plan had been carried into effect in 1911, the funds from the sale of Christmas stamps were not used for combating tuberculosis. The Christmas Stamps Administration used them for the benefit of children in other ways (convalescent homes, etc.). The National Association also has at its disposal, in the form of bequests, capital amounting to about a half a million kroner, which is used principally for the benefit of needy tuberculous patients.

* * *

The above-mentioned measures are directly aimed at overcoming the disease, and are mainly responsible for the great decline which has taken place in the death-rate from tuberculosis in Denmark. Other factors, too, may be regarded as having more or less directly helped to bring about this result — for instance, steps have been taken to provide for the treatment of the population by doctors and nurses. There are about 7,000 fully trained nurses in Denmark, while the number of doctors has constantly increased. In 1901, there were about 1,350 doctors, while in 1928 the figure had risen to about 2,500,

some of whom were medical practitioners, whilst others were engaged at hospitals. This is equivalent to one doctor per 1,400 inhabitants. During the same period home nursing has greatly increased. Home nursing is, to a great extent, organised by special societies, which supply nurses free of cost to members in case of sickness. In 1900, there were 195 societies of this kind, 58 in the towns and 137 in the country. There are now about 800 nursing societies in the country with a total of between 900 and 1,000 nurses, in addition to which the Danish deaconess houses have about 200 trained sisters, for parish nursing, principally in the towns, while in the larger towns nurses are employed by the communes for tending the poor free of cost. For the benefit of these visiting nurses the National Association has arranged a number of courses in tuberculosis hygiene in order to train them for the supervision of hygiene in homes infected with the disease.

The extensive organisation of sick funds has been a very important factor in Denmark. These sick funds receive large subsidies from the State for their work (in 1928 the State subsidies amounted to about 10 million kroner). They provide free medical attendance for members and their children, a supply of medicine entirely or partly gratis, free hospital treatment, and a daily allowance on a sliding scale. The great increase in the membership of sick funds may be seen from the following figures.

Proportion of the Entire Population over 15 years Members of Sick Funds recognised by the State.

	Per cent
1893.	7.9
1900.	18.8
1910.	37
1920.	59.5
1928.	65

It may be mentioned, in conclusion, that there are special laws containing regulations for the supervision of hygienic conditions in factories and workshops, the cleanliness of bakeries, dairies and businesses connected with the foodstuffs industry, working hours for apprentices, the release of working women from work for a certain period before and after childbirth, etc. Endeavours are made to increase the power of resistance of children and young people to the disease by encouraging gymnastics and open-air sports, by arranging for town children to obtain summer holidays in colonies or homes, etc. From Copenhagen alone about 20,000 children are sent to the country every year without any appreciable cost to their families, as the State grants free travelling facilities, while the stay in the country is usually gratis.

NORWAY.

In Norway, as in other countries, organised work to combat tuberculosis only began after Robert KOCH demonstrated, in 1882, the infectiousness of the disease. Since then the authorities, the medical profession and the public have taken the greatest interest in anti-tuberculosis measures.

In 1895, Medical Director Holmboe was instructed by the Storting to prepare a draft law providing for public measures to be taken against tuberculosis, and in 1900 the Law on Tuberculosis was passed.

The State and the communes showed their interest in the work and their appreciation of its importance by granting considerable sums of money for the erection of public

sanatoria, seaside hospitals and tuberculosis homes (Tuberkulosehjem). A large number of similar institutions has also been built by private initiative. Special mention may be made of three large organisations: the Norwegian Red Cross, founded in 1865; the Norwegian Women's Health Association, founded in 1896; and the National Anti-Tuberculosis Association, founded in 1910, all of which are engaged in anti-tuberculosis work. All these organisations obtain considerable sums from the public for their work.

The Law on Tuberculosis of May 8th, 1900.

The basis of all anti-tuberculosis work in Norway has been the law on tuberculosis, the main provisions of which will be discussed hereunder. The provisions of the law apply to all sickness of a tuberculous nature which is accompanied by the elimination of infectious material liable to cause a spread of the disease. The law compels medical practitioners to notify the medical officer of health of all new cases of such disease that come to them for treatment. The notification must state the patient's name, age and circumstances, the form of disease, circumstances of infection, etc. The medical practitioner is further required to instruct the patient as to the precautions to be taken to prevent the spread of infection, and must satisfy himself that his directions are being carried out. The hygienic supervision of tuberculosis is generally entrusted to the medical officer of health.

The most important stipulation of the law is contained in paragraph 6, which provides for the compulsory isolation of infectious tuberculous patients. If the medical officer of health finds that the patient's conduct or his home are such as to entail a special risk of the disease being communicated to others, he must lay the case before the Health Council, which decides what action is to be taken and, if necessary, orders the patient to be removed to hospital. Nowadays, such action is, generally speaking, invariably resorted to where there is danger of infection. Married couples who wish to be together may, however, not be separated by the operation of the law. The opportunity which the law thus provides of effecting the compulsory institutional isolation of infectious patients has proved highly effective, and has been, so to say, the pivot upon which the whole of the tuberculosis work has turned.

For patients removed to a hospital or a nursing-home by virtue of paragraph 6 of the tuberculosis law, the expenses of treatment are paid by the town or province concerned, which recovers 40 per cent of its outlay from the State. Up to half of the expenditure incurred by the province may, moreover, be charged to the district from which the patient comes. Such free institutional treatment of tuberculosis is not regarded as poor relief.

In recent years, the numbers of patients removed to tuberculosis homes or hospitals under paragraph 6 have been as follows:

Year	Towns	Rural districts	Total for whole country
1923	844	1,189	2,033
1924	801	1,173	1,974
1925	622	1,168	1,790
1926	632	1,251	1,883
1927	702	1,281	1,983
1928	748	1,353	2,101

At the present moment, about 90 per cent of all patients in tuberculosis homes have been sent there in pursuance of paragraph 6.

As already stated, the law provides for the compulsory notification of all new cases of infectious tuberculosis. This provision has, however, proved very difficult to enforce, and medical practitioners frequently neglect to send in the statutory notification to the Health Council. For this reason, it has not been possible to form an entirely accurate idea of the number of fresh cases of tuberculosis in its infectious form that come under medical treatment each year, or of the total number of such tuberculous patients under treatment at any given time.

According to the tuberculosis records of the medical officers of health, the following numbers of fresh cases of infectious tuberculosis were notified to the Health Councils during the period 1923-1928:

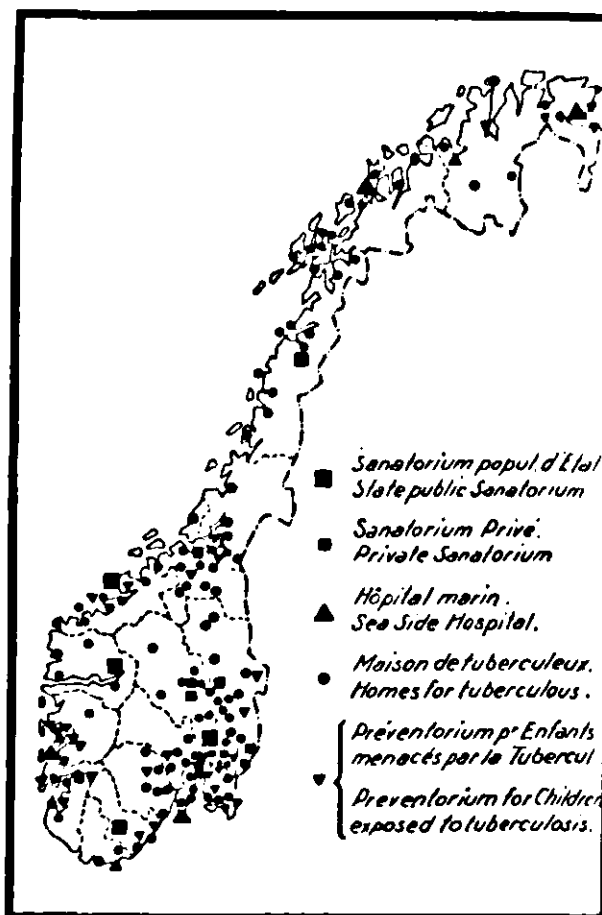
Year	Fresh cases of infectious tuberculosis reported	
	Total number of cases of tuberculosis	Number of pulmonary cases included in the total
1923	7,509	7,180
1924	8,340	7,943
1925	7,827	7,487
1926	7,186	6,854
1927	7,154	6,841
1928	7,117	6,780

These figures are, however, undoubtedly too low, for, as already mentioned, all fresh cases have not been reported to the district physicians.

Institutions for the Care and Treatment of Patients suffering from Pulmonary Tuberculosis, Scrofula and Surgical Tuberculosis.

In 1897, the State opened the first popular sanatorium at Reknes in Molde with seventy-two beds. About the same time, the private foundation of St. Jørgens Hospital in Bergen built the Lyster public sanatorium at Sogn. In 1900, and during the ensuing period, a number of private sanatoria were founded. Apart from this, attention was specially concentrated during these years on the building of small tuberculosis homes (Tuberkulosehjem) essentially designed to provide for the isolation of particularly long-standing cases of infectious tuberculosis. The first tuberculosis home was founded in 1903 by the Norwegian Women's Health Association, and the following year a whole series of similar institutions were set up, all of them by private initiative and with privately collected funds. Later on, the various provinces and communes also built such nursing-homes for the isolation of their tuberculous patients.

Map 3.
ANTI-TUBERCULOSIS INSTITUTIONS IN ACTIVITY IN NORWAY IN 1929.



To begin with, the tuberculosis homes were intended exclusively as institutions for the care of patients and especially for long-standing cases. Later on, however, they tended more and more to be used as curative institutions as well.

After 1914, there was renewed agitation in favour of the erection of large public sanatoria by the State. This led up to a decision by the Storting making additional provision for the erection of four State sanatoria. Three of these are now in use — the National Forest Sanatorium at Setesdal, with 138 beds; the Vensmoen Sanatorium at Saltdal, for northern Norway, with 152 beds; and the Glittre Sanatorium for south-eastern Norway (Østland), with 167 beds. This year, an appropriation has been made for the building of a fifth State sanatorium for Trøndelag, which will have 150 beds.

Seaside Hospitals.

In 1892 and 1893, the Fredriksvern and Hageviken seaside sanatoria, with fifty and forty beds respectively, were built, both by private initiative. In 1919, the State took over the seaside hospital at Fredriksvern, which has since been enlarged to take 140 patients. The seaside hospital at Hageviken has also been enlarged and now has room for 183 patients. In recent years the State has built two seaside hospitals in northern Norway, at Tromsø and Vardø.

Finally, in addition to these four seaside hospitals, four smaller nursing-homes are available for the treatment of scrofula and surgical tuberculosis.

The following table shows the number of tuberculosis institutions in use at the beginning of 1928, the number of beds, and by whom maintained:

Institutions for the care and treatment of tuberculous patients	Total number of		Number maintained by											
			State		Provinces		Communes		Private					
									Norwegian Red-Cross		N.W.H.A. ¹		Other private organisations	
	Institutions	Beds	Institutions	Beds	Institutions	Beds	Institutions	Beds	Institutions	Beds	Institutions	Beds	Institutions	Beds
Sanatoria	12	1,355	4	608	—	—	1	273	1	26	1	136	5	312
Tuberculosis homes for pulmonary tuberculosis	111	2,650	1	33	30	703	35	834	1	26	21	555	23	499
Seaside hospitals	4	419	3	236	—	—	—	—	—	—	—	—	1	183
Nursing-homes for scrofula and surgical tuberculosis	4	152	1	44	—	—	—	—	—	—	1	39	2	69

¹ Norwegian Women's Health Association. (N.S.K.)

Many of the general hospitals also take tuberculous patients, sometimes in special tuberculosis wards. At the end of 1928 there was, in twenty-four hospitals, a total

number of 681 beds specially reserved for tuberculous patients. On December 31st, 1928, 5,257 beds, or one bed per 535 inhabitants, were thus available for tuberculous patients. Taken with reference to the number of deaths from tuberculosis in 1928, this gives roughly 120 beds per 100 deaths.

As shown by the following table, the number of beds for tuberculosis has rapidly increased in the last few years:

Number of Beds in Sanatoria or Tuberculosis Homes during 1923-1928.

	1923		1924		1925		1926		1927		1928	
	Institutions	Beds	Institutions	Beds	Institutions	Beds	Institutions	Beds	Institutions	Beds	Institutions	Beds
Sanatoria	11	940	11	961	12	987	12	1,188	12	1,355	12	1,355
Tuberculosis homes	91	1,712	97	1,919	103	2,037	105	2,211	108	2,459	111	2,650
Total	102	2,652	108	2,880	115	3,024	117	3,399	120	3,814	123	4,005
Per 10,000 inhabitants	—	9.7	—	10.5	—	10.9	—	12.2	—	13.6	—	14.2
Number of beds per 100 deaths from pulmonary tuberculosis	—	65.7	—	66.3	—	74.7	—	95.9	—	109.3	—	114.7

Number of Patients in Tuberculosis Institutions during 1928.

	Number admitted during year	Total number treated	Discharges	Deaths
Institutions for the treatment of pulmonary tuberculosis:				
Sanatoria	3,196	4,447	3,103	47
Tuberculosis homes	2,386	4,677	1,508	743
Total	5,582 ¹	9,124	4,611	790
Surgical tuberculosis and scrofula:				
Seaside hospitals	441	814	406	24
Homes for scrofulous patients	75	183	72	2
Solvanglight Institute	55	87	50	2
Total	571 ²	1,084	528	28
Total for all tuberculosis institutions	6,153	10,208	5,139	818

¹ This includes 84 cases of diseases other than tuberculosis.

² This includes 104 cases of diseases other than tuberculosis.

The number of patients admitted to institutions dealing solely with tuberculosis was thus 5,965. To this should be added 3,469 cases of tuberculosis admitted during the year into general hospitals, making a total of 9,434.

In recent years the following numbers of patients suffering from pulmonary tuberculosis have been admitted for treatment into sanatoria and tuberculosis homes:

Year	Sanatoria	Tuberculosis homes	Total
1923	2,040	1,634	3,674
1924	2,469	2,015	4,484
1925	2,588	2,018	4,606
1926	2,818	1,971	4,789
1927	3,095	2,191	5,286
1928	3,160	2,338	5,498

From 1923 to 1928, the number of patients has, it will be noted, risen by about 50 per cent.

During the period 1923-1928, the following number of patients died in sanatoria and tuberculosis asylums:

Number of Deaths in Sanatoria and Tuberculosis Asylums.

Year	Sanatoria	Tuberculosis asylums	Total	Percentage of total number of deaths from pulmonary tuberculosis.
1923	21	575	596	14.8
1924	40	727	767	17.6
1925	34	671	705	17.4
1926	40	628	668	18.8
1927	37	733	770	22.1
1928	47	743	790	22.6

As already mentioned, many tuberculous patients are removed to general hospitals, so that many deaths occur in these as well. No reliable particulars of the numbers involved in this case, however, are yet available. Hence it is impossible to obtain full details as to how many deaths from tuberculosis in Norway occur in institutions and how many in the homes. The above details concerning deaths in tuberculosis institutions show, however, that the work, especially that of isolating long-standing cases in the hospitals, is making rapid headway. In 1923, 15 per cent of all deaths from pulmonary tuberculosis occurred in sanatoria and tuberculosis homes, and in 1928 the percentage was 23.

Work and Convalescent Homes.

There are at present, in the country, four work and convalescent homes with accommodation for eighty-eight patients in all. In 1915, the Oslo Health Association opened a transition centre for tuberculous women in Oslo, with accommodation for twenty-seven women discharged from sanatoria, hospitals or tuberculosis homes.

The Trondhjem Anti-Tuberculosis Association maintains the Valheim Convalescent Home, which can take nineteen female convalescents.

The Work and Convalescent Home at Saltdal is an institution attached to the Vensmoen Sanatorium. For all practical purposes, it is regarded as a transition centre for patients who are discharged from the Vensmoen Sanatorium and are able to work.

In addition, the Glittre Sanatorium has a training institute which can take thirty male tuberculous patients whose condition renders it difficult for them to revert to their previous occupation, and who must learn another, more suitable, trade. This institute also takes patients other than those who have been treated at Glittre Sanatorium. The patients are paid for their work at rates laid down by the Department of Social Welfare.

Children's Homes and Open-Air Schools for Children specially susceptible to Tuberculosis.

In 1911, the Oslo Health Association set up the first open-air school for children specially susceptible to tuberculosis. At present, there are twenty-eight such schools scattered all over the country, with 900 places in all. One of these — *i.e.*, Talvik, in Finmark — is managed by the State, and the others were established and are managed by private societies and institutions, thus the Norwegian life insurance companies have founded two children's homes for specially susceptible children, but they are managed by the sub-sections of the Health Association and National Association. Most of the children's homes take both infants and older children. Special mention may be made of the Infants' Home in the Aakebergvei, Oslo, which was built, and is owned, by the Oslo section of the National Association, but is managed by the commune of Oslo. It only takes infants from tuberculous families in Oslo, and the number of beds has just been increased from forty to seventy-five. The majority of these institutions are subsidised by the State.

Dispensaries.

A highly important factor in the campaign against tuberculosis is the prophylactic action of the dispensaries in the homes. The first tuberculosis dispensary was opened at Oslo in 1901, the year after the Law on Tuberculosis came into force. To begin with, this work was carried on under the Health Inspector for Infectious Diseases of the Oslo Health Council; but in 1915 the Tuberculosis Department of the Health Council became an independent office with its own medical specialist, the Health Inspector for Tuberculous Diseases. This department now has, in addition to this medical specialist, two assistant medical officers and nine nurses. The department is furnished with all diagnostic equipment, and has become the pivot of anti-tuberculosis work in Oslo. It works in closest co-operation with the Oslo Health Association and the National Anti-Tuberculosis Association.

Through the agency of its nurses, the Tuberculosis Department exercises hygienic supervision over the majority of notified tuberculous patients in Oslo. In 1930, 3,188 tuberculous patients were under the supervision of the Tuberculosis Department.

Through the Tuberculosis Department, all contacts in the home are examined in order to detect, if possible, any new cases and to ensure treatment at an early stage of the disease.

School doctors also take part in the examination of families. Once a year they examine all school-children from tuberculosis-infected homes.

Furthermore, since 1911, the Tuberculosis Department has been keeping a special watch over all children born in homes in which a case of tuberculosis has been reported.

The contribution of the Oslo commune towards the Tuberculosis Department's dispensary work has increased very rapidly. In 1915, 1,500 crowns¹ were granted; in 1920, 158,700; and this year 419,841.

In the following towns the work of the dispensary is carried on by the Health Council in co-operation with the local Health Association or section of the National Anti-Tuberculosis Association: Bergen, Trondhjem, Aalesund, Skien, Moss, Fredrikstad, Sarpsborg and Harstad.

In 1920, the National Anti-Tuberculosis Association included in its programme the provision, throughout the country, of dispensaries similar to those organised in other countries, but adapted to the special circumstances of Norway and based, so far as possible, on existing organisations. Endeavours are being made to set up dispensaries in each of the medical districts, under the direction of a local Tuberculosis Committee, consisting of the medical officer of health, as chairman, one representative of the communal authorities and one representative of every association engaged in anti-tuberculosis work in the commune. To each dispensary it is proposed to attach a trained visiting nurse to help the district medical officer in supervising tuberculous families, and to assist him in the examination of school-children under the scheme set up in 1924 by the National Association.

Experience having shown the need for centralisation of the tuberculosis work carried out by the various organisations, a Central Committee for dispensary work was set up in 1926, consisting of three representatives of the three great organisations — the National Anti-Tuberculosis Association, the Norwegian Women's Health Association and the Norwegian Red Cross — and the senior medical officer for tuberculosis, the last-named acting as chairman. This Committee is required to act as an intermediary between the State and the three organisations and to allocate the State contributions to the dispensaries throughout the country.

In 1926, the Storting made the first grant for dispensary work — *i.e.*, 40,000 crowns per annum for five years. This money is used more especially as a contribution towards the remuneration of visiting nurses, and to start the work of examining school-children.

Finally, particulars will be given of the medical facilities available in the country and of health insurance.

Medical Profession.

As shown by the following table, the number of doctors has been steadily increasing:

¹ The Norwegian crown is worth 1.38 gold francs at par.

Year	Number of doctors ¹	Number of inhabitants per doctor
1890	658	3,046
1895	916	2,289
1900	1,166	1,924
1905	1,160	1,994
1910	1,177	2,031
1915	1,227	2,044
1920	1,281	2,071
1925	1,496	1,853
1928	1,697	1,711

Number of Doctors and Number of Inhabitants per Doctor in the various Provinces in 1900 and 1928.

Provinces	Number of doctors					
	1900			1928		
	Total	Country	Towns	Total	Country	Towns
Norway as a whole	980	426	554	1,586	739	847
Östfold	55	23	32	72	35	37
Akershus	43	39	4	192	187	5
Oslo	267	—	267	377	—	377
Hedmark	45	36	9	69	56	13
Opland	42	36	6	63	48	15
Buskerud	43	23	20	68	36	32
Vestfold	36	11	25	57	18	39
Telemark	39	21	18	65	33	32
East Agder	30	12	18	36	18	18
West Agder	29	10	19	39	13	26
Rogaland	37	13	24	73	25	48
Hordaland	28	28	—	47	47	—
Bergen	54	—	54	87	—	87
Sogn and Fjordane	26	24	2	32	31	1
Møre	40	28	12	58	30	28
South Trøndelag	57	28	29	83	37	46
North Trøndelag	28	21	7	39	29	10
Nordland	46	42	2	80	63	17
Tromsø	22	20	2	29	16	13
Finmarken	13	11	2	20	17	3

¹ Established in Norway.

Provinces	Number of inhabitants per doctor					
	1900			1928		
	Total	Country	Towns	Total	Country	Towns
Norway as a whole	2,286	3,785	1,133	1,761	2,687	953
Östfold	2,489	4,106	1,326	2,405	3,598	1,277
Akershus	2,703	2,894	840	1,074	1,087	606
Oslo	853	—	853	666	—	666
Hedmark	2,804	3,295	841	2,403	2,813	640
Opland	2,769	3,056	1,044	2,215	2,685	713
Buskerud	2,620	3,545	1,557	2,174	3,084	1,150
Vestfold	2,904	6,121	1,489	2,227	4,699	1,086
Telemark	2,540	3,489	1,433	2,021	2,747	1,273
East Agder	2,665	5,501	773	1,967	2,959	974
Vest Agder	2,813	5,917	1,179	1,968	3,931	986
Rogaland	3,448	6,198	1,959	2,394	4,024	1,545
Hordaland	4,848	4,848	—	3,454	3,454	—
Bergen	1,338	—	1,338	1,124	—	1,124
Sogn and Fjordane	3,425	3,671	468	2,907	2,949	1,600
Møre	3,403	3,951	2,126	2,882	4,330	1,330
South Trøndelag	2,375	3,471	1,317	2,109	3,211	1,222
North Trøndelag	2,980	3,690	848	2,460	3,015	852
Norland	3,307	3,474	1,562	2,362	2,640	1,332
Tromsø	3,380	3,368	3,498	3,362	5,129	1,188
Finmarken	2,535	2,374	3,422	2,516	2,390	3,231

Health Insurance.

The first law on health insurance is dated September 18th, 1909. It was subsequently superseded by the present Law of August 6th, 1915, as amended by subsequent enactments.

The law provides for the compulsory insurance of salaried workers, both in public and in private employment, for workers irrespective of the amount of their wages and for officials whose salary does not exceed a figure laid down by the Crown (at present 5,400 kroner). The insurance is financed by payments from members themselves, their employers, the State and the communes, who contribute in the proportions of six-tenths, one-tenth, two-tenths and one-tenth respectively. Persons who are not compulsorily insurable but whose economic circumstances are similar to those of members may voluntarily take out an insurance policy, and are then entitled to similar contributions from the State and commune.

The insurance provides benefits, not only for the members themselves, but, in the event of sickness, also for the partner in marriage, and for children and foster-children under 15 who are dependent upon them for maintenance. The regional sick funds pay the cost of medical or dental attendance, treatment and maintenance in hospitals or maternity homes, sickness allowance so far as the sickness may entail incapacitation for work, maternity allowance before and after childbirth and funeral benefit. Sickness allowance or treatment and maintenance in curative institutions may be paid for twenty-six weeks in any one year; if the disease is tuberculosis, the period is thirty-nine weeks.

At the end of 1928, 31 per cent of the population over 15 years of age were members of the regional sick funds. At Oslo, the percentage was as much as 54. If dependants, husbands, wives and children are included, the proportion of the population which is insured against sickness may be put at 72 per cent in the capital and at 45 to 50 per cent in the country as a whole.

The following table gives particulars of the membership of regional sick funds during the period 1912-1928, taken with reference to the total population over 15 years of age:

Year	Number of members					Percentage of total population above 15 insured
	Men	Women	Total	Proportion in		
				Towns	Rural districts	
1912	194,300	135,700	330,000	139,300	190,700	20.6
1915	206,507	144,710	351,217	146,694	204,523	21
1920	355,138	203,523	558,661	252,373	306,288	31
1925	373,960	222,224	596,184	278,811	317,373	31.3
1928	383,484	235,337	618,821	285,086	333,735	31

Total Expenditure of the Regional Sick Funds.

Year	Total (Norwegian Crowns)	Per member
1915	8,870,077	22.86
1920	35,370,768	60.50
1925	40,255,454	65.87
1928	38,146,713	60.47

At the moment it is impossible to say what proportion of these sums is expended on tuberculosis. The only particulars which can be obtained as to the expenditure of a regional sick fund on tuberculosis have reference to Oslo. In 1928, the total expenditure of the Oslo fund amounted to 489,815 kroner, of which 261,544 kroner were spent on the care of tuberculous patients in sanatoria and tuberculosis homes. The outlay on sanatorium treatment has greatly increased.

Expenditure of the Oslo Regional Sick Fund for the Treatment of Tuberculous Patients in Sanatoria and Tuberculosis Homes.

Year	Total amount paid to sanatoria Kroner	Amount per member
1915	30,671	0.62
1920	63,842	0.71
1925	141,002	1.27
1928	261,544	2.34

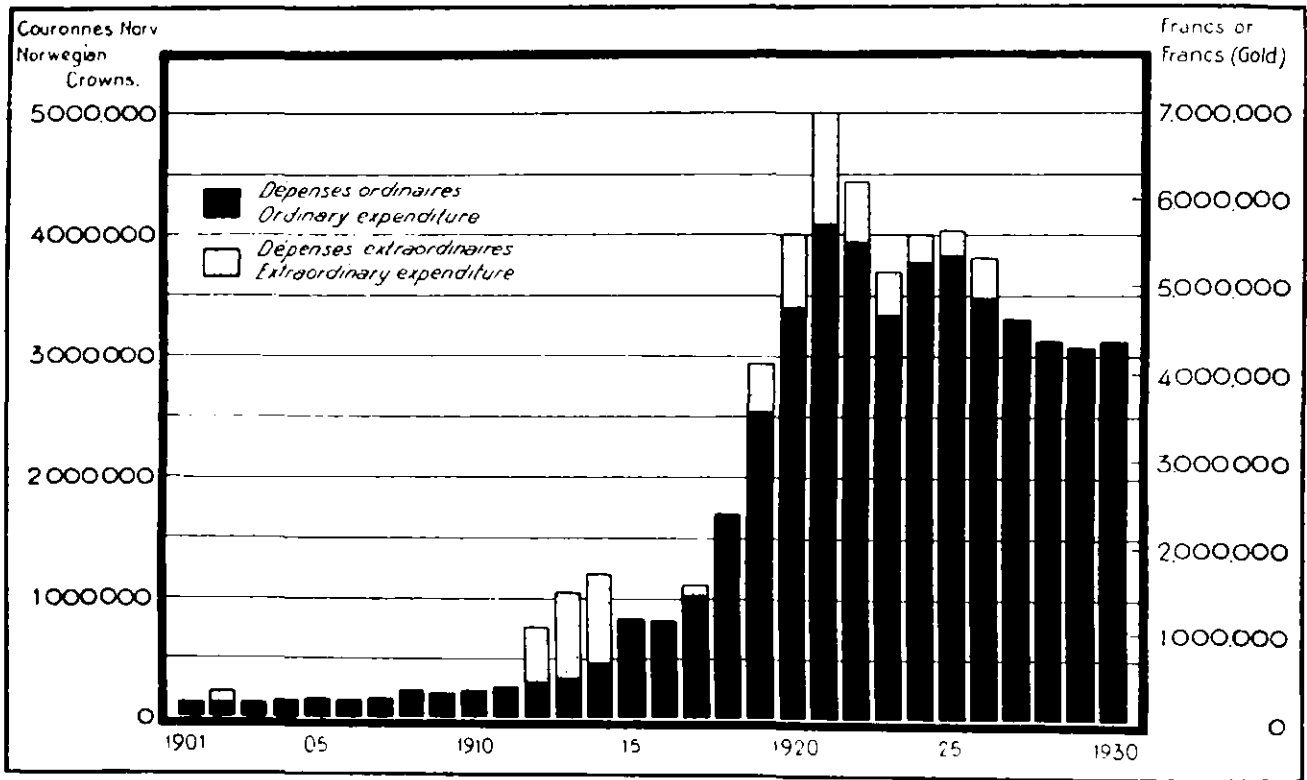
Financial Particulars.

The following *diagram* shows Government expenditure on tuberculosis from 1901 to 1930.

Graph 17.

EXPENDITURE OF THE NORWEGIAN STATE ON ANTI-TUBERCULOSIS ACTIVITIES FROM 1901-1930 (IN NORWEGIAN CROWNS).

(The black bars show the ordinary, the hatched bars extraordinary expenditure.)



At the moment, the following sums are being spent on tuberculosis work:

	Kroner
Annual Government expenditure (budget for 1930-31)	3,100,000
Contributions from the lottery surplus	300,000
Contributions from the turnover tax on the wine monopoly	2,100,000
Contributions of the towns and provinces towards expenses for the maintenance of infectious tuberculous patients (placed in institutions under paragraph 6 of the tuberculosis law	2,100,000
Contributions of the Norwegian life insurance societies towards the treatment of members who are suffering from tuberculosis.	120,000
In addition to this, the societies have, for a number of years, contributed about 33,000 kroner per annum for the erection of homes for children specially susceptible to tuberculosis.	
Annual expenditure of the National Anti-Tuberculosis Association and of the Norwegian Women's Health Association on anti-tuberculosis work	3,000,000

To this must be added the sums annually expended on anti-tuberculosis work by regional sick funds, communes and private associations.

In all, some 10,000,000 kroner, or 3 to 4 kroner per head of population, are spent every year on the campaign against tuberculosis.

SWEDEN.

Active anti-tuberculosis work in Sweden, the way for which was prepared by repeated and detailed discussion by the Swedish Medical Society and at General Medical Congresses during the 'eighties and 'nineties, actually began in the year 1897, when King Oscar II handed over for the erection of public sanatoria the grant of 2,200,000 kroner presented to him by the Swedish people at the jubilee celebrations on the occasion of the twenty-fifth anniversary of his sucession to the throne.

With this money, to which a grant from the Riksdag was added, the first three sanatoria in the country were erected. Previously, there had been only a few small private institutions.

In 1905, a Royal Committee was set up to consider the question of action against tuberculosis. Guided by the report of this Committee, the Riksdag made grants in 1908 and 1909 for the building and maintenance of institutions for the care of the tuberculous. This was the beginning of very notable developments in this field, as a result of which State-subsidised institutions for the care of the tuberculous are now available in all parts of the country (see Map 4).

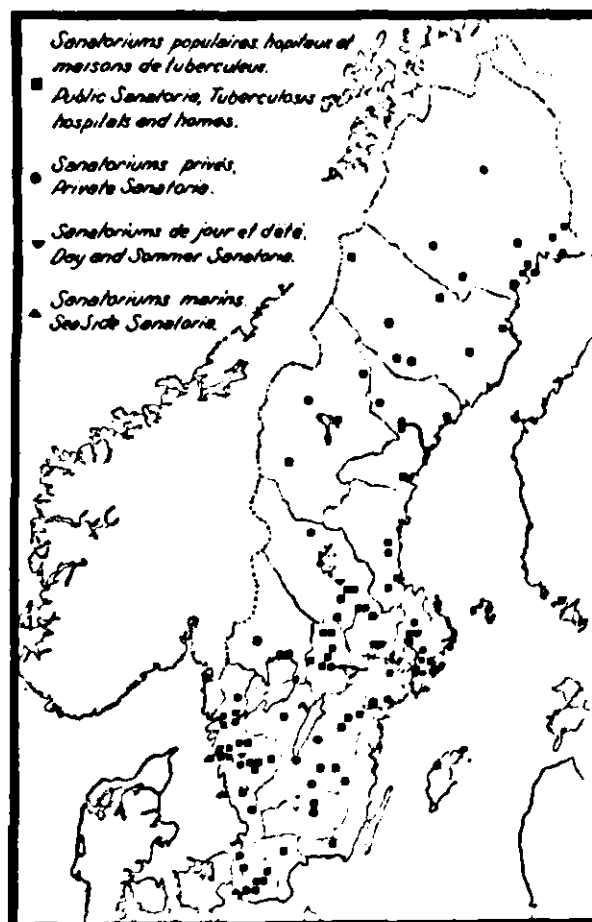
These developments are shown by the following figures.

In 1901 there was in Sweden only one (private) sanatorium, with sixty-five beds; on March 1st, 1929, there were 111 such institutions, providing accommodation for 8,608 patients — a figure which represents, at the present time, about 112 beds per 100 deaths, or approximately fourteen per 10,000 inhabitants. The accommodation available has

proved adequate in some parts of the country; but in others, more especially the northern areas, more beds are urgently needed. Some institutions are now being built or extended, as a result of which the total number of beds available in about a year's time will have been increased to some 9,000. On the basis of the tuberculosis mortality for 1928, this is equivalent to approximately 117 beds per 100 deaths.

Map 4.

ANTI-TUBERCULOSIS INSTITUTIONS IN ACTIVITY IN SWEDEN IN 1929.



The extent to which these institutions for the care of the tuberculous are used will be seen from the following table, which relates to institutions for the care of *pulmonary* cases:

Year	Number of patients on the books	Number of patient-days
1911	5,409	747,741
1912	6,523	913,759
1913	7,890	1,029,423
1914	9,167	1,221,553
1915	10,851	1,415,318
1916	10,866	1,544,763
1917	10,549	1,604,014
1918	11,028	1,569,332
1919	12,044	1,705,613
1920	11,604	1,712,595
1921	11,133	1,784,509
1922	10,856	1,829,467
1923	11,133	1,862,208
1924	12,359	1,996,949
1925	12,282	2,097,158
1926	12,632	2,171,749
1927	13,052	2,249,667

The number of patients on the books of these institutions was thus 145 per cent higher in 1927 than in 1911. The increase in the population during the same period has been about 10 per cent, and pulmonary tuberculosis mortality has decreased by approximately 30 per cent.

The beds available are distributed as follows over the various groups of institutions:

	Beds
1. Jubilee Fund sanatoria	508
2. Institutions for the care of the tuberculous, maintained by the provincial councils and communes	6,419
3. Private sanatoria	331
4. Day and summer sanatoria (communal)	206
5. Seaside sanatoria for surgical tuberculosis	1,144
Total	8,608

The Jubilee Fund sanatoria principally take patients in the *early stages* who have prospects of recovering their full capacity for work. Hence the purpose they serve is primarily therapeutic. The institutions maintained by provincial councils and the communes take patients at *all stages* — that is, both for isolation and internment and for therapeutic purposes. The great majority of these are *large* institutions (fifty to 200 beds). Smaller institutions (fifteen to forty beds) were formerly built, but only a few. Later, after the erection of large sanatoria in all provinces, there was a revival of interest in smaller institutions.

As already mentioned, the available accommodation, more especially in the northernmost parts of the country, is not yet adequate. It is therefore impossible at the moment to provide for the effective isolation of all infectious patients, at any rate in those areas.

As an indication of the extent to which infectious cases are isolated in institutions, it may be mentioned that, in recent years, about 30 per cent of all deaths from pulmonary tuberculosis in the country as a whole occurred in institutions for the care of the tuberculous. If the three largest towns, Stockholm, Göteborg and Malmö, are taken, the figure rises to about 70 per cent.

Prophylactic anti-tuberculosis work has received close attention in Sweden ever since the campaign against tuberculosis was started. The *Swedish National Anti-Tuberculosis Association*, founded in 1904, may be regarded as the organ for that work. This association's programme includes educational work, preventive measures and social-hygienic experiments, and it is thus largely representative of the social side of tuberculosis work.

The educational campaign has been carried on by popular lectures in all parts of the country, newspaper articles, the distribution of tracts in schools and among conscripts, and so on. To these must be added the direct personal instruction which is given by the dispensary nurses during their numerous visits to tuberculosis-infected homes.

The National Association has displayed considerable interest in protective measures for children who belong to tuberculous families and are exposed to the danger of infection. *Infants* (under 2 years) have been boarded out in healthy families as soon as possible after birth. The results of this action have been highly encouraging.

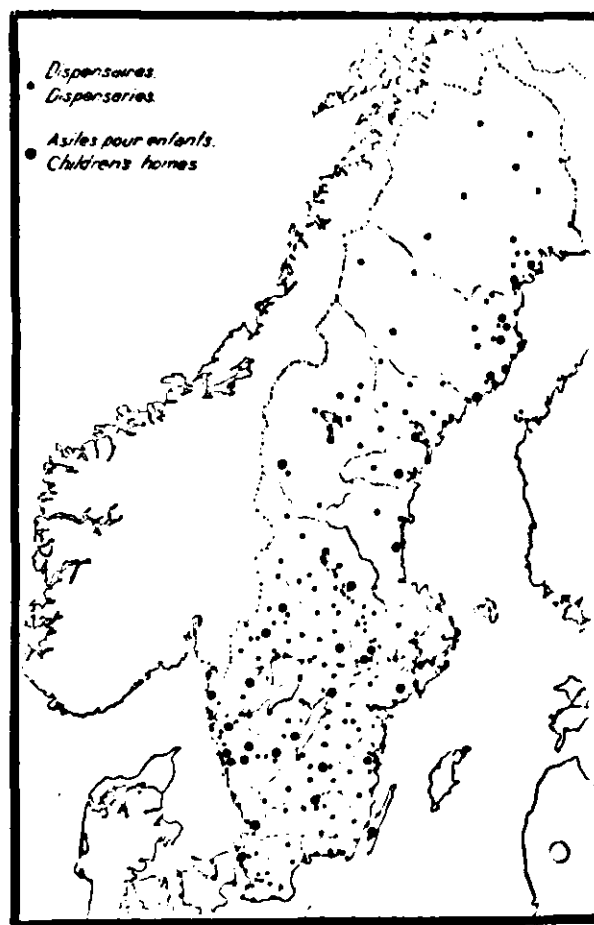
For children over 2 years of age, special homes have been built, where they can be admitted and kept so long as there is a case of open infectious tuberculosis in their homes. At the end of 1928 there were thirty-three such homes, scattered all over the country, with total accommodation for 740 children. They are actively supported by the National Association.

Prophylactic work in the home is carried out to a considerable extent through *dispensaries*. Since 1914, these have enjoyed a measure of State support, and, for the rest, are financed by the provincial councils, the communes, and the National Association. At the end of 1928 there were in Sweden 221 dispensaries distributed all over the country (see Map 5).

The dispensaries, of course, aim principally at action in the *home*, where conditions

Map 5.

TUBERCULOSIS DISPENSARIES AND
ASYLUMS FOR CHILDREN EXPOSED
TO TUBERCULOSIS IN ACTIVITY
IN SWEDEN IN 1929.



favouring a further spread of tuberculosis must be eliminated. The dispensaries are organised by provinces and are usually under central control in each province. An idea of their activities can be gained from the following particulars taken from their 1928 reports:

Number of <i>homes</i> with which the dispensaries are in touch	41,675
Number of <i>home visits</i> made by the dispensary nurses	153,830
Number of <i>persons</i> in whom tuberculosis has been detected	12,635
Number of <i>persons</i> removed to institutions for the care of the tuberculous	10,723
Number of <i>healthy children</i> removed from tuberculosis-infected homes	2,653

The ability of the dispensaries to find out, and gain admittance to, all tuberculous homes in their respective areas seems to be constantly increasing. Conditions differ widely, however, in different parts of the country. In many parts of Sweden the whole of the dispensary work needs to be more actively developed and to obtain greater facilities. It has been urged in many quarters that the introduction of general *compulsory notification* of all cases of tuberculosis would greatly assist the dispensaries in detecting cases of tuberculosis. In the Swedish *Tuberculosis Law* of September 4th, 1914, no provision is made for compulsory notification, nor is anything stipulated regarding the compulsory removal of patients to institutions. On the other hand, the law does provide for the disinfection of dwellings after the death of tuberculous persons, and for the health supervision of persons employed in dairies or in the sale of milk, and it prohibits the employment of women with pulmonary tuberculosis as wet-nurses, children's nurses, and so on. The revision and supplementing of this tuberculosis law is now in course of preparation.

Finance.

The cost of direct tuberculosis work is defrayed in Sweden by the provincial councils and the communes and by contributions from the State and the National Association.

In the 111 institutions at present available, a capital of somewhat more than 46 million kroner has been sunk. Of this sum the State has contributed about 8 millions. Details of the distribution of this money will be seen from the following table:

	Num- ber of insti- tutions	Num- ber of beds	Cost of site	Cost of building	Equip- ment	Total
			Kr.	Kr.	Kr.	Kr.
Tuberculosis hospitals	33	5,015	545,797	27,663,510	3,803,266	32,012,573
Tuberculosis hospitals of the cottage type	52	1,179	148,050	4,281,551	639,835	5,069,436
Hospital wards	13	733	—	2,262,544	456,678	2,719,222
Seaside sanatoria	5	1,144	319,398	4,061,971	613,340	4,994,709
Day and summer sanatoria	4	206	—	—	—	—
Private sanatoria (including living accommodation)	4	331	159,250	1,597,985	308,021	2,065,256
Total	111	8,608	1,172,495	39,867,561	5,821,140	46,861,196 ¹

¹ The Swedish crown is worth 1.38 gold franc at par.

Total expenditure on anti-tuberculosis work during 1927 amounted to approximately 17 million kroner distributed as follows:

1. Current expenditure of <i>institutions for the care of the tuberculous</i> (including the care of lupus patients and travelling expenses)	Kroner 14,370,000
2. Current expenses of <i>dispensaries</i> :	
(a) State subsidised	2,150,000
(b) Not State subsidised	380,000
3. Current expenses of <i>children's homes</i>	80,000
4. Expenditure by the <i>National Association</i> on propaganda and prophylactic work (apart from grants under 2 and 3)	110,000
Total	17,090,000

The following table gives a general view of the total cost of anti-tuberculosis work during 1927, and of the amounts contributed thereto by the various corporations:

	State	Provincial councils	Communes	Payments by patients	National Associa- tion	Interests, dona- tions, etc.	Total
			(Kroner)				
<i>Institutions</i> (in- cluding those for the care of lupus patients and travelling expenses to seaside sana- toria)	3,245,000	4,960,000	2,460,000	3,110,000	—	595,000	14,370,000
<i>Dispensaries</i> :							
(a) State sub- sidised	400,000	700,000	340,000	—	440,000	270,000	2,150,000
(b) Not State subsidised	—	—	380,000	—	—	—	380,000
<i>Educational work, together with prophy- lactic measures not elsewhere included</i>	—	—	—	10,000	110,000	70,000	190,000
Total	3,645,000 21%	5,660,000 33%	3,180,000 19%	3,120,000 18%	550,000 3%	935,000 6%	17,090,000

The amounts of the contributions made by the Riksdag and the provincial councils during the last twenty-five years are given in the following table:

Year	Grant by the Riksdag Kroner	Grant by the provincial councils Kroner	Total Kroner	Per inhabitant öre ¹
1903	—	10,300	10,300	0.2
1904	407,000	16,200	423,200	8
1905	207,000	33,900	240,900	5
1906	207,000	84,050	291,050	5
1907	317,000	166,025	483,025	9
1908	622,000	259,185	881,185	16
1909	890,000	516,938	1,406,938	26
1910	945,000	933,612	1,878,612	34
1911	1,082,625	1,324,384	2,407,009	43
1912	957,000	1,549,810	2,506,810	45
1913	1,157,000	2,165,191	3,322,191	59
1914	1,223,000	2,140,382	3,363,382	59
1915	1,185,000	1,863,286	3,048,286	53
1916	1,285,000	2,718,582	4,003,582	70
1917	1,455,000	4,803,267	6,258,267	1.08
1918	1,865,000	8,094,583	9,959,583	1.71
1919	4,090,037	8,558,719	12,648,756	2.16
1920	3,545,000	10,083,632	13,628,632	2.31
1921	3,545,000	6,033,246	9,578,246	1.61
1922	1,782,500	3,952,791	5,735,291	0.96
1923	3,805,000	3,904,520	7,709,520	1.28
1924	3,650,000	4,543,434	8,193,434	1.36
1925	3,775,000	5,177,203	8,952,203	1.48
1926	4,035,000	5,257,877	9,292,877	1.53
1927	4,460,000	6,128,907	10,588,907	1.74
1928	5,143,000	6,282,537	11,425,537	1.87
Total	51,635,162	86,602,561	138,237,723	—

To these must be added the considerable grants made by the communes, the amount of which it has not been possible to calculate with any degree of accuracy. Such a calculation has been made for the year 1927, and shows that the contribution of the communes was almost as great as that of the State. In 1927, if the grants by the communes are included, the total of the contributions by the Riksdag, provincial councils and communes was equivalent to 2.24 kroner per inhabitant (it is thus nearly 30 per cent more than the combined grants of the Riksdag and the provincial councils).

The total expenditure of the National Association on education, prophylactic measures, etc., amounts to 5½ millions kroner.

¹ The crown is divided into 100 öre.

That factors other than direct anti-tuberculosis work contribute towards the decline of tuberculosis is doubtless generally recognised. Such factors are the high standard of living of the population, improved hygienic conditions, especially in regard to housing and the care of children, a higher level of education and a better understanding of elementary hygienic requirements in respect of cleanliness, sobriety, etc.

But to these there must undoubtedly be added a *purely biological* factor — namely, the growing power of resistance to infection displayed by a population in which the disease has been prevalent for several generations, and a consequent reduction in tuberculosis mortality. It would seem that this decrease can begin long before any direct anti-tuberculosis measures have been taken and long before any appreciable improvement in general hygiene and in the standard of living of the population is noticeable; hence it is due, in all probability, to changes in the reaction of the human organism to infection — that is to say, to purely biological causes.

The closer study of tuberculosis mortality in the various parts of Sweden during the period for which data are available — *i.e.*, from the middle of the eighteenth century onwards — would seem to give us some indication, at any rate, as to the historical development and geographical spread of the tuberculosis which now prevails in Sweden.

At the end of the eighteenth and at the beginning of the nineteenth century, as already mentioned, tuberculosis mortality appears to have been rising rapidly and uninterruptedly in Sweden. If the tuberculosis mortality in the various parts of the country is examined, however, it appears very unevenly distributed. By far the highest rate is to be found in the Stockholm district and in certain southern areas, such as the west coast of Blekinge. The spread of tuberculosis has been centrifugal; it reached, lastly, Norrbotten, which was formerly almost free from infection, while it decreased in its old centres in the towns of central and southern Sweden (after 1860).

In each area the spread of tuberculosis seems to pass through three phases: (1) invasion and rapid spread until a maximum is reached; (2) an apparent stagnation; and, finally (3) a spontaneous regression beginning when tuberculosis has prevailed for three or four generations.

This is the phenomenon which explains the contrast between the tuberculosis maps at the beginning of the nineteenth and at the beginning of the twentieth centuries.

About 1800, the tuberculosis mortality was at its maximum in southern Sweden (Södermanland), particularly in the towns, and it had not yet reached Norrbotten.

Actually, the tuberculosis mortality decreased in all provinces. This decrease, which began in Stockholm and in Södermanland, is greatest there, but is smaller in northern Sweden, where it began later; and it is smallest in Norrbotten, where it is of quite recent date. It is this progressive evolution of the tuberculosis mortality in the different provinces which causes the contrast between the maps from one century to another and the fact that the maximum is now found where there was formerly a minimum and *vice versa*.

There is reason to hope that tuberculosis mortality will fall to a minimum throughout the country, even in the northernmost parts. But the question still remains whether the population in the areas which first reached their minimum in the course of a few generations will again be exposed, defenceless, to a fresh invasion of tuberculosis; and whether, consequently, the country will have to go through the same tuberculosis cycle again — and possibly repeat the process endlessly in the course of time. The future task of the tuberculosis campaign will thus be to provide a means of protection against possible fresh invasions, and its work will therefore probably lie to a large extent in the field of biological immunity.

The above observations are in no way intended to imply that the decline in tuberculosis mortality is due *solely* to biological causes, and that active anti-tuberculosis work may hence be largely superfluous. On the contrary, the intention has merely been to emphasise that a number of factors has certainly been operative in the process, and that it is impossible to say for certain what share the respective factors have had in bringing about the result attained. Active anti-tuberculosis work has doubtless contributed in a large measure to the decline of tuberculosis, and has contributed the more effectively the more resolute and intensive the policy followed and the more efficient the organisation.

Map 6.

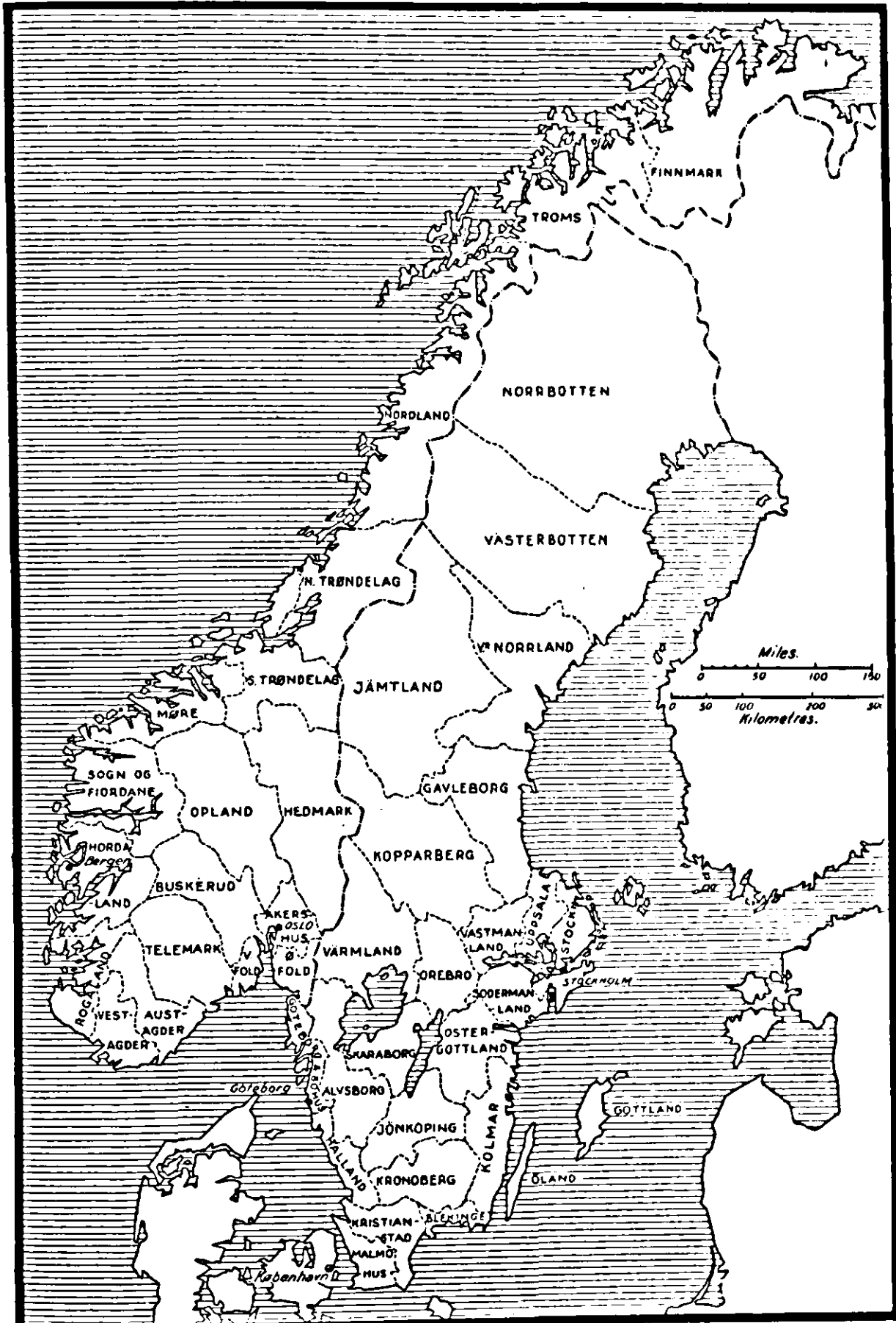


TABLEAU I. — TABLE 1.

MORTALITÉ GÉNÉRALE POUR LES TROIS PAYS CONSIDÉRÉS DANS LEUR ENSEMBLE (TAUX POUR 10.000).
 GENERAL MORTALITY FOR THE THREE COUNTRIES CONSIDERED FOR THE WHOLE POPULATION (RATES PER 10,000).

Années Years	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER			SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
	Danemark Denmark	Norvège Norway	Suède Sweden	Danemark Denmark	Norvège Norway	Suède Sweden	Danemark Denmark	Norvège Norway	Suède Sweden
1860	202		177			184,8			168,7
61	184		185			193,5			176,4
62	183		214			222,2			206,2
63	181		193			201,4			185,7
64	232		203	205,2		210,5	194,9		194,9
65	230		194			203,7			183,3
66	207		199			210,9			189,3
67	198	185	196		192,2	206,7		177,5	186,7
68	192	184	210		192,5	222,2		175,7	198,2
69	190	171	223		178,0	233,9		163,5	212,2
1870	190	162	198		169,0	207,4		155,1	189,2
71	194	169	172		176,0	179,3		162,9	165,3
72	184	166	163		172,5	171,8		159,9	154,2
73	186	169	172		174,4	180,2		163,1	164,4
74	200	182	203	197,4	189,0	214,7		174,6	192,3
75	211	188	203		196,3	213,9	186,4	179,8	192,2
76	198	189	196		197,6	205,4		180,6	187,0
77	187	171	187		177,9	196,8		163,6	177,0
78	185	159	181		164,9	186,7		152,6	174,8
79	197	152	169		156,9	175,0		146,5	164,0
1880	204	161	181		167,0	187,8		154,8	174,5
81	183	170	177		177,7	184,3		162,4	169,8
82	192	186	174		192,6	181,9		178,8	165,7
83	184	172	173		178,5	180,8		166,4	165,9
84	183	166	175		172,9	183,1		159,2	168,1
85	178	166	178	193,6	173,7	184,9	180,1	159,3	170,5
86	181	162	166		169,2	171,6		155,8	160,8
87	182	162	161		168,4	167,1		156,0	155,8
88	195	173	160		180,3	164,5		165,6	155,6
89	185	177	160		187,1	163,5		168,1	156,5
1890	189	180	171		189,7	176,1		171,5	166,6
91	207	176	168	205,9	186,2	174,5	194,4	166,7	162,2
92	193	179	179	202,0	190,2	182,1	186,6	169,3	175,6
93	187	164	168	196,8	174,8	174,4	180,3	154,5	162,5
94	173	169	164	181,1	170,5	167,6	168,0	159,1	160,3
95	168	157	152	175,8	165,9	156,6	161,3	149,0	147,5
96	156	152	156	164,4	162,3	160,7	147,3	141,7	152,3
97	165	154	154	173,8	164,0	158,1	157,2	143,9	149,2
98	155	153	151	162,5	161,9	156,0	147,2	144,1	145,8
99	173	168	177	182,1	177,7	181,4	163,9	159,5	171,9
1900	168	159	168	177,4	167,1	173,3	159,9	151,1	163,6
01	158	150	161	168,2	158,6	164,6	148,5	142,2	156,7
02	145	139	154	152,9	145,0	156,7	139,5	133,6	150,8
03	146	148	151	153,8	155,9	155,5	140,3	141,4	146,5
04	141	143	153	149,1	148,0	155,5	133,9	138,6	150,5
05	151	148	156	157,0	152,3	159,6	144,2	143,7	153,0

06	136	137	144	146,6	148,0	146,6	129,4	132,2	140,8
07	142	143	146	146,7	148,0	148,0	137,5	138,7	143,9
08	148	142	149	153,1	147,3	150,8	141,3	137,6	147,4
09	132	136	137	138,9	141,1	138,1	127,6	130,5	135,4
1910	130	135	140	136,1	140,6	142,9	122,5	130,0	138,0
11	136	132	138	142,2	139,1	141,0	128,5	125,5	135,0
12	131	135	142	135,0	140,0	144,1	126,9	129,9	139,9
13	125	133	137	128,0	138,5	139,3	121,6	127,1	133,8
14	126	135	138	131,9	140,4	140,1	120,1	129,2	136,7
15	128	134	147	131,9	139,5	147,9	124,8	128,5	145,6
16	134	138	136	139,5	145,0	137,1	128,7	132,2	134,1
17	132	136	134	137,2	141,2	135,8	129,2	131,2	132,0
18	130	172	180	131,5	179,2	185,8	127,4	164,3	174,6
19	130	138	145	129,9	141,7	145,7	128,8	133,8	143,5
1920	129	128	133	129,4	130,9	134,2	128,8	124,6	131,7
21	111	115	124	110,5	118,6		110,7	111,6	
22	119	120	128	117,6	121,6		119,5	118,8	
23	113	116	114	114,6	117,9		112,2	113,8	
24	113		120	113,8			112,4		
25	108		117	108,0			108,4		
26	110		118	110,1			109,8		
27	115		127	113,9			115,3		
28	110		120	109,9			109,2		

Périodes de cinq années — Five-year Periods

Danemark années Denmark Years	Norvège et Suède années Norway and Sweden Years	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER			SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
		Danemark	Norvège	Suède	Danemark	Norvège	Suède	Danemark	Norvège	Suède
		Denmark	Norway	Sweden	Denmark	Norway	Sweden	Denmark	Norway	Sweden
1860-64	1861-65	196		198	205,2		206,5	194,9		189,3
65-69	66-70	203	175	205		183,0	216,2		168,0	195,1
70-74	71-75	191	175	183		182,0	192,2		168,0	173,9
75-79	76-80	195	166	183	197,4	173,9	190,2	186,4	159,0	175,4
80-84	81-85	189	172	175		179,0	183,0		165,0	168,0
85-89	86-90	184	171	164	193,6	179,0	168,6	180,1	163,5	159,1
90-94	91-95	190	169	166		179,5	171,0		159,7	161,6
95-99	96-00	163	157	161	196,4	166,7	166,0	182,2	148,1	156,6
1900-04	1901-05	152	146	155	171,8	152,0	158,4	155,4	139,9	151,5
05-09	06-10	142	139	143	160,1	144,0	145,2	144,3	133,8	141,1
10-14	11-15	129	134	140	147,6	140,0	142,5	135,9	128,4	141,1
15-19	16-20	131	142	145	134,6	148,0	147,7	123,8	137,2	138,2
20-24	21-25	117	117	121	133,9	119,4		127,8	114,7	143,2
25-28	26	113		122	116,9			116,5		
					110,5			110,8		

Diminution en pourcentage — Decrease in Percentage

	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER				SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
	Danemark	Norvège	Suède		Danemark	Norvège	Suède	Danemark	Norvège	Suède
	Denmark	Norway	Sweden		Denmark	Norway	Sweden	Denmark	Norway	Sweden
1865-69—1920-24	42,0%	33,1%	40,9%	1890-94—1915-19	31,8%	15,9%	13,6%	29,8%	14,1%	11,4%
1890-94—1920-24	38,4%	30,8%	27,1%	1890-94—1920-24	40,5%	29,4%		36,1%	28,2%	
				1890-94—1925-28	43,7%			39,2%		

TABLEAU 2. — TABLE 2.

MORTALITÉ GÉNÉRALE PARMI LA POPULATION RURALE PAR 10.000 HABITANTS.
GENERAL MORTALITY AMONG RURAL POPULATION PER 10.000 INHABITANTS.

Année Year	Danemark Denmark	Norvège Norway	Suède Sweden	Année Year	Danemark Denmark	Norvège Norway	Suède Sweden	Périodes de cinq années — Five-year Periods					
								Danemark Denmark	Norvège et Suède & Sweden	Danemark Denmark	Norvège Norway	Suède Sweden	
1860			169,7	1895	165,7	149,9	148,9						
61			175,9	96	152,9	142,6	154,6						
62			204,4	97	164,1	145,9	151,2						
63			187,4	98	149,8	147,3	148,6						
64			194,9	99	169,6	161,6	174,9						
65			184,4	1900	168,9	152,5	168,1						
66			186,7	01	152,9	143,8	158,8	1860-64	1861-65				189,4
67		176,9	190,7	02	145,7	133,7	154,3	65-69	66-70		167,7		197,1
68		175,2	202,5	03	145,2	144,8	151,3	70-74	71-75		166,3		171,3
69		165,0	215,5	04	136,7	138,5	153,3	75-79	76-80	183,4	156,8		175,1
1870		153,7	190,0	05	148,6	142,5	155,4	80-84	81-85	181,3	165,0		169,0
71		161,9	163,6	06	131,4	132,3	143,7	85-89	86-90	176,9	161,4		158,3
72		157,7	151,4	07	141,1	139,6	146,8	90-94	91-95	184,0	161,2		162,7
73		160,8	158,8	08	142,3	137,8	149,2	95-99	96-00	160,4	150,0		159,5
74		172,5	190,4	09	128,1	131,9	136,8	1900-04	1901-05	149,9	104,7		154,6
75		178,1	191,4	1910	126,2	132,9	139,6	05-09	06-10	138,2	134,9		143,1
76	188,7	179,5	187,7	11	133,5	127,5	139,1	10-14	11-15	126,5	129,6		142,6
77	179,9	162,9	178,9	12	129,6	129,8	143,1	15-19	16-20	126,2	139,5		149,6
78	178,5	148,2	173,8	13	121,8	129,0	138,8	20-24	21-25	114,1	116,4		124,5
79	186,7	142,9	163,0	14	121,7	130,8	139,5	25-28	26-28	107,1			125,9
1880	197,1	150,7	172,2	15	125,5	130,9	151,6	Diminution en pourcentage — Decrease in Percentage					
81	177,1	162,6	170,3	16	125,8	133,4	139,2	1875-79—1920-24	37,8%	25,8%	28,9%		
82	182,0	177,3	165,4	17	129,3	132,1	138,2	1890-94—1920-24	38,0%	27,8%	23,5%		
83	178,0	168,6	166,3	18	120,8	165,4	184,3						
84	172,4	158,1	170,0	19	129,6	139,0	148,9						
85	173,3	158,7	172,8	1920	124,9	127,6	137,4						
86	171,9	153,6	160,5	21	107,7	115,4	128,4						
87	170,9	152,4	155,4	22	116,4	119,1	132,4						
88	191,3	160,2	154,6	23	112,5	114,7	117,3						
89	177,2	167,4	154,3	24	110,3		124,2						
1890	183,7	173,3	166,8	25	104,0		120,2						
91	191,9	168,8	162,6	26	106,2		121,2						
92	190,4	172,0	175,6	27	113,2		131,6						
93	183,1	155,0	165,2	28	104,8		124,8						
94	171,2	160,3	161,3										

TABLEAU 3. — TABLE 3.

TABLEAU 3. — TABLE 3.
MORTALITÉ GÉNÉRALE PARMI LA POPULATION URBAINE (TAUX POUR 10.000).
GENERAL MORTALITY AMONG URBAN POPULATION (RATES PER 10,000).

Années Years	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER			SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
	Danemark Denmark	Norvège Norway	Sweden Sweden	Danemark Denmark	Norvège Norway	Suède Sweden	Danemark Denmark	Norvège Norway	Suède Sweden
1860			231,6						
61			253,6			284,5			227,1
62			288,0			316,2			263,5
63			238,4			260,1			219,5
64			258,6			287,1			233,9
65			260,4			293,1			232,2
66			294,3			293,0			264,7
67		224,7	236,9			260,2			217,2
68		228,1	261,3			329,0			237,2
69		198,3	272,7			308,1			243,2
1870		202,4	252,7			283,7			227,0
71		205,3	229,0			260,3			203,0
72		205,9	237,0			267,1			212,1
73		205,3	256,7			293,4			226,2
74		223,9	283,5			332,6			242,6
75		231,9	273,3			312,7			240,4
76	222,1	224,7	245,7	243,8		279,6	202,6		217,3
77	206,6	196,7	232,4	225,8		262,6	189,1		206,9
78	201,5	195,2	219,8	221,0		242,5	183,9		200,6
79	223,2	178,6	205,8	244,4		227,0	204,1		187,8
1880	220,2	190,2	230,1	239,0		252,7	203,1		211,2
81	197,2	190,6	212,8	211,8		238,2	184,1		191,7
82	217,7	208,1	217,3	241,1		244,9	196,6		194,2
83	198,9	180,1	208,6	219,0		234,4	181,0		187,1
84	208,2	187,4	202,3	224,7		229,3	192,3		179,7
85	187,8	188,1	200,7	207,6		224,2	170,2		181,0
86	201,1	187,8	192,4	218,4		214,9	185,8		173,5
87	205,1	189,9	189,0	222,3		211,1	189,7		170,4
88	203,5	204,4	184,4	222,1		203,0	186,9		168,6
89	200,9	200,0	184,6	222,7		202,0	181,7		169,9
1890	199,0	192,2	190,4	217,2		209,8	183,8		173,9
91	209,7	187,1	191,9	227,2	202,8	210,8	194,3	173,6	176,1
92	197,0	190,7	192,3	217,0	203,9	209,0	179,5	179,3	178,3
93	195,5	181,6	181,1	216,0	195,4	201,7	177,6	169,8	163,8
94	177,8	187,0	174,5	195,6	204,2	191,9	164,7	172,2	159,9
95	172,8	168,2	164,0	189,7	181,2	181,2	158,1	157,0	149,6
96	161,9	169,3	163,5	181,2	187,8	181,3	145,0	153,4	148,5
97	166,9	166,0	162,6	186,1	183,7	181,5	150,2	150,7	146,7
98	162,8	158,8	159,4	180,3	174,7	179,6	147,5	144,9	142,2
99	179,6	177,0	182,6	201,4	192,4	204,0	160,8	163,6	164,3
1900	169,5	167,2	169,1	188,1	184,2	187,8	149,9	152,5	153,2
01	166,1	157,7	166,9	186,3	173,7	184,6	148,4	144,1	151,9
02	144,5	145,2	151,6	161,7	158,7	164,2	129,7	133,7	140,9
03	148,3	151,5	149,6	163,6	165,1	164,9	135,0	140,1	136,5
04	147,0	148,4	151,7	163,4	157,1	164,7	134,7	141,1	140,6
05	153,9	156,3	158,8	168,2	166,6	171,0	141,8	147,7	148,3
06	143,8	140,4							

07	145.3	143.8	143.0	156.7	153.7	156.4	135.5	136.3	131.5
08	155.3	150.5	148.9	170.2	161.6	157.7	142.7	140.6	141.2
09	138.7	137.3	136.4	150.3	144.7	145.7	128.9	131.3	128.3
1910	135.4	135.5	142.9	148.9	145.0	153.4	123.9	127.9	133.8
11	140.3	137.2	134.5	153.6	145.2	143.1	128.9	130.3	127.1
12	132.0	140.6	136.3	140.1	151.0	146.2	125.2	132.7	127.8
13	128.6	135.2	130.0	138.5	146.1	139.1	120.3	125.5	122.1
14	130.8	139.0	135.2	139.1	150.1	142.7	123.8	128.9	128.8
15	132.3	133.7	133.7	139.9	142.0	140.4	125.8	126.9	127.9
16	145.0	143.1	126.4	155.4	154.6	131.5	136.2	133.7	122.0
17	136.4	137.7	123.0	143.9	145.2	128.5	129.9	130.5	118.2
18	141.4	175.7	169.6	151.2	189.4	183.9	136.2	164.2	157.3
19	129.8	134.2	134.0	134.3	142.9	136.7	120.8	126.9	131.6
1920	134.9	127.7	122.2	142.7	136.2	124.5	131.8	120.4	120.3
21	114.5	113.9	113.5	116.1	121.5	116.6	113.3	107.5	110.8
22	121.7	122.9	117.3	122.9	131.0	115.6	120.5	115.9	118.9
23	114.5	118.2	106.3	117.8	123.1	107.7	111.7	114.0	105.4
24	117.0	112.4	109.0	118.9	118.1	110.0	115.4	107.6	108.2
25	114.0	111.8	110.5	114.4		111.3	113.7		109.8
26	115.4	111.2	109.6	117.8			113.4		
27	116.8	113.4	116.3	116.8			116.8		
28	116.4		110.2						

Périodes de cinq années — Five-year Periods

Danemark Années Denmark Years	Norvège et Suède Années Norway and Sweden Years	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER			SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
		Danemark	Norvège	Suède	Danemark	Norvège	Suède	Danemark	Norvège	Suède
		Denmark	Norway	Sweden	Denmark	Norway	Sweden	Denmark	Norway	Sweden
1800-04	1801-05	216.0		259.7			288.1			235.1
65-69	66-70	201.6		263.4			294.0			237.7
70-74	71-75	218.7		256.6			294.2			225.4
75-79	76-80	213.4		226.4	233.7		252.3	194.9		204.6
80-84	81-85	209.0		208.1	227.3		233.9	191.3		186.5
85-89	86-90	199.8		188.1	218.8		208.1	183.6		171.3
90-94	91-95	195.7		180.5	214.6	197.5	198.7	179.2	170.4	165.3
95-99	96-00	168.9		167.6	187.8	184.6	187.1	152.4	153.0	151.1
1900-04	1901-05	154.6		155.7	172.2	164.2	169.8	139.2	141.3	143.6
05-09	06-10	147.4		142.9	161.3	151.1	154.0	135.5	133.6	133.3
10-14	11-15	133.4		133.9	143.9	146.9	142.2	124.4	128.8	126.8
15-19	16-20	137.6		135.0	144.9	153.7	141.0	131.3	135.1	129.9
20-24	21-25	120.4		111.3	123.7	123.4	112.2	118.5	111.2	110.6
25-	26-	115.6		112.0	116.3			114.6		

Diminution en pourcentage — Decrease in Percentage

	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER				SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
	Danemark	Norvège	Suède		Danemark	Norvège	Suède	Danemark	Norvège	Suède
	Denmark	Norway	Sweden		Denmark	Norway	Sweden	Denmark	Norway	Sweden
1875-79—1925-28	45.8%	42.7%	50.5%	1875-79—1920-24	47.1%		55.5%	39.2%		45.9%
1800-04—1925-28	40.0%	38.5%	37.0%	1800-04—1920-24	42.3%		43.5%	33.0%		33.1%

TABLEAU 4. — TABLE 4.

MORTALITÉ GÉNÉRALE DANS LES CAPITALES (TAUX PAR 10.000).
GENERAL MORTALITY IN THE CAPITALS (RATES PER 10,000).

Années Years	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER			SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
	Copenhague Copenhagen	Oslo	Stockholm	Copenhague Copenhagen	Oslo	Stockholm	Copenhague Copenhagen	Oslo	Stockholm
1860			310,8			399,0			
61			334,8			445,3			208,6
62			387,9			358,0			339,4
63			313,7			378,7			276,3
64			332,6			398,2			293,7
65			349,4			405,8			308,5
66			341,2			303,3			287,2
67			287,0			307,2			256,9
68			261,6			378,6			224,2
69			329,6			364,2			290,3
1870			308,6			356,0			264,2
71			308,7			377,0			271,0
72			322,5			430,8			279,0
73		222,1	359,3			521,9			302,5
74			414,4			426,8			335,6
75			345,7			349,5			281,0
76	242,7		291,5	271,7		324,0	217,6		244,8
77	223,5		282,7	248,6		258,6	201,9		248,9
78	216,4	211,5	223,6	236,7		249,0	199,1		194,5
79	254,4		218,4	278,3		325,5	233,9		192,9
1880	243,0		290,8	274,9		280,0	215,8		262,3
81	214,0	190,9	245,7	236,1	208,2	285,7	195,1	176,1	217,9
82	244,2	204,3	242,9	277,8	220,5	275,0	215,1	190,5	207,9
83	218,0	168,6	240,9	247,3	176,2	275,0	193,7	162,1	212,7
84	233,7	192,7	236,0	257,7	209,1	277,2	213,2	178,8	201,6
85	203,7	208,9	250,2	232,7	234,5	289,3	179,1	187,1	217,3
86	229,1	206,7	223,5	254,7	224,0	251,3	207,3	192,1	199,7
87	235,0	239,5	222,3	261,2	264,6	255,0	212,8	218,6	194,5
88	216,8	223,9	204,4	245,4	243,2	227,3	192,6	207,9	185,1
89	214,6	214,6	207,6	241,7	235,3	231,1	191,9	197,3	187,6
1890	210,3	205,9	203,2	236,5	230,6	234,7	188,1	185,0	176,8
91	218,3	195,3	228,3	239,8	220,2	254,8	200,2	174,3	206,3
92	203,3	192,1	211,1	230,6	210,1	233,3	180,3	177,0	192,6
93	207,8	173,3	199,1	235,8	190,3	229,6	184,4	159,0	174,0
94	190,7	187,1	191,3	214,5	206,4	216,7	170,9	170,9	170,3
95	182,1	167,2	173,6	208,1	184,2	198,8	160,4	152,9	152,8
96	164,8	181,8	175,2	189,7	202,8	199,5	144,1	164,0	155,1
97	171,7	161,8	171,7	198,1	182,7	200,9	149,8	144,0	147,4
98	173,8	163,9	177,9	198,2	182,5	211,7	153,4	147,9	149,6
99	187,8	176,2	206,7	215,9	191,6	236,0	164,4	163,0	182,1
1900	172,3	157,5	178,2	201,4	176,3	206,2	148,1	141,6	154,5
01	176,7	151,8	180,7	204,9	164,6	210,5	152,9	141,2	155,8
02	147,8	146,9	153,1	169,3	161,9	176,1	129,7	134,5	134,0
03	155,3	150,4	152,4	175,6	164,2	173,5	138,4	139,1	135,1
04	155,4	142,9	153,3	176,4	153,3	173,2	137,9	134,4	136,9

05	159,1	166,7	167,9	179,6	177,0	188,0	142,1	158,3	151,3
06	152,2	133,5	145,5	174,8	147,3	166,6	133,6	122,3	127,9
07	150,3	135,0	149,4	167,4	145,9	173,7	136,2	126,1	129,1
08	164,0	141,2	159,6	186,1	150,6	175,4	145,9	133,6	146,4
09	144,4	132,2	151,9	161,5	139,3	169,6	130,4	126,5	137,2
1910	141,9	122,3	158,5	159,6	128,6	179,7	127,5	117,1	141,1
11	146,2	135,5	137,9	162,4	142,8	154,1	133,1	129,6	124,8
12	136,6	138,2	150,6	148,7	150,4	173,4	126,8	128,0	132,1
13	131,3	127,1	136,7	145,1	136,8	152,8	119,9	118,9	123,2
14	136,4	130,7	147,1	146,1	139,1	161,4	128,4	123,7	135,5
15	134,5	119,4	133,9	144,6	125,3	147,1	126,3	114,5	123,2
16	150,8	129,6	126,6	166,1	141,0	140,1	138,2	120,0	115,7
17	139,6	118,2	124,1	150,7	123,9	134,0	129,4	113,5	116,1
18	140,9	149,5	170,0	151,2	158,1	196,3	137,2	142,2	148,8
19	130,9	121,2	145,4	140,6	125,5	154,2	127,0	117,6	138,4
1920	139,0	117,2	121,2	150,3	122,4	124,0	132,1	112,9	119,0
21	112,1	107,9	115,4	115,1	114,0	121,6	110,2	102,8	110,4
22	122,5	124,0	117,5	125,1	134,1	116,7	120,1	115,7	118,3
23	114,2	114,8	111,9	120,8	120,1	115,7	108,7	119,5	109,2
24	119,8	108,8	112,9	122,4	116,5	113,7	118,0	102,3	111,9
25	113,7	109,4	116,1	116,7	117,2	120,4	117,7	103,0	112,8
26	115,8	110,9	118,4	120,6			111,8		
27	115,4	115,0	112,0	116,3			114,6		
28	117,5		109,2						

Périodes de cinq années — Five-year Periods

Danemark Années Denmark Years	Norvège et Suède Années Norway and Sweden Years	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER			SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
		Copenhague Copenhagen	Oslo	Stockholm	Copenhague Copenhagen	Oslo	Stockholm	Copenhague Copenhagen	Oslo	Stockholm
		1860-64	1861-65			343,5			395,3			299,8
65-69	66-70			303,5			351,4			264,4
70-74	71-75		222,1	351,0			422,1			294,2
75-79	76-80	234,3	211,5	260,7	258,8		300,0	213,3		228,4
80-84	81-85	230,5	193,2	243,2	258,7	209,9	281,6	206,4	179,0	211,4
85-89	86-90	219,9	217,9	211,9	247,2	239,4	239,6	196,8	200,0	198,4
90-94	91-95	205,9	182,6	200,2	231,3	201,7	226,2	184,6	166,4	178,7
95-99	96-00	176,1	167,9	182,2	202,1	186,8	221,2	154,5	151,9	157,9
1900-04	1901-05	169,1	151,7	161,5	184,8	164,2	184,2	141,1	141,5	142,6
05-09	06-10	153,9	132,7	153,0	173,8	142,2	173,0	137,6	125,1	136,4
10-14	11-15	138,4	130,1	141,1	152,2	138,8	157,5	127,1	122,9	127,8
15-19	16-20	139,2	127,1	137,4	150,0	131,2	149,6	130,7	121,2	127,6
20-24	21-25	121,5	113,0	114,8	126,7	120,4	117,6	117,8	106,9	112,5
25	26	115,6	112,0	113,2	117,9			114,7		

Diminution en pourcentage — Decrease in Percentage

	DEUX SEXES ENSEMBLE BOTH SEXES TOGETHER				SEXE MASCULIN MALES			SEXE FÉMININ FEMALES		
	Copenhague Copenhagen	Oslo	Stockholm		Copenhague Copenhagen	Oslo	Stock- holm	Copenhague Copenhagen	Oslo	Stock- holm
1875-79—1925-28	50,7%	46,6%	56,6%	1875-79—1920-24	51,0%		60,8%	44,8%		50,7%
1800-04—1925-28	43,8%	38,2%	43,5%	1800-04—1920-24	45,2%		48,0%	36,2%		37,0%

TABLEAU 5. — TABLE 5.

MORTALITÉ GÉNÉRALE PAR GROUPES D'ÂGE ET PAR SEXE. — GENERAL MORTALITY BY AGE AND SEX.

NORVÈGE : ENSEMBLE DU PAYS. — NORWAY : WHOLE OF THE COUNTRY.

Sexe masculin — Males																	
	0-1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
1867-70	1268,7	227,9	65,0	38,7	60,3	91,0	94,8	84,5	96,2	105,3	130,3	167,5	237,9	289,3	470,0	677,5	1029,2
1871-75	1274,6	212,1	74,5	41,0	59,8	94,3	93,9	90,5	91,1	99,4	117,5	163,3	199,1	299,6	409,8	664,0	950,0
1876-80	1191,8	209,0	63,7	39,5	59,8	89,4	87,2	77,5	86,0	98,0	117,0	138,9	179,1	257,3	386,5	578,2	911,6
1881-85	1158,4	231,7	78,6	44,1	63,0	92,3	85,6	79,6	82,8	91,6	106,2	142,5	177,8	257,1	373,6	580,4	910,9
1886-90	1104,3	220,7	73,8	46,3	67,3	99,6	91,9	79,1	82,7	89,0	108,4	133,3	181,5	247,7	367,4	564,1	879,4
1991-95	1142,2	184,4	63,0	41,7	71,7	112,2	97,3	88,7	86,2	99,9	111,3	140,3	181,9	259,0	366,0	560,5	875,6
1896-00	1142,9	136,4	41,0	33,6	67,9	103,6	92,5	82,4	85,1	89,1	107,0	130,8	171,2	235,0	352,0	528,8	874,5
1901-05	928,8	108,9	36,5	31,9	61,7	96,8	85,7	78,1	76,0	85,6	102,0	126,9	159,8	231,0	348,6	515,4	822,6
1906-10	802,2	90,2	35,6	29,5	59,6	89,0	81,2	70,8	75,5	80,4	93,5	122,5	159,1	223,7	338,5	523,0	846,8
1911-15	757,5	80,0	32,6	25,5	57,2	85,3	79,1	70,5	71,1	79,1	95,8	121,2	165,6	228,8	339,6	524,2	845,0
1916-20	734,6	88,4	37,4	30,1	72,2	109,1	105,0	93,6	83,2	83,7	96,9	119,3	164,2	229,5	346,2	533,9	874,9
1921-25	581,5	54,4	20,0	19,1	44,3	68,5	62,3	57,9	57,5	64,3	82,2	106,0	150,1	222,4	327,0	516,9	824,7
Sexe féminin — Females																	
1867-70	1065,7	217,2	64,2	42,6	47,8	58,1	71,7	76,8	92,2	94,1	103,1	124,2	192,2	258,0	413,8	596,9	953,5
1871-75	1069,5	209,1	72,8	41,5	49,6	63,1	71,7	80,0	87,6	97,9	103,8	128,6	163,8	256,6	350,8	570,8	875,0
1876-80	985,0	196,8	63,2	42,6	52,4	62,6	71,5	81,3	87,8	94,2	98,6	119,0	153,2	218,8	338,7	514,7	826,6
1881-85	962,0	227,0	81,5	47,8	52,3	62,4	71,7	80,0	89,1	92,2	97,7	121,5	148,4	222,6	337,7	497,7	804,9
1886-90	947,7	216,5	77,8	50,6	54,5	64,1	76,6	82,2	88,3	88,3	93,7	113,0	148,0	209,2	316,6	472,0	773,5
1891-95	950,4	175,4	63,6	46,8	57,2	64,2	74,0	82,1	87,3	92,5	94,6	115,6	143,9	213,1	318,1	504,1	781,3
1896-00	907,8	127,3	44,9	38,1	55,3	62,0	71,4	74,8	80,5	87,4	86,3	105,6	135,8	198,2	301,6	474,9	784,4
1901-05	752,0	103,8	37,2	36,3	56,6	65,3	67,9	74,0	77,7	82,6	86,5	107,1	135,5	194,7	291,9	459,3	753,1
1906-10	652,1	84,0	35,5	35,7	50,5	63,8	65,9	70,7	74,2	77,0	82,3	104,2	131,9	187,7	289,2	386,7	769,8
1911-15	620,6	72,6	30,3	30,1	48,7	60,7	63,4	59,8	68,6	76,2	78,2	96,5	132,7	186,7	284,8	463,4	735,2
1916-20	584,8	80,7	35,6	35,4	62,3	79,7	84,3	80,1	78,1	76,6	87,5	106,5	137,6	193,3	292,9	468,0	775,5
1921-25	470,8	47,2	18,2	21,8	44,9	56,0	52,7	50,5	53,9	58,6	71,6	93,1	119,1	179,4	278,6	440,3	715,1

TABLEAU 6. — TABLE 6.
MORTALITÉ GÉNÉRALE PAR GROUPES D'ÂGE ET PAR SEXE. — GENERAL MORTALITY BY AGE AND SEX.
SUÈDE: ENSEMBLE DU PAYS. — SWEDEN: WHOLE OF THE COUNTRY.

Sexe masculin — Males															
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
1891-95	410,2	64,6	35,7	45,6	67,9	65,4	68,2	76,5	88,5	107,5	139,9	191,8	266,0	405,3	630,4
1896-00	381,9	53,6	33,2	47,2	66,9	66,9	66,2	76,4	87,9	107,1	134,6	180,3	256,8	385,4	611,1
1901-05	340,6	46,8	32,8	48,2	67,2	64,7	61,7	69,6	82,3	102,7	133,2	173,3	247,6	370,5	579,4
1906-10	274,0	34,2	25,8	42,8	67,0	59,9	59,0	63,7	78,8	95,9	124,0	168,2	239,1	355,8	562,3
1911-15	241,8	32,3	25,0	45,3	66,4	59,6	60,8	65,1	73,7	93,5	124,1	168,8	240,4	361,5	583,7
1916-20	236,2	38,5	30,2	57,0	94,4	92,2	83,0	76,9	77,8	91,7	118,8	163,2	232,3	377,5	560,9
Sexe féminin — Females															
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
1891-95	353,3	66,2	37,8	46,7	57,2	61,3	66,7	73,8	80,6	88,0	109,8	147,1	221,7	351,8	562,6
1896-00	330,1	53,5	37,9	48,4	57,3	61,3	63,6	71,1	77,4	84,0	108,8	138,8	204,3	323,2	534,1
1901-05	289,9	48,7	38,6	38,6	56,1	61,8	64,3	68,5	74,7	84,1	103,7	139,1	200,1	307,6	507,0
1906-10	232,0	33,1	29,5	29,5	55,2	58,5	59,2	65,9	70,3	81,1	98,8	132,6	191,3	302,2	493,7
1911-15	203,7	31,5	28,2	28,2	52,1	56,2	57,6	61,5	70,8	77,5	97,7	129,4	193,7	308,4	502,6
1916-20	198,0	37,9	33,2	33,2	70,1	77,5	76,4	72,1	74,8	81,1	102,7	135,2	195,2	303,4	510,1

TABLEAU 7. — TABLE 7.
MORTALITÉ GÉNÉRALE PAR GROUPES D'ÂGE ET PAR SEXE. — GENERAL MORTALITY BY AGE AND SEX.
DANEMARK: POPULATION URBAINE. — DENMARK: URBAN POPULATION.

Sexe masculin — Males												
	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	over 75	
1890-94	645,3	76,2	35,9	47,9	69,5	71,2	112,5	190,0	343,2	681,6	1.679,3	
1895-99	590,5	41,6	27,9	37,7	60,5	59,9	106,9	176,7	333,2	641,4	1.428,1	
1900-04	510,4	35,6	21,5	32,9	48,6	58,8	97,7	170,8	310,5	645,5	1.488,2	
1905-09	447,5	27,6	18,6	32,1	47,1	54,7	87,7	164,2	309,9	622,6	1.510,9	
1910-14	357,1	23,4	15,4	31,7	43,6	49,1	81,6	147,8	292,5	587,2	1.472,5	
1915-19	334,9	26,2	18,7	41,1	74,7	67,5	83,1	134,9	271,5	587,1	1.471,8	
1920-23	284,4	19,7	13,7	28,9	42,7	42,1	55,2	107,7	204,6	545,2	1.461,7	
Sexe féminin — Females												
	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	over 75	
1890-94	578,4	81,0	45,2	43,6	41,4	58,8	81,7	113,1	216,4	503,2	1.326,8	
1895-99	486,4	43,3	30,8	35,6	38,6	49,4	71,2	105,3	195,7	454,0	1.238,8	
1900-04	406,9	34,1	23,9	30,7	36,7	46,1	65,7	104,8	185,7	437,5	1.281,6	
1905-09	360,2	27,7	21,5	31,4	38,1	46,6	63,9	103,0	184,3	460,6	1.319,7	
1910-14	286,2	24,2	17,2	28,4	32,1	42,6	61,4	98,9	185,9	444,0	1.313,9	
1915-19	260,1	24,2	20,6	39,2	48,2	60,2	69,6	99,1	202,9	462,7	1.353,1	
1920-23	210,0	18,7	15,2	27,8	33,3	41,5	55,2	100,8	188,2	455,7	1.353,8	

TABLEAU 8. — TABLE 8.

MORTALITÉ GÉNÉRALE PAR GROUPES D'ÂGE ET PAR SEXE. — GENERAL MORTALITY BY AGE AND SEX.
OSLO.

Sexe masculin — Males											
	0-1	1-4	5-9	10-14	15-19	20-30	30-40	40-50	50-60	60-70	70-80
1871-75	2.353,0	385,0	77,0	37,0	54,0	96,0	156,0	204,0	305,0	484,0	1.091,0
1876-80	1.906,0	313,0	89,0	37,0	46,0	84,0	104,0	144,0	257,0	412,0	785,0
1881-85	1.868,0	367,0	96,0	47,0	44,0	80,0	106,0	141,0	243,0	427,0	753,0
1886-90	2.049,0	499,0	125,0	43,0	57,0	86,0	88,0	126,0	237,0	463,0	786,0
1891-95	1.850,0	285,0	63,0	33,0	56,0	75,0	91,0	127,0	242,0	469,0	888,0
1896-00	1.921,0	222,0	50,0	27,0	45,0	71,0	83,0	134,0	228,0	419,0	960,0
1901-05	1.407,0	192,0	48,0	30,0	50,0	72,0	77,0	121,0	197,0	422,0	912,0
1906-10	1.176,0	148,0	41,0	31,0	48,0	63,0	72,0	105,0	193,0	376,0	836,0
1911-15	1.199,0	146,0	41,0	21,0	36,0	52,0	73,0	114,0	182,0	396,0	912,0
1916-20	938,0	116,0	37,0	21,0	46,0	63,0	87,0	109,0	178,0	385,0	879,0
1921-24	955,0	77,0	21,0	17,0	35,0	50,0	64,4	104,0	189,0	376,0	870,4
Sexe féminin — Females											
	0-1	1-4	5-9	10-14	15-19	20-30	30-40	40-50	50-60	60-70	70-80
1871-75	1.873,0	383,0	103,0	58,0	53,0	76,0	100,0	143,0	183,0	334,0	781,0
1876-80	1.608,0	294,0	79,0	42,0	44,0	59,0	78,0	105,0	166,0	294,0	643,0
1881-85	1.621,0	349,0	85,0	48,0	46,0	63,0	91,0	112,0	174,0	321,0	665,0
1886-90	1.755,0	489,0	139,0	62,0	46,0	61,0	82,0	97,0	167,0	300,0	633,0
1891-95	1.590,0	278,0	69,0	42,0	44,0	60,0	76,0	97,0	148,0	292,0	701,0
1896-00	1.449,0	210,0	50,0	40,0	47,0	54,0	75,0	95,0	133,0	283,0	672,0
1901-05	1.165,0	183,0	47,0	42,0	52,0	57,0	69,0	86,0	146,0	279,0	684,0
1906-10	934,0	138,0	42,0	33,0	49,0	52,0	62,0	82,0	126,0	284,0	664,0
1911-15	952,0	143,0	34,0	28,0	38,0	45,0	59,0	82,0	131,0	278,0	632,0
1916-20	703,0	105,0	32,0	29,0	48,0	59,0	68,0	78,0	126,0	262,0	630,0
1921-24	684,0	63,0	15,0	18,0	34,0	38,0	42,0	69,0	120,0	255,0	652,0

TABLEAU 9. — TABLE 9.

MORTALITÉ GÉNÉRALE PAR GROUPES D'ÂGE ET PAR SEXE. — GENERAL MORTALITY BY AGE AND SEX.
COPENHAGUE. — COPENHAGEN.

Sexe masculin — Males											
	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	over 75
1890-94	800,0	75,0	30,0	51,0	71,0	79,0	127,0	215,0	370,0	722,0	1.757,0
1895-99	677,0	45,0	28,0	40,0	62,0	68,0	126,0	212,0	375,0	688,0	1.487,0
1900-04	589,0	37,0	18,0	33,0	51,0	66,0	117,0	201,0	365,0	690,0	1.599,0
1905-09	506,0	32,0	20,0	32,0	48,0	61,0	106,0	196,0	368,0	678,0	1.577,0
1910-14	374,0	26,0	16,0	33,0	45,0	57,0	99,0	179,0	334,0	646,0	1.520,0
1915-19	343,0	27,0	22,0	42,0	68,0	76,0	97,0	156,0	303,0	626,0	1.459,0
1920-23	282,0	21,0	14,0	28,0	43,0	51,0	64,0	124,0	274,0	601,0	1.572,0
Sexe féminin — Females											
	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	over 75
1890-94	702,0	79,0	38,0	39,0	39,0	55,0	80,0	120,0	227,0	503,0	1.375,0
1895-99	571,0	43,0	31,0	31,0	35,0	46,0	72,0	114,0	202,0	456,0	1.237,0
1900-04	477,0	35,0	21,0	26,0	34,0	43,0	65,0	115,0	190,0	439,0	1.303,0
1905-09	404,0	30,0	21,0	30,0	35,0	47,0	70,0	108,0	189,0	466,0	1.332,0
1910-14	303,0	30,0	20,0	28,0	32,0	43,0	66,0	109,0	197,0	454,0	1.317,0
1915-19	264,0	26,3	22,0	40,0	47,0	60,0	70,0	106,0	204,0	465,0	1.354,0
1920-23	205,0	18,0	15,0	30,0	33,0	42,1	57,0	100,0	196,0	465,0	1.385,0

TABLEAU 10. — TABLE 10.

MORTALITÉ GÉNÉRALE DE 1920 A 1924 PAR GROUPES D'ÂGE ET PAR SEXE AU DANEMARK.
GENERAL MORTALITY FROM 1920 TO 1924 BY AGE AND SEX IN DENMARK.

Ages	Sexe masculin — Males			Sexe féminin — Females		
	Population rurale Rural Population	Villes de province Provincial Towns	Copenhague Copenhagen	Population rurale Rural Population	Villes de province Provincial Towns	Copenhague Copenhagen
0-4	248,5	287,5	275,9	194,0	220,3	203,1
5-9	16,9	17,6	20,1	15,8	17,6	16,5
10-14	15,1	12,8	14,1	15,2	14,6	14,5
15-19	24,5	29,1	29,4	26,6	25,5	30,1
20-24	33,7	40,8	40,6	33,4	33,1	33,6
25-34	33,9	34,7	48,4	40,2	40,2	40,7
35-44	39,4	44,9	65,3	52,3	52,1	57,7
45-54	72,0	90,7	121,1	81,8	90,6	101,9
55-64	161,6	215,8	274,6	168,2	183,1	206,4
65-74	415,3	511,3	611,6	434,0	454,7	475,1

TABLEAU 11a. — TABLE 11a.

MORTALITÉ GÉNÉRALE PAR GROUPES D'ÂGE ET PAR SEXE POUR LES PAYS
PRIS DANS LEUR ENSEMBLE.

GENERAL MORTALITY BY AGE AND SEX FOR THE WHOLE OF THE COUNTRIES.

	NORVÈGE: SEXE MASCULIN NORWAY: MALES			SUÈDE: SEXE MASCULIN SWEDEN: MALES		
	1889-92	1919-22	Diminution en % Decrease in %	1891-95	1920	Diminution en % Decrease in %
0-1	1.138,0	613,4	46,1	410,2	241,7	41,1
1-4	202,5	67,6	66,6			
5-9	82,8	31,9	61,5	64,6	33,0	48,9
10-14	49,8	23,3	53,2	35,7	25,7	28,0
15-19	65,2	48,3	25,9	45,6	42,4	7,0
20-24	100,9	80,6	20,1	67,9	71,8	5,4
25-29	92,4	75,3	18,5	65,4	61,6	4,3
30-34				68,2	59,3	13,0
35-39	83,1	66,8	19,6	76,5	61,8	19,2
40-44				88,5	67,5	23,7
45-49	101,2	76,4	24,5	107,5	82,6	23,2
50-54				139,9	111,1	20,5
55-59	164,1	125,5	23,5	191,8	153,1	20,2
60-64				266,0	219,7	17,4
65-69	304,9	266,2	12,7	405,3	331,0	18,3
70-74				630,4	527,9	16,2
75-79	706,9	646,0	8,6			
	NORVÈGE: SEXE FÉMININ NORWAY: FEMALES			SUÈDE: SEXE FÉMININ SWEDEN: FEMALES		
	1889-92	1919-22	Diminution en % Decrease in %	1891-95	1920	Diminution en % Decrease in %
0-1	967,2	484,3	49,9	353,3	197,5	44,1
1-4	200,4	60,1	70,0			
5-9	83,6	28,8	65,5	66,2	33,1	50,0
10-14	52,0	26,8	48,4	37,8	26,0	31,2
15-19	62,0	49,1	20,8	46,7	42,4	9,2
20-24	65,2	63,4	2,7	57,2	49,4	13,6
25-29	76,8	63,4	17,4	61,3	55,0	10,3
30-34				66,7	56,1	15,8
35-39	87,6	63,4	27,6	73,8	60,5	18,0
40-44				80,6	65,5	18,7
45-49	98,2	71,7	26,9	88,0	74,1	15,8
50-54				109,8	95,5	13,0
55-59	130,1	111,0	13,9	147,1	127,1	13,6
60-64				221,7	180,5	18,5
65-69	261,6	221,5	15,3	351,8	294,2	16,4
70-74				562,6	482,7	14,2
75-79	619,3	563,8	8,9			

TABLEAU 116. — TABLE 116.

MORTALITÉ GÉNÉRALE PAR GROUPES D'AGE ET PAR SEXE DANS LA POPULATION URBAINE.
GENERAL MORTALITY BY AGE AND SEX AMONG URBAN POPULATION.

	DANEMARK: SEXE MASCULIN DENMARK: MALES			NORVÈGE: SEXE MASCULIN NORWAY: MALES					
	1890-94	1920-23	Diminution en % Decrease in %	1889-92	1919-22	Diminution en % Decrease in %			
0-1	645,3	284,4	55,9	1.647,0	720,9	56,2			
1-4				270,5	83,9	69,0			
5-9				76,2	19,7	74,1	99,4	33,1	66,7
10-14				35,9	13,7	61,8	49,3	21,0	57,4
15-19				47,9	28,9	39,6	70,7	47,9	32,2
20-24				69,5	42,7	38,5	108,6	73,5	32,3
25-29				71,2	42,1	40,9	97,2	74,9	22,9
30-34							101,0	77,5	23,3
35-39				112,5	55,2	50,9	136,9	98,8	27,8
40-44							190,0	107,7	43,3	220,4	163,7	25,8
45-49				343,2	204,6	40,4			
50-54							681,6	545,2	20,0
55-59									
60-64									
65-69									
70-74									
	DANEMARK: SEXE FÉMININ DENMARK: FEMALES			NORVÈGE: SEXE FÉMININ NORWAY: FEMALES					
	1890-94	1920-23	Diminution en % Decrease in %	1889-92	1919-22	Diminution en % Decrease in %			
0-1	578,4	219,0	62,1	1.351,0	544,6	59,7			
1-4				274,8	69,3	74,8			
5-9				81,0	18,7	76,9	101,3	29,5	70,9
10-14				45,2	15,2	66,3	56,7	25,0	55,9
15-19				43,6	27,8	36,2	65,2	41,9	35,7
20-24				41,4	33,3	19,5	64,2	54,1	15,7
25-29				58,8	41,5	29,4	73,4	55,5	24,4
30-34							94,6	57,9	38,8
35-39				81,7	55,2	32,4	110,2	76,4	30,7
40-44							113,1	100,8	10,8	147,4	123,4	16,3
45-49				216,4	188,2	13,0			
50-54							503,2	455,7	9,4
55-59									
60-64									
65-69									
70-74									

TABLEAU 12. — TABLE 12.

MORTALITÉ GÉNÉRALE PAR GROUPES D'AGE ET PAR SEXE DANS LES CAPITALES.
GENERAL MORTALITY BY AGE AND SEX IN THE CAPITALS.

	COPENHAGUE: SEXE MASCULIN COPENHAGEN: MALES			OSLO: SEXE MASCULIN OSLO: MALES		
	1890-94	1920-23	Diminution en % Decrease in %	1891-95	1921-24	Diminution en % Decrease in %
0-1	800,1	281,7	64,8	1.850,0	955,3	48,3
1-4				284,7	76,7	73,3
5-9	74,9	20,9	72,1	63,2	20,8	67,1
10-14	30,2	14,0	53,0	32,5	16,7	48,6
15-19	50,9	27,7	45,6	56,1	35,0	37,6
20-24	70,5	42,6	39,6	75,3	49,9	33,8
25-29	79,2	51,1	35,5			
30-34				91,0	64,4	29,2
35-39	126,9	64,3	49,3	127,2	103,9	39,6
40-44						
45-49	215,2	123,5	42,6	241,7	188,9	21,8
50-54				468,3	376,0	19,7
55-59	370,4	274,2	25,9			
60-64				887,5	870,4	1,9
65-69	722,0	600,5	16,8			
70-74						
	COPENHAGUE: SEXE FÉMININ COPENHAGEN: FEMALES			OSLO: SEXE FÉMININ OSLO: FEMALES		
	1890-94	1920-23	Diminution en % Decrease in %	1891-95	1921-24	Diminution en % Decrease in %
0-1	702,4	204,9	70,8	1.590,0	684,2	57,0
1-4				278,4	63,1	77,3
5-9	78,5	17,7	77,4	68,8	14,5	78,9
10-14	37,8	15,1	60,1	42,0	18,3	56,4
15-19	39,0	30,3	22,3	44,3	33,8	23,7
20-24	38,5	32,9	14,5	59,5	37,6	36,8
25-29	54,9	42,1	23,3			
30-34				75,8	42,3	24,2
35-39	79,9	57,1	28,6	97,1	68,6	29,4
40-44						
45-49	119,9	100,4	16,3	147,7	120,2	18,6
50-54				291,6	255,1	12,5
55-59	226,9	195,7	13,7			
60-64				700,9	651,9	6,1
65-69	502,7	464,8	7,5			
70-74						

TABLEAU 13. — TABLE 13.

MORTALITÉ GÉNÉRALE PAR PROVINCES (VILLES ET CAMPAGNES ENSEMBLE) EN NORVÈGE.
GENERAL MORTALITY BY PROVINCES (TOWNS AND COUNTRY TOGETHER) IN NORWAY.

	1867-70	1871-75	1876-80	1881-85	1886-90	1891-95
Östfold	185,0	189,4	164,8	168,1	168,7	164,9
Akershus	188,3	178,4	164,0	160,5	174,0	172,1
Oslo	218,8	222,1	211,5	193,2	217,9	182,6
Hedmark	162,4	147,2	143,8	144,1	158,9	161,7
Opland	143,3	148,3	144,1	151,6	150,4	153,3
Buskerud	194,1	169,9	167,1	163,9	172,3	162,3
Vestfold	195,1	169,0	166,0	161,8	158,9	154,4
Telemark	197,8	176,6	167,7	169,2	167,6	156,7
Aust Agder	208,3	189,5	187,5	168,0	167,4	169,2
Vest Agder	201,6	207,8	202,1	192,2	196,9	190,0
Rogaland	160,5	185,1	182,1	180,5	164,6	168,2
Hordaland	150,7	173,8	164,3	170,3	162,0	147,5
Bergen	222,2	247,1	213,8	201,3	175,7	178,8
Sogn. Fjord	148,3	151,4	144,9	150,4	156,1	136,7
Møn	143,2	153,0	141,7	158,8	153,6	147,5
S. Trøndelag	165,3	175,6	164,0	192,4	178,1	187,1
N. Trøndelag	136,9	152,8	150,1	163,2	156,5	168,6
Norland	171,8	178,7	149,7	179,5	152,4	178,3
Tromsø	197,1	167,4	154,8	183,9	151,3	160,2
Finmark	309,9	234,2	214,3	218,4	237,6	239,3
	1896-1900	1901-05	1906-10	1911-15	1916-20	
Östfold	154,9	143,1	130,9	122,0	134,6	
Akershus	160,7	136,0	120,4	110,8	109,1	
Oslo	167,9	151,7	132,7	130,1	127,1	
Hedmark	146,4	140,1	133,0	123,5	133,8	
Opland	135,2	128,2	122,9	120,8	129,7	
Buskerud	154,6	143,6	134,0	124,1	135,9	
Vestfold	155,0	137,8	133,4	125,6	140,7	
Telemark	148,0	138,3	129,3	126,5	131,6	
Aust Agder	156,9	151,5	136,5	142,1	154,6	
Vest Agder	173,6	153,1	146,1	136,6	140,6	
Rogaland	167,8	144,1	140,3	131,8	138,4	
Hordaland	150,2	137,4	136,2	132,6	142,7	
Bergen	166,4	146,3	139,6	132,1	140,9	
Sogn. Fjord	140,0	139,3	133,9	138,6	150,3	
Møn	148,2	139,0	137,5	134,4	145,9	
S. Trøndelag	171,7	158,5	155,5	149,0	155,8	
N. Trøndelag	153,2	143,4	146,0	144,2	149,5	
Norland	131,2	132,3	132,4	125,3	141,9	
Tromsø	149,2	141,9	130,0	130,1	158,8	
Finmark	202,7	203,6	206,6	186,1	205,4	

TABLEAU 14. — TABLE 14.

MORTALITÉ GÉNÉRALE PAR PROVINCES (POPULATION RURALE) EN NORVÈGE.
GENERAL MORTALITY BY PROVINCES (RURAL POPULATION) IN NORWAY.

	1881-85	1886-90	1891-95	1896-00	1901-05	1906-10	1911-15	1916-20
Östfold	164,8	166,2	163,2	153,0	141,7	126,5	118,6	129,8
Akershus.	161,1	173,1	171,4	160,5	135,9	110,4	110,0	108,0
Oslo	—	—	—	—	—	—	—	—
Hedmark	143,3	157,5	162,4	146,6	141,9	134,4	124,6	133,9
Opland	151,6	151,3	152,3	134,7	128,6	123,6	121,8	130,6
Buskerud	159,8	164,9	159,6	152,1	139,7	128,7	121,8	132,5
Vestfold	155,6	156,0	152,5	154,4	135,0	132,5	122,0	134,6
Telemark	170,4	165,3	152,9	146,0	137,2	125,8	123,6	131,1
Aust Agder	168,6	169,1	172,8	160,0	156,5	138,1	140,0	148,8
Vest Agder	188,0	191,1	184,5	172,8	151,6	145,0	133,9	146,2
Rogaland	169,8	157,2	166,6	168,0	141,5	138,0	127,7	137,4
Hordaland	170,3	162,0	147,5	150,2	137,4	126,2	132,6	142,8
Bergen.	—	—	—	—	—	—	—	—
Sogn. Fjord	150,4	155,9	136,6	139,7	139,5	134,5	139,3	150,3
Møn	154,2	149,9	132,8	147,7	138,1	136,8	137,0	144,7
S. Trøndelag	183,7	164,1	174,5	165,8	156,5	155,9	149,3	157,1
N. Trøndelag	162,0	155,4	168,3	153,4	141,8	144,5	142,2	147,8
Nordland	177,7	151,8	177,6	130,3	131,7	133,1	126,3	143,0
Tromsø	186,1	147,5	158,4	145,6	138,8	128,1	127,9	158,7
Finmark	214,6	226,1	224,6	191,7	195,2	192,2	177,4	199,3

TABLEAU 15. — TABLE 15.

MORTALITÉ GÉNÉRALE PAR PROVINCES (POPULATION URBAINE) EN NORVÈGE.
GENERAL MORTALITY BY PROVINCES (URBAN POPULATION) IN NORWAY.

	1881-85	1886-90	1891-95	1896-00	1901-05	1906-10	1911-15	1916-20
Östfold	177	175	169	159	146	141	130	146
Akershus.	142	200	195	170	139	163	152	167
Oslo	193	218	183	168	152	133	130	127
Hedmark	165	190	149	144	113	111	104	132
Opland	150	122	183	146	121	112	106	118
Buskerud	176	194	169	161	154	148	130	145
Vestfold	177	165	158	166	143	135	132	152
Telemark	165	175	168	154	142	140	135	133
Aust Agder	165	159	152	142	136	132	148	172
Vest Agder	204	214	206	176	157	149	144	155
Rogaland	206	182	151	168	148	144	137	140
Hordaland	—	—	—	—	—	—	—	—
Bergen.	201	176	179	166	146	140	132	141
Sogn. Fjord	160	183	144	178	123	87	91	150
Møn	187	175	175	150	143	140	125	150
S. Trøndelag	229	235	231	188	164	155	148	153
N. Trøndelag	186	175	173	151	164	164	169	170
Nordland	245	167	198	151	143	124	111	129
Tromsø	165	189	178	185	170	145	145	159
Finmark	231	277	294	259	236	264	221	231

TABLEAU 16. — TABLE 16.

MORTALITÉ GÉNÉRALE PAR PROVINCES (POPULATIONS URBAINE ET RURALE ENSEMBLE) EN SUÈDE.
GENERAL MORTALITY BY PROVINCES (URBAN AND RURAL POPULATIONS TOGETHER) IN SWEDEN.

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Stockholm	138	151	137	147	134	126	123	169	146	121	116	117	112	113	116	116
Stockholm (Province)	133	138	136	140	139	128	124	166	146	118	112	118	110	110	111	115
Upsala	145	154	151	152	155	135	126	178	149	134	124	130	118	124	118	126
Södermanland	133	132	131	131	140	121	113	161	138	130	119	119	113	113	109	117
Östergötland	145	143	133	131	144	129	131	174	145	133	120	128	109	118	117	121
Jönköping	133	134	127	131	141	130	130	159	134	134	119	121	114	118	108	110
Kronoberg	142	137	141	144	155	140	140	175	142	142	130	134	120	126	123	124
Kalmar	150	154	147	148	156	145	146	182	156	146	132	140	119	127	125	134
Gotland	147	151	150	168	175	149	140	177	160	159	155	149	138	152	134	150
Blekinge	141	141	140	146	157	132	138	202	151	140	132	136	114	134	122	123
Kristiansstad	152	142	138	138	153	136	138	174	150	134	127	137	114	119	122	120
Malmöhus	132	137	128	130	133	131	123	173	132	125	113	122	106	110	109	108
Halland	136	160	135	133	150	144	140	168	148	139	132	136	111	125	119	113
Göteborg Bohus	137	143	134	139	145	136	133	191	147	122	118	122	110	111	113	106
Älvsborg	145	145	143	137	155	143	142	175	149	132	130	132	120	122	122	117
Skaraborg	144	143	144	138	157	135	142	173	154	136	134	140	125	126	123	123
Värmland	140	145	141	146	151	139	153	188	145	138	130	133	128	122	120	120
Örebro	133	128	125	133	138	123	123	155	132	123	115	124	110	111	112	113
Västmanland	135	139	142	130	148	126	126	176	145	129	116	125	107	115	118	121
Kopparsberg	131	137	132	133	148	137	133	195	146	125	119	125	108	122	118	115
Gävleborg	131	134	132	132	144	131	125	184	139	130	122	124	111	117	115	118
Väster Norrland	132	135	141	139	147	144	139	213	148	144	136	126	120	136	129	128
Jämtland	133	139	136	135	158	147	130	212	146	142	128	129	110	131	120	118
Västerbotten	131	140	129	132	149	151	144	186	141	140	133	133	118	123	114	116
Norrbotten	141	167	147	153	161	160	157	197	149	177	144	139	120	125	122	120

TABLEAU 17. — TABLE 17.

MORTALITÉ GÉNÉRALE PAR PROVINCES EN SUÈDE. — GENERAL MORTALITY BY PROVINCES IN SWEDEN.

	POPULATIONS URBAINE ET RURALE ENSEMBLE URBAN AND RURAL POPULATIONS TOGETHER		POPULATION RURALE RURAL POPULATION		POPULATION URBAINE URBAN POPULATION	
	1919-22	1923-26	1919-22	1923-26	1919-22	1923-26
Stockholm	124,9	114,4	—	—	124,9	114,4
Stockholm (Province) . .	—	111,3	123,2	111,7	—	108,6
Upsala	134,3	121,3	132,9	120,2	138,4	124,3
Södermanland	126,4	112,7	132,9	115,9	111,5	105,6
Östergötland	131,3	116,2	130,2	116,3	133,5	115,9
Jönköping	126,9	112,3	131,1	116,3	116,2	102,6
Kronoberg	137,1	123,2	137,6	123,5	133,1	118,8
Kalmar	143,4	126,3	145,9	128,8	132,2	115,3
Gotland	155,5	143,5	156,2	145,5	152,1	133,7
Blekinge	139,9	123,2	143,5	126,3	130,9	115,4
Kristiansstad	136,8	118,6	139,0	120,4	117,0	102,1
Malmöhus	123,0	108,1	134,7	116,7	110,2	98,9
Halland	138,6	117,2	143,8	119,5	121,3	109,7
Göteborg Bohus	127,1	109,9	135,4	120,1	120,4	103,6
Älvsborg	135,5	120,1	140,9	125,8	116,4	101,8
Skaraborg	141,9	124,3	144,8	125,9	124,2	116,9
Värmland	136,6	122,7	140,5	126,1	115,1	105,1
Örebro	123,4	111,5	111,1	114,6	115,1	98,9
Västmanland	128,4	115,2	131,2	116,8	121,5	111,1
Kopparnsberg	128,6	115,8	129,9	117,1	117,3	104,7
Gävleborg	128,9	115,2	130,3	115,3	123,8	114,7
Väster Norrland	138,3	128,4	138,8	128,9	134,8	125,3
Jämtland	136,2	119,8	138,7	121,1	113,7	108,2
Västerbotten	136,5	117,9	137,3	118,5	122,4	110,3
Norrbottn	151,9	121,9	156,0	124,8	122,9	100,9

TABLEAU 18. — TABLE 18.

MORTALITÉ GÉNÉRALE PAR PROVINCES AU DANEMARK. — GENERAL MORTALITY BY PROVINCES IN DENMARK.

	POPULATIONS URBAINE ET RURALE ENSEMBLE URBAN AND RURAL POPULATIONS TOGETHER				POPULATION RURALE RURAL POPULATION				POPULATION URBAINE URBAN POPULATION			
	1920-25	1926	1927	1928	1920-25	1926	1927	1928	1920-25	1926	1927	1928
Copenhagen	119.5	116.5	114.4	116.7	—	—	—	—	119.5	116.5	114.4	116.7
Copenhagen												
Province de Copenhagen	117.0	108.3	109.9	109.5	110.4	105.4	100.8	98.5	123.6	111.6	120.9	123.8
Province of Copenhagen												
Roskilde	122.7	111.9	115.6	115.3	120.4	110.3	110.9	110.6	123.9	115.1	125.9	125.8
Frederiksborg	122.5	119.8	129.7	118.5	124.4	120.4	128.4	116.9	116.5	118.1	133.2	123.8
Holbæk	115.7	116.3	109.7	114.5	117.9	121.1	113.9	118.8	105.4	94.6	90.7	95.6
Sorø	118.6	117.4	119.9	114.5	114.8	110.9	117.1	104.9	127.8	132.0	126.3	136.1
Præsts	119.7	114.5	120.0	113.9	122.9	116.0	122.4	112.3	110.4	108.3	110.2	120.9
Bornholm	125.1	121.3	133.4	123.6	100.5	100.8	107.7	101.7	157.6	148.2	167.3	134.7
Maribo	112.0	106.9	112.3	112.4	112.4	108.0	112.4	111.9	111.2	104.4	112.3	113.4
Odense	113.8	100.8	111.2	103.4	111.3	94.1	109.7	94.7	117.1	110.2	113.4	115.7
Assens	114.4	109.2	115.5	113.9	116.2	108.1	118.4	113.5	107.9	112.9	105.0	115.1
Svendborg	120.6	112.8	127.4	114.5	120.9	111.8	128.0	114.9	119.7	116.2	125.6	113.2
Hjørring	110.3	104.1	115.3	106.2	109.3	105.5	115.6	105.0	113.7	99.2	114.1	110.4
Thisted	116.1	116.5	118.9	115.3	112.6	110.2	117.4	111.2	130.2	142.6	125.3	132.9
Aalborg	117.3	106.1	120.5	105.8	113.5	103.2	116.4	102.8	125.4	112.9	129.9	112.9
Viborg	108.8	102.1	117.1	102.1	107.9	101.8	118.5	90.8	113.8	103.7	110.5	115.6
Randers	117.8	110.4	115.6	105.4	115.1	102.8	113.9	103.4	124.9	132.8	120.1	110.9
Aarhus	109.3	104.2	109.3	101.5	109.3	96.1	112.7	96.6	109.3	110.9	106.5	105.6
Skanderborg	111.9	109.7	111.3	109.7	106.1	103.7	102.6	103.9	120.5	119.0	124.9	118.8
Ringkøbing	108.7	108.7	110.3	99.9	105.6	104.2	107.1	93.5	117.3	125.9	122.4	123.8
Vejle	112.3	112.2	112.0	108.1	110.1	108.6	109.1	104.9	116.3	118.9	117.4	114.1
Ribe	108.3	102.4	105.7	101.1	103.9	96.8	103.5	98.5	120.9	118.4	112.0	108.7
Haderslev	110.1	94.8	101.4	98.1	105.9	95.5	100.0	93.9	122.9	92.8	105.6	110.6
Aabenraa	112.3	112.5	113.6	108.5	112.5	115.9	111.5	108.4	111.9	101.1	120.9	105.2
Sønderborg	115.9	104.3	127.4	109.1	122.5	111.7	133.2	115.9	100.7	87.7	114.7	93.9
Tønder	93.6	100.9	114.3	100.3	90.6	91.6	115.0	94.7	104.1	132.6	111.6	120.0
Faerøerne	110.3	82.1	64.0	85.0	109.3	80.9	65.9	87.9	117.9	90.0	51.6	67.7

TABLEAU 19. — TABLE 19.

MORTALITÉ TUBERCULEUSE EN NORVÈGE (ENSEMBLE DU PAYS) PAR SEXE.
TUBERCULOSIS MORTALITY IN NORWAY (WHOLE OF THE COUNTRY) BY SEX.

	TUBERCULOSE (TOUTES FORMES) TUBERCULOSIS (ALL FORMS)			TUBERCULOSE PULMONAIRE PULMONARY TUBERCULOSIS		
	Deux sexes Both Sexes	Sexe masculin Males	Sexe féminin Females	Deux sexes Both Sexes	Sexe masculin Males	Sexe féminin Females
1867-70	24,4	—	—	20,4	—	—
1871-75	24,4	23,3	25,6	19,3	17,8	20,7
1876-80	26,1	25,0	27,0	20,1	18,7	21,5
1881-85	27,9	26,5	29,2	21,4	19,5	23,2
1886-90	25,8	24,3	27,2	19,5	17,7	21,3
1891-95	28,3	27,2	29,3	22,0	20,6	23,4
1896-00	31,0	29,9	31,9	23,4	22,1	24,7
1901-05	28,2	26,8	29,5	21,4	19,8	23,0
1906-10	26,0	24,4	27,4	20,0	18,1	21,8
1911-15	23,6	23,0	24,2	18,5	17,5	19,5
1916-20	22,6	22,2	22,9	17,8	17,1	18,5
1921	20,8	20,0	21,5	16,4	15,4	17,4
1922	21,1	20,3	21,7	16,7	15,6	17,7
1923	19,6	19,2	19,9	15,2	14,6	15,8

TABLEAU 20. — TABLE 20.

MORTALITÉ TUBERCULEUSE DANS LA POPULATION URBAINE.

TUBERCULOSIS MORTALITY AMONG URBAN POPULATION.

LES DEUX SEXES ENSEMBLE. — BOTH SEXES TOGETHER.

Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Périodes quinquennales — Five-year Periods						
								Danemark Années Denmark Years	Norvège et Suède Années Norway & Sweden Years	Danemark Denmark	Norvège Norway	Suède Sweden		
1860				1895	25,6	38,9	30,2	1860-64	1861-65					
61				96	23,2	35,7	29,3	1865-69	1866-70					
62				97	24,0	35,7	30,9	1870-74	1871-75					
63				98	22,4	38,3	29,2	1875-79	1876-80	31,0				
64				99	21,2	38,1	30,8	1880-84	1881-85	30,6				
65				1900	22,9	37,2	30,4	1885-89	1886-90	29,3	38,7			
66				01	21,0	32,5	30,7	1890-94	1891-95	27,9	37,6	30,4		
67				02	18,7	31,6	29,4	1895-99	1896-00	23,3	37,0	30,1		
68				03	18,9	31,4	28,2	1900-04	1901-05	20,2	31,9	29,0		
69				04	19,6	32,4	28,6	1905-09	1906-10	17,4	28,7	26,0		
1870				05	19,7	31,9	28,3	1910-14	1911-15	14,5	25,1	24,0		
71				06	17,5	31,0	26,9	1915-19	1916-20	14,5	23,9	21,1		
72				07	16,8	29,9	26,3	1920-24	1921-25	10,6	20,2	15,8		
73				08	17,7	29,4	26,5	1925-	1926	8,8	17,0	13,5		
74				09	15,5	26,9	25,3	1890-91—1894-95		27,9	37,6	30,4		
75				1910	14,3	26,0	24,9	1925—1926		8,8	17,0	13,5		
76	31,4			11	15,4	25,8	23,7	Diminution en pourcentage . .	68,2%	54,8%	55,6%			
77	30,8			12	15,1	24,8	24,4	Decrease in percentage . . .						
78	29,8			13	13,6	24,9	23,2							
79	32,0			14	13,8	24,2	23,8							
1880	30,0			15	13,3	24,4	24,5							
81	30,0			16	15,6	26,1	23,5							
82	31,6			17	17,8	24,9	22,7							
83	30,0			18	13,9	22,8	20,8							
84	31,2			19	11,9	21,5	20,0							
85	29,3			1920	11,7	23,6	18,6							
86	28,5			21	10,8	20,0	16,8							
87	28,1			22	10,1	21,0	16,5							
88	31,6			23	9,6	19,8	15,3							
89	28,6			24	10,9	20,4	15,1							
1890	30,3			25	9,9	19,6	15,3							
91	29,3	38,2	29,5	26	8,9	16,7	13,6							
92	28,0	36,8	31,6	27	8,2	17,4	13,8							
93	26,9	36,2	30,4	28	8,2		13,2							
94	25,4	37,8	30,2											

TABLEAU 21. — TABLE 21.

MORTALITÉ PAR TUBERCULOSE PULMONAIRE DANS LA POPULATION URBAINE.
MORTALITY FROM PULMONARY TUBERCULOSIS AMONG URBAN POPULATION.

LES DEUX SEXES ENSEMBLE. — BOTH SEXES TOGETHER.

Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Périodes quinquennales. — Five-year Periods					
								Danemark Années Denmark Years	Norvège et Suède Années Norway a. Sweden Years	Danemark Denmark	Norvège Norway	Suède Sweden	
1860	25,5			1895	18,9	30,2	22,7						
61	24,0			96	17,0	26,5	21,8						
62	20,5			97	17,6	27,4	23,7						
63	23,0			98	16,6	29,8	21,9						
64	28,0			99	15,9	29,2	23,4						
65	27,5			1900	17,2	27,9	23,4	1860-64	1861-65	24,3			
66	26,0			01	15,0	24,8	23,6	1865-69	1866-70	25,3			
67	25,0			02	13,4	23,3	21,9	1870-74	1871-75	27,6			
68	24,0			03	13,9	22,9	21,2	1875-79	1876-80	26,6			
69	24,0			04	14,5	24,5	21,8	1880-84	1881-85	24,9		32,1	
1870	25,0			05	14,6	24,9	21,7	1885-89	1886-90	23,4	30,0	29,7	
71	28,5			06	13,2	23,4	20,7	1890-94	1891-95	20,8	29,0	28,4	
72	27,0			07	12,8	22,9	20,0	1895-99	1896-00	17,2	28,2	24,3	
73	27,0			08	13,4	22,4	20,5	1900-04	1901-05	14,8	24,1	22,9	
74	29,0			09	11,4	20,3	19,9	1905-09	1906-10	13,1	21,6	22,0	
75	29,0			1910	10,9	19,1	19,3	1910-14	1911-15	11,1	19,4	20,1	
76	26,5		34,1	11	11,5	19,9	19,0	1915-19	1916-20	11,1	19,4	19,4	
77	26,1		34,2	12	11,6	19,2	19,7	1920-24	1921-25	8,3	18,7	17,2	
78	25,1		30,1	13	10,5	19,2	18,6	1925	1926	7,0	15,8	12,7	
79	26,3		31,1	14	10,8	19,0	19,3				13,6		
1880	24,9		31,4	15	10,4	19,1	20,0	1890-91—1894-95		20,8	29,0	24,3	
81	24,7		32,9	16	12,3	20,2	19,2	1920-21—1924-25		8,3	15,8	12,7	
82	25,6		28,9	17	13,7	19,2	18,3	Diminution en pourcentage . .		60,1%	45,5%	47,7%	
83	24,5		29,5	18	10,3	18,3	17,3	Decrease in percentage . . .					
84	24,9		28,7	19	9,2	16,6	16,3						
85	23,6		29,0	1920	9,1	18,2	15,1						
86	22,2		28,0	21	8,4	15,3	13,6						
87	23,1		26,5	22	7,9	16,7	13,4						
88	25,2		29,8	23	7,4	15,5	12,0						
89	22,4		29,2	24	8,4	16,2	12,2						
1890	22,8		28,5	25	7,8	15,5	12,5						
91	21,9	29,5	27,0	26	7,1	13,2							
92	20,7	28,3	24,8	27	6,5	14,0							
93	19,7	27,9	23,9	28	6,3								
94	19,0	29,1	23,4										

TABLEAU 22. — TABLE 22.

DIMINUTION COMPARÉE DE LA MORTALITÉ GÉNÉRALE, DE LA MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) ET PAR TUBERCULOSE PULMONAIRE DANS LA POPULATION URBAINE DES TROIS PAYS, DE LA PÉRIODE 1890-94—1891-95 A 1921-24.
(Les chiffres de la première période quinquennale sont pris comme unités = 100.)

COMPARATIVE DECLINE OF GENERAL MORTALITY, MORTALITY FROM TUBERCULOSIS (ALL FORMS) AND FROM PULMONARY TUBERCULOSIS, IN THE URBAN POPULATION OF THE THREE COUNTRIES, FROM THE PERIOD 1890-94—1891-95 TO 1921-24.
(The figures for the first five-year period are taken as units = 100.)

Danemark Années Denmark Years	Norvège et Suède Années Norway and Sweden Years	MORTALITÉ GÉNÉRALE GENERAL MORTALITY			MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) MORTALITY FROM TUBERCULOSIS (ALL FORMS)			MORTALITÉ PAR TUBERCULOSE PULMONAIRE MORTALITY FROM PULMONARY TUBERCULOSIS		
		Danemark Denmark	Norvège Norway	Suède Sweden	Danemark Denmark	Norvège Norway	Suède Sweden	Danemark Denmark	Norvège Norway	Suède Sweden
1890-94	1891-95	100	100	100	100	100	100	100	100	100
1895-99	1896-00	85,8	91,8	92,8	83,5	98,4	99,0	82,7	97,2	94,2
1900-04	1901-05	79,0	83,0	86,2	72,4	84,8	95,4	71,1	83,1	90,5
1905-09	1906-10	75,3	77,5	79,2	62,3	76,3	85,5	63,0	74,5	82,7
1910-14	1911-15	68,2	75,0	74,2	52,0	66,7	78,9	53,4	66,9	79,8
1915-19	1916-20	70,3	78,6	74,8	52,0	63,6	69,4	53,4	64,5	70,8
1920-24	1921-24	61,5	63,3	61,6	38,0	54,0	52,0	39,9	54,5	52,3

La diminution de la mortalité générale au cours de la période considérée est pratiquement la même dans les trois pays. Celle de la mortalité par tuberculose (toutes formes) et par tuberculose pulmonaire est plus forte que celle de la mortalité générale. Elle est particulièrement considérable au Danemark.

The decrease in general mortality during the period considered is about the same in the three countries.

The decline in mortality from tuberculosis (all forms) and from pulmonary tuberculosis is greater than that of general mortality. It is particularly large in Denmark.

TABLEAU 23. — TABLE 23.
MORTALITÉ TUBERCULEUSE DANS LA POPULATION URBAINE.
TUBERCULOSIS MORTALITY AMONG URBAN POPULATION.
SEXE MASCULIN. — MALES.

Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Périodes quinquennales — Five-year Periods						
								Danemark Années Denmark Years	Norvège et Suède Années & Sweden Years	Danemark Denmark	Norvège Norway	Suède Sweden		
1860				1895	29,6	40,1	33,7							
61				96	27,1	37,6	30,7							
62				97	27,8	37,6	34,1							
63				98	25,1	39,9	32,7							
64				99	24,0	38,5	34,6							
65				1900	26,7	38,8	34,0							
66				01	23,9	35,0	32,8	1860-64	1861-65					
67				02	21,1	33,2	31,1	1865-69	1866-70					
68				03	21,0	31,3	30,7	1870-74	1871-75					
69				04	21,6	31,6	31,5	1875-79	1876-80	34,1				
1870				05	22,4	32,8	30,2	1880-84	1881-85	33,0				
71				06	18,8	30,6	28,6	1885-89	1886-90	32,6				
72				07	18,2	30,7	28,5	1890-94	1891-95	31,6	38,3	33,6		
73				08	18,4	30,7	28,4	1895-99	1896-00	26,7	38,5	33,2		
74				09	16,2	28,2	27,5	1900-04	1901-05	22,8	32,8	31,1		
75				1910	15,6	25,6	26,8	1905-09	1906-10	18,8	29,2	27,9		
76	33,8			11	17,5	26,6	23,0	1910-14	1911-15	15,5	25,9	24,9		
77	35,6			12	15,4	25,9	26,3	1915-19	1916-20	15,8	24,5	22,3		
78	32,5			13	14,6	26,2	24,2	1920-24	1921-25	10,8	21,4	16,5		
79	34,5			14	14,6	25,9	25,8	1925	1926	9,1				
1880	33,3			15	14,7	25,1	25,3	Diminution en pourcentage - Decrease in Percentage						
81	32,2			16	17,4	28,2	23,9	1890-91—1894-95		31,6	38,3	33,6		
82	34,6			17	19,1	26,7	23,6	1920-21—1924-25		10,8	21,4	16,5		
83	33,4			18	14,8	23,5	22,5			65,8%	44,1%	50,9%		
84	31,6			19	12,8	21,9	21,8							
85	32,2			1920	11,7	24,3	19,8							
86	30,4			21	11,1	21,2	18,4							
87	31,3			22	10,0	22,3	17,1							
88	36,7			23	9,9	20,9	15,5							
89	32,1			24	11,1	21,0	15,9							
1890	33,4			25	9,7		15,8							
91	33,6	38,6	32,1	26	9,3									
92	32,2	37,1	34,5	27	8,3									
93	29,9	36,5	34,8	28	8,4									
94	28,6	39,3	33,0											

TABLEAU 24. — TABLE 24.

MORTALITÉ PAR TUBERCULOSE PULMONAIRE DANS LA POPULATION URBAINE.
MORTALITY FROM PULMONARY TUBERCULOSIS AMONG URBAN POPULATION.

SEXE MASCULIN. — MALES.

Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Périodes quinquennales — Five-year Periods					
								Danemark Années Denmark Years	Norvège et Suède Années Norway & Sweden Years	Danemark Denmark	Norvège Norway	Suède Sweden	
1860				95	21,8	30,4	25,1						
61				96	20,4	27,5	22,8						
62				97	20,9	28,0	25,9						
63				98	18,8	30,7	25,1						
64				99	18,5	28,9	25,9						
65				1900	20,7	28,5	25,8						
66				01	17,9	26,7	25,0						
67				02	15,2	24,3	22,7						
68				03	15,6	21,6	22,7						
69				04	15,9	22,9	23,2						
1870				05	16,6	25,1	22,7						
71				06	14,2	22,3	21,1						
72				07	13,7	22,3	21,1						
73				08	13,8	22,6	22,1						
74				09	11,9	20,9	21,5						
75				1910	11,8	17,9	20,5						
76	28,6		38,6	11	12,9	20,1	19,6	1860-64	1861-65				
77	29,9		39,0	12	11,9	20,1	21,2	1865-69	1866-70				
78	26,5		32,7	13	11,3	19,8	19,1	1870-74	1871-75				
79	27,9		35,2	14	11,6	20,1	20,7	1875-79	1876-80	28,1			35,8
1880	27,7		33,4	15	11,3	19,1	20,9	1880-84	1881-85	26,4			33,0
81	26,8		37,1	16	14,0	21,9	19,5	1885-89	1886-90	25,7			30,7
82	28,1		31,7	17	14,5	20,4	18,6	1890-94	1891-95	23,1	29,4		26,5
83	26,8		32,2	18	11,2	18,4	18,7	1895-99	1896-00	19,8	28,7		25,1
84	25,0		31,4	19	9,7	16,6	17,5	1900-04	1901-05	16,2	24,1		23,3
85	25,6		32,7	1920	8,8	18,4	15,5	1905-09	1906-10	13,1	21,2		21,3
86	23,1		30,7	21	8,5	15,7	14,9	1910-14	1911-15	11,8	19,8		20,3
87	25,5		29,0	22	7,9	17,3	13,9	1915-19	1916-20	11,6	19,1		17,8
88	29,3		32,0	23	7,5	16,1	12,6	1920-24	1921-25	8,2	16,3		13,6
89	25,2		31,6	24	8,3	16,2	13,0	1925	1926	7,2			
1890	25,3		30,4	25	7,6		12,8	1890-91—1894-95		23,1	29,4		26,5
91	25,2	29,7	29,1	26	7,4			1920-21—1924-25		8,2	16,3		13,6
92	23,8	28,2	26,6	27	6,5								
93	22,9	29,0	27,1	28				Diminution en pourcentage . .		64,5%	44,5%		48,7%
94	21,7	29,9	24,7					Decrease in percentage . . .					

TABLEAU 25. — TABLE 25.
MORTALITÉ TUBERCULEUSE DANS LA POPULATION URBAINE.
TUBERCULOSIS MORTALITY AMONG URBAN POPULATION.
SEXE FÉMININ. — FEMALES.

Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Périodes quinquennales — Five-year Periods									
								Danemark Années Denmark Years	Norvège et Suède Années & Sweden Years	Danemark Denmark	Norvège Norway	Suède Sweden					
1860				1895	22,2	38,0	27,3										
61				96	19,7	34,0	28,2										
62				97	20,7	34,0	28,1										
63				98	20,0	37,0	26,1										
64				99	18,7	37,7	27,6										
65				1900	19,6	35,8	27,4										
66				01	18,5	30,5	28,9										
67				02	16,6	30,3	27,8										
68				03	17,1	31,4	26,0										
69				04	17,9	33,0	26,4										
1870				05	17,3	31,1	26,6										
71				06	16,3	31,4	25,3										
72				07	15,7	29,4	24,4										
73				08	17,0	28,4	24,2										
74				09	14,9	25,9	23,4										
75				1910	13,3	26,4	23,3										
76	29,1			11	13,7	25,1	22,7										
77	26,5			12	14,8	23,9	22,9										
78	27,4			13	13,0	23,8	22,4										
79	29,8			14	13,2	22,9	22,2										
1880	27,1			15	12,0	23,9	23,8										
81	27,3			16	14,1	24,3	23,2										
82	28,8			17	16,8	23,5	21,9										
83	27,0			18	13,4	22,3	19,2										
84	30,8			19	11,5	21,1	18,5										
85	26,8			1920	11,9	22,9	18,0										
86	26,8			21	10,6	19,1	15,4										
87	25,4			22	10,2	19,9	16,5										
88	27,7			23	9,3	19,0	15,1										
89	26,0			24	10,9	20,0	14,8										
1890	27,3			25	10,2		14,9										
91	25,5	38,0	27,3	26	8,5												
92	24,3	36,5	29,3	27	8,2												
93	23,7	36,0	26,8	28	7,3												
94	22,7	36,5	27,8														
								1860-64					1861-65				
								1865-69					1866-70				
								1870-74					1871-75				
								1875-79					1876-80				
								1880-84					1881-85				
								1885-89					1886-90				
								1890-94					1891-95				
								1895-99					1896-00				
								1900-04					1901-05				
								1905-09					1906-10				
								1910-14					1911-15				
								1915-19					1916-20				
								1920-24					1921-25				
								1925					1926				
								28,2					28,3				
								26,5					26,5				
								24,6					37,0				
								20,2					35,7				
								17,9					31,3				
								16,2					28,3				
								13,5					23,9				
								13,6					22,8				
								10,6					19,5				
								8,9					15,3				
													Diminution en pourcentage • Decrease in Percentage				
								1890-91—1894-95					24,6				
								1920-21—1924-25					10,6				
													57,0%				
													47,3%				
													27,7				
													15,3				
													44,8%				

TABLEAU 26. — TABLE 26.

MORTALITÉ PAR TUBERCULOSE PULMONAIRE DANS LA POPULATION URBAINE.
MORTALITY FROM PULMONARY TUBERCULOSIS AMONG URBAN POPULATION.

SEXE FÉMININ. — FEMALES.

Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Années Years	Danemark Denmark	Norvège Norway	Suède Sweden	Périodes quinquennales — Five-year Periods						
								Danemark Années Denmark Years	Norvège et Suède Années Norway and Sweden Years	Danemark Denmark	Norvège Norway	Suède Sweden		
1860				95	16,6	30,1	20,7							
61				96	14,1	25,7	21,0							
62				97	14,6	27,0	21,8							
63				98	14,5	29,1	19,3							
64				99	13,7	29,5	21,4							
65				1900	14,5	27,5	21,3							
66				01	12,6	23,1	22,5	1860-64	1861-65					
67				02	11,6	22,4	21,2	1865-69	1866-70					
68				03	12,5	24,0	19,9	1870-74	1871-75					
69				04	13,0	26,0	20,5	1875-79	1876-80	23,9			29,1	
1870				05	12,9	24,7	20,8	1880-84	1881-85	23,2			27,1	
71				06	12,3	24,3	20,3	1885-89	1886-90	21,8			26,4	
72				07	12,0	23,5	19,1	1890-94	1891-95	18,1	28,7		22,5	
73				08	13,0	22,3	19,2	1895-99	1896-00	14,7	27,8		21,9	
74				09	10,9	19,9	18,5	1900-04	1901-05	12,9	24,1		20,9	
75				1910	10,1	20,1	18,3	1905-09	1906-10	12,3	22,0		19,1	
76	24,3		30,3	11	10,2	19,9	18,4	1910-14	1911-15	10,3	18,8		18,6	
77	22,7		30,1	12	11,5	18,4	18,4	1915-19	1916-20	10,3	18,0		16,6	
78	23,9		28,0	13	9,7	18,8	18,3	1920-24	1921-25	8,3	14,6		12,7	
79	24,7		27,6	14	10,1	18,2	18,2	1925	1926	7,1				
1880	22,5		29,6	15	9,5	19,0	19,6	1890-91—1894-95		18,1	28,7		22,5	
81	22,8		29,3	16	10,9	18,9	18,9	1920-21—1924-25		8,3	14,6		12,7	
82	23,4		26,5	17	12,6	18,2	18,0	Diminution en pourcentage . . .						
83	22,4		27,2	18	9,6	18,2	16,1	Decrease in percentage . . .		51,2%	49,1%		43,6%	
84	23,0		26,4	19	8,9	16,7	15,2							
85	21,7		26,0	1920	9,4	18,1	14,8							
86	21,4		25,8	21	8,3	15,0	12,6							
87	21,0		24,4	22	8,0	16,2	13,6							
88	21,9		27,9	23	7,3	15,0	12,6							
89	22,9		27,1	24	8,5	16,2	12,2							
1890	20,5		27,0	25	8,0		12,4							
91	19,1	29,4	25,2	26	6,8									
92	17,8	28,3	23,2	27	6,4									
93	16,9	27,1	21,3	28										
94	16,7	38,5	22,3											

TABLEAU 27. — TABLE 27.

DIMINUTION COMPARÉE DE LA MORTALITÉ GÉNÉRALE, DE LA MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) ET PAR TUBERCULOSE PULMONAIRE, PAR SEXE, DANS LES TROIS PAYS, DE LA PÉRIODE 1890-94—1891-95 A 1921-1924.

(Les chiffres de la première période quinquennale sont pris comme unités = 100.)

COMPARATIVE DECLINE OF GENERAL MORTALITY, MORTALITY FROM TUBERCULOSIS (ALL FORMS) AND FROM PULMONARY TUBERCULOSIS IN THE THREE COUNTRIES, BY SEX, FROM THE PERIOD 1890-94—1891-95 TO 1921-1924.

(The figures for the first five-year period are taken as units = 100.)

SEXE MASCULIN MALES		MORTALITÉ GÉNÉRALE GENERAL MORTALITY			MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) MORTALITY FROM TUBERCULOSIS (ALL FORMS)			MORTALITÉ PAR TUBERCULOSE PULMONAIRE MORTALITY FROM PULMONARY TUBERCULOSIS		
					Danemark Denmark	Norvège Norway	Suède Sweden	Danemark Denmark	Norvège Norway	Suède Sweden
Années	Years									
1890-94	1891-95	100	100	100	100	100	100	100	100	100
1895-99	1896-00	87,5	93,5	94,2	83,5	98,4	99,0	85,7	97,6	94,7
1900-04	1901-05	80,2	83,1	85,4	72,4	84,8	95,4	70,1	82,0	87,9
1905-09	1906-10	75,2	76,6	77,5	62,4	76,3	85,5	56,7	72,1	80,4
1910-14	1911-15	67,1	74,4	71,5	51,9	66,8	78,9	51,1	67,4	76,6
1915-19	1916-20	67,5	77,8	70,9	51,9	63,6	69,4	50,2	64,9	67,2
1920-24	1921-24	57,6	62,5	56,4	38,0	53,7	52,0	35,5	55,4	51,3
1925					31,5	45,3	44,4	31,2		
SEXE FÉMININ FEMALES										
1890-94	1891-95	100	100	100	100	100	100	100	100	100
1895-99	1896-00	85,0	89,8	91,4	82,1	96,5	99,3	81,2	96,9	97,3
1900-04	1901-05	77,7	82,9	86,8	72,7	84,6	98,0	71,3	84,0	92,9
1905-09	1906-10	75,6	78,4	80,6	65,8	76,5	87,0	67,9	76,6	84,9
1910-14	1911-15	69,4	75,6	76,7	54,9	64,6	86,0	56,9	65,5	82,7
1915-19	1916-20	73,3	79,3	78,6	55,2	61,6	72,9	56,9	62,7	73,8
1920-24	1921-25	66,1	65,2	66,9	43,1	52,7	55,2	45,8	50,9	56,3
1925	1926	63,9			36,1			39,3		

TABLEAU 28. — TABLE 28.

MORTALITÉ TUBERCULEUSE DANS LES CAPITALES. — TUBERCULOSIS MORTALITY IN THE CAPITALS.

Années Years	Copenhague Copenhagen	Oslo	Stockholm	Années Years	Copenhague Copenhagen	Oslo	Stockholm	Périodes quinquennales Five-year Periods						
								Danemark Années Denmark Years	Norvège et Suède Années Norway & Sweden Years	Copen- hague Copen- hagen	Oslo	Stock- holm		
1860				1895	28,9	37,4	34,2							
61				96	25,4	33,5	33,0							
62				97	24,6	33,1	33,7							
63				98	23,8	35,8	30,6							
64				99	22,5	36,7	33,3							
65				1900	23,6	37,1	31,1							
66				01	21,5	28,9	32,0							
67				02	16,7	27,9	30,0							
68				03	18,9	28,9	27,1							
69				04	19,6	29,2	28,9							
1870				05	20,3	33,8	29,2							
71				06	18,6	28,5	28,5							
72				07	17,1	27,2	29,4							
73		45,5		08	18,1	26,9	30,8							
74				09	16,7	24,5	30,0							
75				1910	14,9	23,6	28,7							
76	36,4			11	16,9	22,9	26,0							
77	37,0			12	16,9	23,9	28,7							
78	34,0	39,8		13	14,2	22,8	26,7							
79	38,9			14	14,9	21,9	28,1							
1880	38,6			15	14,4	21,4	28,1							
81	36,6			16	17,9	21,6	25,7							
82	37,1			17	19,7	19,4	23,9							
83	34,1	39,6		18	15,1	20,1	24,6							
84	37,0			19	12,8	18,9	24,5							
85	33,5			1920	11,8	20,9	21,7							
86	31,9			21	11,4	17,7	17,2							
87	32,5			22	10,6	18,8	17,0							
88	35,2	35,6		23	10,1	17,4	15,4							
89	32,3			24	12,5	18,1	16,7							
1890	32,7			25	10,6	16,9	16,3							
91	30,5	37,0	37,2	26	10,3	14,4	15,5							
92	28,9	36,4	36,4	27	9,4	16,4	16,2							
93	27,6	34,7	33,7	28			16,0							
94	27,5	32,9	33,8											
								Diminution en pourcentage - Decrease in percentage						
								1890-91—1894-95		29,4	35,0	35,3		
								1925—1926		10,1	15,9	15,9		
										65,6%	54,6%	54,9%		

TABLEAU 29. — TABLE 29.

MORTALITÉ PAR TUBERCULOSE PULMONAIRE DANS LES CAPITALES.
MORTALITY FROM PULMONARY TUBERCULOSIS IN THE CAPITALS.

Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Périodes quinquennales — Five-year Periods				
								Danemark Années Denmark Years	Norvège et Suède Années Norway and Sweden Years	Copen- hague Copen- hagen	Oslo	Stock- holm
1860	33.0			1895	19.7	30.2	25.5	1860-64	1861-65	30.9		
61	29.0			96	17.9	25.8	24.0	1865-69	1866-70	29.9		
62	29.0			97	17.7	26.8	25.9	1870-74	1871-75	34.6	35.0	
63	28.0			98	17.3	28.4	23.1	1875-79	1876-80	32.0	31.6	39.2
64	35.0			99	16.9	28.1	25.6	1880-84	1881-85	28.4	31.8	35.1
65	34.0			1900	17.7	27.6	24.3	1885-89	1886-90	24.9	28.3	31.6
66	30.0			01	15.3	23.2	24.6	1890-94	1891-95	20.8	27.7	27.4
67	29.0			02	11.7	20.4	23.0	1895-99	1896-00	17.8	26.8	24.8
68	28.0			03	13.8	21.2	21.4	1900-04	1901-05	14.5	22.9	23.1
69	28.0			04	14.6	21.9	22.2	1905-09	1906-10	13.8	20.7	22.8
1870	31.0			05	15.1	27.8	22.2	1910-14	1911-15	12.0	17.9	22.4
71	34.0			06	14.2	22.4	21.0	1915-19	1916-20	12.6	16.3	21.2
72	34.0			07	13.4	21.9	21.7	1920-24	1921-25	8.9	14.3	14.9
73	36.0	35.0		08	13.9	21.5	24.9	1925	1926	8.3		
74	37.0			09	12.6	19.9	24.1	1890-91—1894-95		20.8	27.7	27.4
75	36.0			1910	11.4	18.7	23.3	1920-21—1924-25		8.9	14.3	14.9
76	30.4		43.0	11	12.6	18.3	21.3					
77	30.7		43.1	12	13.2	19.1	23.3					
78	27.7	31.6	34.5	13	11.0	18.6	21.3					
79	31.3		36.2	14	11.9	17.3	22.6					
1880	30.9		37.5	15	11.5	16.4	23.3					
81	28.5		40.3	16	14.4	17.5	21.1					
82	28.9		32.5	17	15.7	16.0	19.9					
83	26.4	31.8	33.6	18	11.7	16.6	21.4					
84	27.6		31.7	19	10.1	15.1	20.5					
85	24.9		34.4	1920	9.3	16.3	18.4					
86	22.7		29.1	21	9.2	13.8	14.5					
87	25.8		27.6	22	8.3	15.1	14.4					
88	26.6	28.3	33.4	23	7.8	13.9	12.9					
89	24.3		33.5	24	9.9	14.4	14.2					
1890	23.8		27.9	25	8.6	13.6	14.0					
91	21.8	30.5	28.6	26	8.4	12.0						
92	19.8	28.6	27.9	27	7.8	13.7						
93	18.9	28.9	26.6	28								
94	19.9	25.3	25.8									
								Diminution en pourcentage . . .		57.2%	48.4%	45.6%
								Decrease in percentage . . .				

TABLEAU 30. — TABLE 30.

DIMINUTION COMPARÉE DE LA MORTALITÉ GÉNÉRALE, DE LA MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) ET PAR TUBERCULOSE PULMONAIRE, DANS LES TROIS CAPITALES, DE LA PÉRIODE 1890-91—1894-95 A 1924-25.

(Les chiffres de la première période quinquennale sont pris comme unités = 100.)

COMPARATIVE DECLINE OF GENERAL MORTALITY, MORTALITY FROM TUBERCULOSIS (ALL FORMS), AND FROM PULMONARY TUBERCULOSIS, IN THE THREE CAPITALS, FROM THE PERIOD 1890-91—1894-95 TO 1924-25.

(The figures for the first five-year period are taken as units = 100.)

Danemark Années	Norvège et Suède Années	MORTALITÉ GÉNÉRALE GENERAL MORTALITY			MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) MORTALITY FROM TUBERCULOSIS (ALL FORMS)			MORTALITÉ PAR TUBERCULOSE PULMONAIRE MORTALITY FROM PULMONARY TUBERCULOSIS		
		Copen- hague Copen- hagen	Oslo	Stockholm	Copen- hague Copen- hagen	Oslo	Stockholm	Copen- hague Copen- hagen	Oslo	Stockholm
1890-94	1891-95	100	100	100	100	100	100	100	100	100
1895-99	1896-00	85,5	91,9	91,0	84,7	98,9	93,2	85,6	96,7	90,5
1900-04	1901-05	82,1	83,1	80,7	67,7	85,1	84,4	69,7	82,7	84,3
1905-09	1906-10	74,7	72,7	76,4	61,6	74,0	83,9	66,3	74,7	83,2
1910-14	1911-15	67,2	71,3	70,5	53,1	64,3	78,2	57,7	64,6	81,7
1915-19	1916-20	67,6	69,6	68,6	54,1	57,4	71,9	60,6	58,8	77,4
1920-24	1921-25	59,0	61,9	57,3	38,4	51,4	50,2	42,8	51,6	54,4

TABLEAU 31. — TABLE 31.

MORTALITÉ TUBERCULEUSE DANS LES TROIS CAPITALES.

TUBERCULOSIS MORTALITY IN THE THREE CAPITALS.

SEXE MASCULIN. — MALES.

Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Années Year	Copen- hague Copen- hagen	Oslo	Stock- holm	Périodes quinquennales — Five-year Periods				
								Danemark Années Denmark Years	Norvège et Suède Années Norway & Sweden Years	Copen- hague Copen- hagen	Oslo	Stock- holm
1860				1895	36,5	39,4		1860-64	1861-65			
61				96	33,4	33,6		1865-69	1866-70			
62				97	30,7	37,1		1870-74	1871-75		47,8	
63				98	29,4	38,3		1875-79	1876-80	42,4	44,2	
64				99	28,5	36,8		1880-84	1881-85	42,8	42,5	
65				1900	30,9	37,6		1885-89	1886-90	39,3	39,4	
66				01	27,2	29,8		1890-94	1891-95	36,3	37,3	
67				02	20,7	30,1		1895-99	1896-00	31,6	36,0	
68				03	23,7	30,3		1900-04	1901-05	25,3	30,4	
69				04	24,7	29,0		1905-09	1906-10	21,8	26,7	
1870				05	26,4	32,7		1910-14	1911-15	18,2	23,7	
71				06	22,0	28,2		1915-19	1916-20	18,9	21,3	
72				07	20,1	28,4		1920-24	1921-25	12,4	20,2	
73				08	21,3	27,7		1925	1926	11,3		
74				09	19,4	25,9		Diminution en pourcentage - Decrease in Percentage				
75				1910	17,0	24,4		1890-91—1894-95		36,3	37,3	
76	41,6			11	20,3	23,4		1920-21—1924-25		12,4	20,2	
77	44,7			12	19,3	25,5				65,8%	45,8%	
78	39,1			13	17,7	25,7						
79	44,3			14	16,5	21,8						
1880	46,2			15	16,6	23,2						
81	41,4			16	21,9	24,5						
82	45,0			17	23,1	20,7						
83	41,9			18	17,6	21,9						
84	39,9			19	15,7	18,9						
85	39,6			1920	12,9	20,9						
86	37,5			21	13,3	19,1						
87	38,3			22	11,3	21,2						
88	43,5			23	11,9	19,7						
89	38,0			24	13,5	20,5						
1890	39,9			25	11,7							
91	36,9	38,1		26	11,7							
92	36,4	40,0		27	10,5							
93	34,7	37,7		28								
94	33,8	35,0										

TABLEAU 32. — TABLE 32.

MORTALITÉ PAR TUBERCULOSE PULMONAIRE DANS LES TROIS CAPITALES.
MORTALITY FROM PULMONARY TUBERCULOSIS IN THE THREE CAPITALS.

SEXE MASCULIN. — MALES.

Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Périodes quinquennales — Five-year Periods				
								Danemark Années Denmark Years	Norvège et Suède Années & Sweden Years	Copen- hague Copen- hagen	Oslo	Stock- holm
1860				1895	25,3	30,9		1860-64	1861-65			
61				96	24,5	26,2		1865-69	1866-70			
62				97	23,0	30,0		1870-74	1871-75		36,4	
63				98	22,2	30,0		1875-79	1876-80	34,5	34,4	
64				99	22,2	27,7		1880-84	1881-85	32,9	33,6	
65				1900	23,8	27,8		1885-89	1886-90	29,6	31,1	
66				01	20,4	24,3		1890-94	1891-95	26,2	29,4	
67				02	15,5	21,3		1895-99	1896-00	23,4	27,8	
68				03	18,1	21,0		1900-04	1901-05	19,2	22,9	
69				04	18,6	21,1		1905-09	1906-10	16,9	21,0	
1870				05	20,2	26,7		1910-14	1911-15	14,3	18,7	
71				06	16,9	22,0		1915-19	1916-20	15,2	17,3	
72				07	16,1	22,1		1920-24	1921-25	9,9	15,9	
73				08	16,9	21,9		1925	1926	9,4		
74				09	14,8	21,2		Diminution en pourcentage - Decrease in Percentage				
75				1910	13,2	18,6		1890-91—1894-95		26,2	29,4	
76	34,8			11	15,2	18,3		1920-21—1924-25		9,9	15,9	
77	37,1			12	15,1	20,1				62,2%	45,9%	
78	30,9			13	14,2	20,8						
79	34,6			14	13,5	17,3						
1880	37,1			15	13,3	17,6						
81	32,4			16	17,9	19,8						
82	34,8			17	18,8	17,1						
83	31,7			18	14,4	17,9						
84	29,1			19	11,9	15,4						
85	29,2			1920	10,1	16,4						
86	25,6			21	10,6	14,7						
87	30,7			22	9,0	16,8						
88	33,5			23	9,1	15,5						
89	28,8			24	10,7	16,4						
1890	29,3			25	9,5							
91	27,1	31,1		26	9,8							
92	25,1	32,0		27	8,9							
93	24,7	30,1		28								
94	24,9	26,0										

TABLEAU 33. — TABLE 33.
MORTALITÉ TUBERCULEUSE DANS LES TROIS CAPITALES.
TUBERCULOSIS MORTALITY IN THE THREE CAPITALS.

SEXE FÉMININ. — FEMALES.

Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Périodes quinquennales — Five-year Periods.				
								Danemark Années Denmark Years	Norvège et Suède Années Norway & Sweden Years	Copen- hague Copen- hagen	Oslo	Stock- holm
1860				1895	22,5	35,7		1860-64	1861-65			
61				96	18,7	33,5		1865-69	1866-70			
62				97	19,5	29,8		1870-74	1871-75		43,4	
63				98	19,1	33,7		1875-79	1876-80	31,6	35,9	
64				99	17,5	36,6		1880-84	1881-85	31,6	37,2	
65				1900	17,6	36,7		1885-89	1886-90	27,8	32,4	
66				01	16,7	28,3		1890-94	1891-95	23,6	33,1	
67				02	13,4	26,2		1895-99	1896-00	19,4	33,5	
68				03	14,9	27,8		1900-04	1901-05	15,5	29,3	
69				04	15,4	29,4		1905-09	1906-10	15,1	25,3	
1870				05	15,3	34,7		1910-14	1911-15	13,5	21,4	
71				06	15,7	28,8		1915-19	1916-20	13,6	19,0	
72				07	14,6	26,3		1920-24	1921-25	10,3	16,3	
73				08	15,4	26,5		1925	1926	9,1		
74				09	14,4	23,4		Diminution en pourcentage - Decrease in Percentage				
75				1910	13,1	23,0						
76	31,8			11	14,4	22,5		1890-91—1894-95		23,6	33,1	
77	30,4			12	15,1	22,6		1920-21—1924-25		10,3	16,3	
78	29,7			13	11,4	20,4				56,3%	50,8%	
79	34,4			14	13,6	22,0						
1880	32,1			15	12,5	19,9						
81	31,2			16	14,7	19,2						
82	32,3			17	16,5	18,3						
83	27,5			18	13,5	18,7						
84	34,6			19	11,1	18,3						
85	28,3			1920	11,3	20,9						
86	27,6			21	10,0	16,6						
87	27,5			22	10,1	17,0						
88	28,3			23	8,7	15,5						
89	27,5			24	11,6	16,1						
1890	26,5			25	9,6							
91	25,2	36,0		26	9,2							
92	22,5	33,3		27	8,4							
93	21,7	32,3		28								
94	22,3	31,3										

TABLEAU 34. — TABLE 34.

MORTALITÉ PAR TUBERCULOSE PULMONAIRE DANS LES TROIS CAPITALES.
MORTALITY FROM PULMONARY TUBERCULOSIS IN THE THREE CAPITALS.

SEXE FÉMININ. — FEMALES.

Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Années Years	Copen- hague Copen- hagen	Oslo	Stock- holm	Périodes quinquennales — Five-year Periods				
								Danemark Années Denmark Years	Norvège et Suède Années & Sweden Years	Copen- hague Copen- hagen	Oslo	Stock- holm
1860				1895	15,0	29,6		1860-64	1861-65			
61				96	12,5	25,5		1865-69	1866-70			
62				97	13,2	24,1		1870-74	1871-75		33,7	
63				98	13,2	27,1		1875-79	1876-80	26,1	29,1	
64				99	12,4	28,5		1880-84	1881-85	24,6	30,2	
65				1900	12,6	27,4		1885-89	1886-90	20,9	25,9	
66				01	10,9	22,3		1890-94	1891-95	16,2	26,2	
67				02	8,5	19,7		1895-99	1896-00	13,3	26,0	
68				03	10,2	21,4		1900-04	1901-05	10,7	22,9	
69				04	11,3	22,6		1905-09	1906-10	11,3	20,4	
1870				05	11,0	28,6		1910-14	1911-15	10,2	17,2	
71				06	11,9	22,7		1915-19	1916-20	10,5	15,4	
72				07	11,2	21,8		1920-24	1921-25	8,2	13,0	
73				08	11,5	21,2		1925	1926	7,3		
74				09	10,9	18,9		Diminution en pourcentage - Decrease in percentage				
75				1910	9,9	18,7		1890-91—1894-95		16,2	26,2	
76	26,2			11	10,4	18,3		1920-21—1924-25		8,2	13,0	
77	25,2			12	11,6	18,2				49,4 %	50,4 %	
78	25,1			13	8,4	16,7						
79	27,8			14	10,7	17,4						
1880	25,6			15	9,9	15,5						
81	25,1			16	11,4	15,6						
82	23,9			17	12,8	15,2						
83	21,9			18	9,8	15,6						
84	20,4			19	8,9	14,8						
85	21,4			1920	9,6	16,2						
86	20,2			21	8,0	13,0						
87	21,7			22	7,7	13,7						
88	20,8			23	6,6	12,7						
89	20,6			24	9,0	12,8						
1890	19,1			25	7,8							
91	17,4	30,0		26	7,3							
92	15,3	25,7		27	6,9							
93	13,9	23,5		28								
94	15,8	24,8										

TABLEAU 35. — TABLE 35.

DIMINUTION COMPARÉE DE LA MORTALITÉ GÉNÉRALE, DE LA MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) ET PAR TUBERCULOSE PULMONAIRE, PAR SEXE, DANS LES TROIS CAPITALES, DE LA PÉRIODE 1890-91—1894-95 A 1920-21—1924-25.

(Les chiffres de la première période quinquennale sont pris comme unités = 100.)

COMPARATIVE DECLINE OF GENERAL MORTALITY, MORTALITY FROM TUBERCULOSIS (ALL FORMS), AND FROM PULMONARY TUBERCULOSIS, IN THE THREE CAPITALS, BY SEX, FROM THE PERIOD 1890-91—1894-95 TO 1920-21—1924-25.

(The figures for the first five-year period are taken as units = 100.)

Sexe masculin Males		MORTALITÉ GÉNÉRALE GENERAL MORTALITY			MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) MORTALITY FROM TUBERCULOSIS (ALL FORMS)			MORTALITÉ PAR TUBERCULOSE PULMONAIRE MORTALITY FROM PULMONARY TUBERCULOSIS		
Danemark Années Denmark Years	Norvège et Suède Années Norway & Sweden Years	Copen- hague Copen- hagen	Oslo	Stockholm	Copen- hague Copen- hagen	Oslo	Stockholm	Copen- hague Copen- hagen	Oslo	Stockholm
1890-94	1891-95	100	100	100	100	100		100	100	
1895-99	1896-00	87,4	92,6	97,8	87,0	96,5		89,3	94,6	
1900-04	1901-05	79,9	81,4	81,5	69,2	81,5		73,3	77,9	
1905-09	1906-10	75,1	70,5	76,5	60,1	71,6		64,5	71,4	
1910-14	1911-15	65,8	68,8	69,7	50,2	63,6		54,6	63,6	
1915-19	1916-20	64,8	66,5	66,1	52,1	57,1		58,0	58,8	
1920-24	1921-25	54,8	59,6	52,0	34,2	54,2		37,8	54,1	
Sexe féminin Females										
1890-94	1891-95	100	100	100	100	100		100	100	
1895-99	1896-00	83,6	91,3	88,3	82,2	101,2		82,1	99,3	
1900-04	1901-05	76,4	85,0	79,8	65,7	88,5		66,1	87,4	
1905-09	1906-10	74,5	75,2	76,3	63,9	76,4		69,8	77,9	
1910-14	1911-15	68,8	73,8	71,5	57,2	64,6		62,9	65,6	
1915-19	1916-20	70,8	72,8	71,4	57,6	57,4		64,8	58,8	
1920-24	1921-25	63,8	64,3	62,9	43,7	49,2		50,6	49,6	
1925	1926				38,6			45,1		

TABLEAU 36. — TABLE 36.

MORTALITÉ PAR AGE ET PAR SEXE EN NORVÈGE EN 1921-1925.

MORTALITY BY AGE AND SEX IN NORWAY IN 1921-1925.

Sexe masculin Males	TAUX PAR 10.000 RATES PER 10,000				MORTALITÉ PROPORTIONNELLE (PAR 100 DÉCÈS) PROPORTIONAL MORTALITY (PER 100 DEATHS)		
	Age	Tuberculose Tuberculosis	Autres maladies Other Diseases	Accidents	Total	Tuberculose Tuberculosis	Autres maladies Other Diseases	Accidents
0-1	22,1	557,2	2,1	581,4	3,8	95,8	0,4
1-4	9,3	35,0	7,0	51,3	18,1	68,2	13,7
5-9	5,9	10,7	4,3	20,9	28,2	51,2	20,6
10-14	7,3	8,0	3,2	18,5	39,5	43,2	17,3
15-19	22,9	11,3	6,1	40,3	56,8	28,0	15,2
20-24	43,8	15,6	9,9	69,3	63,2	22,5	14,3
25-29	37,0	16,1	10,7	63,8	58,0	25,2	16,8
30-39	25,2	23,6	10,2	58,8	42,9	40,1	17,0
40-49	17,7	45,5	9,2	72,4	24,4	62,9	12,7
50-59	15,9	98,3	9,2	123,4	12,9	79,7	7,4
60-69	18,5	236,5	9,4	264,4	7,0	89,4	3,6
70-79	14,6	612,5	7,8	634,9	2,3	96,5	1,2
80 & +	6,3	1.768,8	10,9	1.786,0	0,4	99,0	0,6
Total	19,7	89,8	7,7	117,2	16,8	76,6	6,6
Sexe féminin Females							
Age							
0-1	17,0	452,7	1,3	471,0	3,6	96,1	0,3
1-4	8,9	31,6	3,6	44,1	20,2	71,6	8,2
5-9	7,0	10,5	1,5	19,0	36,8	55,3	7,9
10-14	11,9	7,9	0,6	20,4	58,3	38,8	2,9
15-19	31,9	10,0	1,1	43,0	74,2	23,3	2,5
20-24	42,0	13,2	1,1	56,3	74,6	23,4	2,0
25-29	36,6	16,4	0,7	53,7	68,2	30,5	1,3
30-39	25,7	26,2	0,8	52,7	48,8	49,7	1,5
40-49	18,1	45,1	1,0	64,2	28,2	70,3	1,5
50-59	15,7	86,8	1,7	104,2	15,1	83,3	1,6
60-69	15,3	200,1	1,9	217,3	7,0	92,1	0,9
70-79	14,5	528,9	2,7	546,1	2,7	96,8	0,5
80 & +	8,2	1.631,9	3,6	1.643,7	0,5	99,3	0,2
Total	20,9	90,1	1,4	112,4	18,6	80,2	1,2

TABLEAU 37. — TABLE 37.

MORTALITÉ PAR AGE ET PAR SEXE AU DANEMARK EN 1920-1924 (POUR LA TUBERCULOSE EN 1920-1925)

MORTALITY BY AGE AND SEX IN DENMARK IN 1920-1924 (FOR TUBERCULOSIS IN 1920-1925).

Sexe masculin Males	TAUX DE MORTALITÉ PAR 10.000 DEATH RATES PER 10,000				MORTALITÉ PROPORTIONNELLE (PAR 100 DÉCÈS) PROPORTIONAL MORTALITY (PER 100 DEATHS)		
	Tuberculose Tuberculosis	Autres maladies Other Diseases	Accidents	Total	Tuberculose Tuberculosis	Autres maladies Other Diseases	Accidents
Age							
0-4	8,5	244,4	8,2	261,1	3,4	92,3	3,3
5-9	3,6	11,6	2,4	17,6	20,5	65,9	13,6
10-14	3,2	9,3	2,0	14,5	22,1	64,1	13,8
15-19	8,1	14,5	3,6	26,2	30,9	55,4	13,7
20-24	13,0	19,7	4,1	36,8	35,3	53,5	11,2
25-34	11,6	22,4	3,5	37,5	30,9	59,8	9,3
35-44	9,5	34,1	2,9	46,5	20,4	73,3	6,3
45-54	10,1	73,2	3,0	86,3	11,7	84,8	3,5
55-64	10,9	179,3	4,5	194,7	5,6	92,1	2,3
65-74	13,8	446,5	5,7	466,0	3,0	95,8	1,2
75 & +	8,3						
Total	8,7						
Sexe féminin Females							
Age							
0-4	7,6	187,5	5,9	201,0	3,8	93,3	2,9
5-9	3,9	11,8	0,6	16,3	23,8	72,5	3,7
10-14	5,3	9,1	0,5	14,9	35,6	61,1	3,3
15-19	14,3	12,2	0,5	27,0	53,0	45,1	1,9
20-24	16,8	16,7	0,5	34,0	49,1	49,4	1,5
25-34	14,9	25,1	0,3	40,3	35,0	64,3	0,7
35-44	10,7	42,4	0,5	53,6	19,9	79,2	0,9
45-54	9,9	78,0	0,7	88,6	11,2	88,0	0,8
55-64	11,1	168,7	1,0	180,8	6,1	93,3	0,6
65-74	12,9	433,0	1,9	447,8	2,9	96,7	0,4
75 & +	8,6						
Total	10,5						

TABLEAU 38. — TABLE 38.

MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE (PAR 10.000 HABITANTS),
EN 1919-1922, EN NORVÈGE.

TUBERCULOSIS MORTALITY BY AGE AND SEX (PER 10,000 INHABITANTS),
IN 1919-1922, IN NORWAY.

Age	ENSEMBLE DU PAYS WHOLE OF THE COUNTRY		CAMPAGNES (DISTRICTS) COUNTRY (DISTRICTS)		VILLES TOWNS		OSLO	
	Masculin Males	Féminin Females	Masculin Males	Féminin Females	Masculin Males	Féminin Females	Masculin Males	Féminin Females
0-1	21,7	19,4	20,5	17,1	25,0	23,1	24,9	27,9
1-4	10,1	9,8	8,3	8,6	15,8	13,6	18,4	16,6
5-9	6,9	7,8	6,2	7,1	8,8	9,7	8,0	6,0
10-14	7,2	12,0	7,3	12,2	7,0	11,4	3,8	9,6
15-19	24,6	32,6	23,9	33,3	26,2	31,1	21,1	27,0
20-29	43,0	38,9	45,1	43,2	38,6	31,7	26,5	26,3
30-39	25,5	29,1	25,3	32,5	26,1	22,7	21,9	18,4
40-49	19,1	20,8	18,4	22,0	20,6	18,5	21,0	15,8
50-59	16,6	17,3	15,9	18,2	18,2	15,3	24,2	14,0
60-69	18,2	16,3	16,7	17,1	22,7	14,4	21,8	15,9
70-79	13,3	14,3	13,6	15,5	12,2	11,3	12,9	10,0
80 & +	9,4	10,1	10,7	11,5	2,3	5,5	—	2,0
Total	20,5	21,9	19,8	22,4	22,3	20,5	20,0	18,1

MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE (PAR 10.000 HABITANTS),
EN 1920-1925, AU DANEMARK.

TUBERCULOSIS MORTALITY BY AGE AND SEX (PER 10,000 INHABITANTS),
IN 1920-1925, IN DENMARK.

Age	ENSEMBLE DU PAYS WHOLE OF THE COUNTRY		POPULATION RURALE RURAL POPULATION		VILLES DE PROVINCE PROVINCIAL TOWNS		COPENHAGUE ¹ COPENHAGEN ¹	
	Masculin Males	Féminin Females	Masculin Males	Féminin Females	Masculin Males	Féminin Females	Masculin Males	Féminin Females
0-4	8,5	7,6	6,9	5,9	8,9	8,5	14,6	12,7
5-9	3,6	3,9	3,3	3,7	3,0	3,7	5,0	5,4
10-14	3,2	5,3	3,4	5,2	2,5	5,1	3,6	5,9
15-19	8,1	14,3	6,7	13,7	10,9	13,8	10,6	16,3
20-24	13,0	16,8	11,3	17,3	15,3	17,2	15,1	15,3
25-34	11,6	14,9	10,6	16,1	12,3	15,3	13,3	12,5
35-44	9,5	10,7	7,7	11,4	8,8	10,6	14,2	9,3
45-54	10,1	9,9	8,5	10,7	8,4	9,8	16,2	8,5
55-64	10,9	11,1	10,4	13,5	9,9	9,7	13,8	7,3
65-74	13,8	12,9	12,9	14,9	12,3	12,7	19,6	8,2
75 & +	8,3	8,6	7,5	8,9	7,9	8,2	13,9	8,3
Total	8,7	10,5	7,4	10,7	8,9	10,7	12,4	10,1

¹ Y compris Frederiksberg.

¹ Together with Frederiksberg.

TABLEAU 39. — TABLE 39.

ÉVOLUTION DE LA MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE EN NORVÈGE
(ENSEMBLE DU PAYS) PAR 10.000 HABITANTS.EVOLUTION OF TUBERCULOSIS MORTALITY BY AGE AND SEX IN NORWAY
(WHOLE OF THE COUNTRY) PER 10,000 INHABITANTS.

Sexe masculin — Males													
Age	1871-75	1876-80	1881-85	1886-90	1891-95	1896-00	1901-05	1906-10	1911-15	1916-20	1921-25	1926	1927
0-1	68,6	64,1	70,4	58,1	61,9	60,1	49,1	34,9	29,4	24,1	22,1	20,8	24,4
1-4	26,1	30,4	30,0	26,5	23,7	27,4	20,4	18,5	15,1	11,3	9,3	7,2	8,5
5-9	12,9	11,5	13,4	12,8	12,5	15,0	11,9	10,3	8,6	7,7	5,9	4,8	5,4
10-14	8,6	9,1	10,6	10,5	11,9	14,5	13,0	11,6	8,7	8,6	7,3	5,2	3,9
15-19	15,4	22,0	22,7	21,1	25,2	31,9	30,9	28,9	27,2	26,6	22,9	16,4	16,9
20-24	32,8	37,6	41,2	40,0	46,5	50,4	49,5	45,8	48,8	49,3	43,8	35,5	35,6
25-29														43,6	41,2	37,0	35,6	31,4
30-39	27,7	28,4	30,6	28,9	33,5	36,0	32,4	31,2	29,0	28,4	25,2	21,1	22,8
40-49	21,7	28,9	23,9	23,4	26,5	27,0	26,0	23,2	22,0	21,1	17,7	17,6	15,6
50-59	24,0	22,9	22,2	21,6	27,6	28,1	23,7	23,4	21,9	18,6	15,9	15,3	14,3
60-69	26,3	24,8	22,1	21,8	29,8	29,6	26,4	24,0	21,7	19,6	18,5	16,0	15,4
70-79	22,8	16,2	25,1	17,5	21,1	22,8	17,4	19,0	18,1	15,4	14,6	13,1	12,3
80 & +	7,9	3,2	8,7	8,2	9,2	10,2	9,1	7,5	8,4	5,8	6,3	7,7	10,2
Total	23,3	25,0	26,5	24,3	27,2	29,9	26,8	24,4	23,0	22,2	19,7	16,9	16,7
Sexe féminin — Females													
Age	1871-75	1876-80	1881-85	1886-90	1891-95	1896-00	1901-05	1906-10	1911-15	1916-20	1921-25	1926	1927
0-1	59,7	56,0	60,4	60,6	57,5	57,5	43,1	31,0	27,1	21,8	17,0	18,2	16,0
1-4	27,4	28,0	29,8	24,0	23,8	27,3	20,9	16,2	12,6	11,7	8,9	8,0	8,3
5-9	15,5	16,6	15,4	14,4	14,6	19,2	14,3	12,9	10,4	8,5	7,0	6,2	5,4
10-14	13,1	16,5	17,1	17,9	19,1	22,3	20,8	19,1	15,4	13,3	11,9	8,2	8,2
15-19	22,8	27,5	26,9	28,5	32,1	37,5	39,0	35,5	33,3	32,8	31,9	21,6	22,7
20-24	27,5	34,1	34,0	35,7	38,3	41,9	43,8	43,9	40,6	40,7	42,0	34,5	30,6
25-29														39,5	37,5	36,6	31,5	31,8
30-39	30,3	34,0	37,9	37,3	39,2	41,1	40,4	38,5	33,6	31,8	25,7	21,5	21,7
40-49	29,7	28,7	31,6	28,3	32,4	31,8	30,4	27,9	25,4	22,9	18,1	15,0	15,7
50-59	27,4	25,8	27,4	24,7	26,4	28,9	25,3	23,8	19,3	18,9	15,7	12,1	14,9
60-69	31,7	23,8	31,0	23,0	27,6	29,3	24,4	22,4	19,5	16,9	15,3	14,3	15,3
70-79	18,6	16,8	24,3	18,8	25,4	24,8	18,3	19,9	16,7	14,4	14,5	11,8	15,2
80 & +	9,6	9,4	6,6	5,1	11,9	9,2	8,1	8,1	9,2	6,8	8,2	7,9	11,0
Total	25,6	27,0	29,2	27,2	29,3	31,9	29,5	27,4	24,2	22,9	20,9	17,0	17,3

TABLEAU 40. — TABLE 40.

ÉVOLUTION DE LA MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE A OSLO PAR 10.000 HABITANTS.

EVOLUTION OF TUBERCULOSIS MORTALITY BY AGE AND SEX IN OSLO PER 10,000 INHABITANTS.

Sexe masculin — Males													
Age	1871-75	1876-80	1881-85	1886-90	1891-95	1896-00	1901-05	1906-10	1911-15	1916-20	1921-25	1926	1927
0-1	90,3	79,2	62,8	65,5	65,2	69,1	31,3	29,8	35,4	28,2	26,7	18,0	20,6
1-4	69,9	60,4	41,0	46,8	41,0	40,8	30,4	20,4	22,4	18,1	15,4	10,5	17,1
5-9	29,1	24,6	24,0	23,8	21,0	23,0	17,4	10,7	9,9	9,1	6,3	11,4	7,0
10-14	13,7	10,6	16,3	12,3	15,2	14,4	12,3	12,2	6,7	5,7	5,4	4,4	3,3
15-19	20,5	26,2	22,8	24,8	30,8	26,1	27,4	28,3	20,0	23,1	20,9	10,5	13,6
20-29	49,6	48,2	52,2	51,9	43,7	41,5	45,7	37,7	31,7	27,1	27,8	23,1	30,9
30-39	62,8	54,6	55,3	44,4	43,3	38,5	33,9	34,1	29,6	27,1	22,9	24,0	27,2
40-49	61,9	48,9	52,7	39,7	41,5	37,0	36,3	31,2	29,3	23,8	18,5	15,0	21,1
50-59	57,8	55,4	55,8	48,8	47,8	50,9	29,9	31,2	26,5	22,0	22,3	17,1	17,5
60-69	57,3	62,4	62,7	64,0	52,8	52,0	38,0	37,0	34,7	22,9	23,8	17,6	8,7
70-79	52,9	35,1	53,1	41,7	33,9	44,1	25,5	24,7	28,1	14,8	13,0	13,5	13,1
80 & +	—	—	18,9	13,5	55,0	28,9	21,3	19,6	4,3	4,2	—	17,1	—
Total	47,8	44,2	42,5	39,4	37,3	36,0	30,4	26,7	23,7	21,3	19,8	16,1	19,6
Sexe féminin — Females													
Age	1871-75	1876-80	1881-85	1886-90	1891-95	1896-00	1901-05	1906-10	1911-15	1916-20	1921-25	1926	1927
0-1	84,1	78,9	48,6	64,9	62,8	68,5	32,8	16,8	29,4	26,3	24,3	20,0	34,0
1-4	77,3	48,0	47,8	40,6	43,2	46,9	29,7	19,7	19,3	15,3	14,4	8,9	13,6
5-9	28,7	27,3	20,4	24,3	21,8	21,4	17,3	13,2	9,4	8,1	5,1	8,1	8,2
10-14	21,1	21,3	24,6	27,6	18,4	22,9	23,9	16,3	12,8	11,5	8,9	5,4	6,7
15-19	32,6	27,4	26,4	29,7	29,6	31,4	34,2	33,6	26,7	27,6	26,0	16,3	18,5
20-29	39,3	35,0	37,4	31,7	34,5	32,2	37,4	33,5	26,5	25,3	23,7	21,9	25,3
30-39	42,9	36,6	49,0	33,9	35,1	37,7	35,0	33,6	26,3	21,7	15,4	11,7	13,4
40-49	48,8	43,9	43,8	30,3	35,5	33,4	24,8	24,0	20,7	16,2	13,1	13,0	7,8
50-59	51,3	33,0	41,1	35,0	31,6	30,5	23,9	18,7	18,6	16,0	10,8	11,2	7,5
60-69	51,5	31,6	38,2	36,4	34,0	30,8	20,1	22,6	19,9	13,9	14,5	8,4	7,5
70-79	50,1	45,2	26,9	19,4	36,1	44,2	29,6	23,6	16,8	12,0	12,2	5,4	12,1
80 & +	—	9,1	22,5	11,2	25,5	11,7	14,4	18,6	18,6	8,1	5,7	—	—
Total	43,4	35,9	37,2	32,4	33,1	33,5	29,3	25,3	21,4	19,0	16,1	13,1	13,9

TABLEAU 41. — TABLE 41.

ÉVOLUTION DE LA MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE
PAR 10.000 HABITANTS A COPENHAGUE.

EVOLUTION OF TUBERCULOSIS MORTALITY BY AGE AND SEX
PER 10,000 INHABITANTS IN COPENHAGEN

Sexe masculin — Males							
Age	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-25
0-4	59,6	49,2	34,4	25,7	20,2	17,9	14,6
5-9	18,0	16,2	11,7	9,7	6,5	6,8	5,0
10-14	8,2	9,5	4,9	5,5	4,4	5,9	3,6
15-19	20,2	15,7	12,5	11,5	13,3	15,1	10,6
20-24	24,3	25,1	20,7	19,1	18,9	20,6	15,1
25-34	35,6	28,5	26,0	21,9	20,8	21,0	13,3
35-44	48,4	44,4	30,9	30,5	24,2	24,9	14,2
45-54	49,7	46,8	42,1	32,9	25,9	25,5	16,2
55-64	50,3	43,7	41,8	40,9	28,3	27,1	13,8
65-74	53,7	41,3	41,2	28,6	26,3	28,9	19,6
75 & +	47,5	41,3	32,8	19,5	8,6	20,4	13,9
Sexe féminin — Females							
0-4	50,7	47,7	31,0	21,5	17,3	17,0	12,7
5-9	19,5	15,5	14,5	9,9	9,3	8,4	5,4
10-14	14,3	11,3	8,1	8,1	6,7	7,4	5,9
15-19	17,0	13,8	10,9	15,8	13,3	17,1	16,3
20-24	16,7	13,9	13,2	16,7	15,3	17,9	15,3
25-34	23,0	18,2	16,2	18,9	18,0	16,5	12,5
35-44	23,8	19,0	14,9	16,9	14,4	14,6	9,3
45-54	20,8	18,9	14,7	12,8	11,8	10,8	8,5
55-64	22,9	16,2	16,1	10,7	12,1	11,0	7,3
65-74	22,9	18,1	15,8	12,5	10,0	11,7	8,2
75 & +	18,7	13,8	10,4	13,8	10,9	11,7	8,3

TABLEAU 42. — TABLE 42.

ÉVOLUTION DE LA MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE
PAR 10.000 HABITANTS EN NORVÈGE.

EVOLUTION OF TUBERCULOSIS MORTALITY BY AGE AND SEX
PER 10,000 INHABITANTS IN NORWAY.

Sexe masculin — Males								
Age	POPULATION RURALE RURAL POPULATION				POPULATION URBAINE URBAN POPULATION			
	1889-92	1899-02	1909-12	1919-22	1889-92	1899-02	1909-12	1919-22
0-1	62,6	55,3	29,9	20,5	82,1	80,3	43,3	25,0
1-4	18,6	19,4	12,2	8,3	44,0	35,3	22,1	15,8
5-9	11,7	11,8	9,0	6,2	24,4	20,5	12,8	8,8
10-14	10,8	12,7	8,9	7,3	18,2	17,8	10,5	7,0
15-19	21,1	31,2	26,2	23,9	35,0	30,7	28,2	26,2
20-24	43,6	56,3	52,7	49,2	59,4	50,5	42,6	40,5
25-29				40,2				36,4
30-39	30,5	33,7	30,0	25,3	46,5	40,5	32,4	26,1
40-49	21,1	24,8	21,0	18,4	41,4	36,4	30,6	20,6
50-59	20,6	22,4	19,1	15,9	43,7	39,1	26,7	18,2
60-69	20,3	25,2	19,6	16,7	44,0	40,9	30,7	22,7
70-79	15,4	19,4	18,1	13,6	28,0	26,2	18,7	12,2
80 & +	7,9	10,4	6,8	10,7	13,1	8,3	9,7	2,3
Total	23,2	26,9	22,0	19,8	41,1	36,2	26,7	22,3
Sexe féminin — Females								
0-1	56,6	52,7	25,5	17,1	74,4	74,5	35,6	23,1
1-4	16,7	18,3	11,6	8,6	43,3	36,6	19,8	13,6
5-9	13,2	16,4	9,7	7,1	29,9	23,0	16,7	9,7
10-14	16,0	21,6	14,9	12,2	29,0	21,7	17,0	11,4
15-19	31,3	40,0	32,3	33,3	38,4	34,6	27,2	31,1
20-24	37,5	46,3	43,9	45,2	37,1	36,2	33,5	33,8
25-29				41,0				29,1
30-39	36,3	40,6	34,4	32,5	45,4	41,4	32,9	22,7
40-49	27,2	31,6	26,9	22,0	38,7	30,8	24,6	18,5
50-59	23,1	29,4	21,4	18,2	35,8	28,9	20,9	15,3
60-69	21,8	25,4	19,2	17,1	36,1	25,2	19,6	14,4
70-79	19,1	20,0	19,6	15,5	34,5	22,5	16,6	11,3
80 & +	12,2	8,0	9,3	11,5	14,3	12,2	13,4	5,5
Total	25,9	30,2	24,1	22,4	38,2	32,9	24,9	20,5

TABLEAU 43. — TABLE 43.

ÉVOLUTION DE LA MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE
PAR 10.000 HABITANTS AU DANEMARK (POPULATION URBAINE).

EVOLUTION OF TUBERCULOSIS MORTALITY BY AGE AND SEX
PER 10,000 INHABITANTS IN DENMARK (URBAN POPULATION).

Sexe masculin — Males							
Age	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24
0-4	43,7	35,9	29,6	23,1	16,1	15,1	11,6
5-9	17,9	14,9	11,0	8,8	6,1	5,8	3,7
10-14	10,3	9,5	7,1	5,4	4,3	5,5	3,3
15-19	21,5	15,6	13,5	12,6	12,3	14,8	11,4
20-24	28,8	26,0	21,7	20,6	18,3	20,5	15,3
25-34	33,3	26,0	24,7	20,3	19,1	18,1	13,1
35-44	41,8	35,0	26,9	24,2	20,2	19,2	11,0
45-54	45,8	37,6	33,2	26,7	20,0	21,3	12,1
55-64	47,5	41,7	37,7	31,1	23,5	21,2	10,7
65-74	50,2	33,9	35,6	24,6	21,6	21,9	14,9
75 & +	36,5	31,1	25,3	14,9	10,6	14,1	9,6
Sexe féminin — Females							
0-4	39,0	33,3	27,7	18,8	14,7	13,7	10,1
5-9	20,4	15,9	13,3	9,3	7,1	6,9	4,7
10-14	19,4	13,1	11,1	9,0	6,3	7,0	5,6
15-19	22,9	17,9	16,3	18,2	15,8	17,4	15,1
20-24	19,9	17,7	18,4	20,6	17,6	17,6	15,8
25-34	26,2	21,7	19,6	20,7	19,2	18,6	13,4
35-44	27,6	21,3	18,3	17,5	15,0	15,2	9,9
45-54	23,1	19,1	15,9	15,3	12,1	11,4	10,7
55-64	24,6	18,4	17,5	13,3	11,8	12,2	9,5
65-74	27,6	20,5	18,8	15,6	11,5	12,8	10,1
75 & +	18,9	16,4	13,9	12,9	8,7	10,8	5,9

TABLEAU 44. — TABLE 44.

ÉVOLUTION DE LA MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE EN SUÈDE
(POPULATION URBAINE).

EVOLUTION OF TUBERCULOSIS MORTALITY BY AGE AND SEX IN SWEDEN
(URBAN POPULATION).

Taux par 10.000 — Rates per 10,000						
	0-4	5-9	10-19	20-39	40-59	60 & +
SEXE MASCULIN MALES						
1892-93	50,0	19,4	17,3	34,9	43,8	50,5
1919-22	22,2	8,3	11,2	25,3	18,7	20,7
SEXE FÉMININ FEMALES						
1892-93	45,2	20,6	20,7	25,2	27,2	38,7
1919-22	20,7	8,3	15,0	21,4	14,3	15,9
Diminution en pourcentage — Decrease in Percentage						
SEXE MASCULIN MALES						
1892-93	100	100	100	100	100	100
1919-22	44,4	42,8	68,6	72,2	42,7	41,0
SEXE FÉMININ FEMALES						
1892-93	100	100	100	100	100	100
1919-22	45,8	40,3	72,5	84,9	52,6	41,1

ÉVOLUTION DE LA MORTALITÉ TUBERCULEUSE PAR AGE ET PAR SEXE EN SUÈDE
(ENSEMBLE DU PAYS).

EVOLUTION OF TUBERCULOSIS MORTALITY BY AGE AND SEX IN SWEDEN
(WHOLE OF THE COUNTRY).

Taux par 10.000 — Rates per 10,000										
	0-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70 & +
SEXE MASCULIN MALES										
1911-15	16,1	7,1	6,9	20,0	30,0	23,0	19,0	21,0	20,0	13,0
1921-25	11,8	4,8	4,9	16,0	26,0	18,0	14,0	14,0	16,0	10,0
SEXE FÉMININ FEMALES										
1911-15	15,0	8,3	12,3	26,0	33,0	27,0	22,0	17,0	16,0	11,0
1921-25	10,0	5,5	8,4	21,0	26,0	19,0	15,0	12,0	13,0	9,0
Diminution en pourcentage — Decrease in Percentage										
SEXE MASCULIN MALES										
1911-15	100	100	100	100	100	100	100	100	100	100
1921-25	73,7	67,6	71,0	80,0	86,7	78,3	73,7	66,7	76,9	79,4
SEXE FÉMININ FEMALES										
1911-15	100	100	100	100	100	100	100	100	100	100
1921-25	67,3	66,3	68,3	80,8	78,8	70,4	68,2	70,6	81,2	81,8

TABLEAU 45. — TABLE 45.

DIMINUTION COMPARÉE DE LA MORTALITÉ TUBERCULEUSE ET DE LA MORTALITÉ GÉNÉRALE SELON L'AGE ET LE SEXE EN NORVÈGE.

(Les taux de la première période quinquennale sont pris comme unités = 100.)

COMPARATIVE DECLINE OF TUBERCULOSIS MORTALITY AND GENERAL MORTALITY, ACCORDING TO AGE AND SEX IN NORWAY.

(The rates for the first five-year period are taken as units = 100.)

SEXE MASCULIN MALES	MORTALITÉ TUBERCULEUSE — POPULATION RURALE TUBERCULOSIS MORTALITY — RURAL POPULATION											
	0-1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70-79	80 & +
1889-92	100	100	100	100	100	100	100	100	100	100	100	100
1899-02	88,3	104,3	100,9	117,6	147,8	129,1	110,5	117,5	108,7	124,1	126,0	115,9
1909-12	47,8	65,6	77,0	82,4	124,3	120,9	98,4	99,5	92,7	96,5	117,5	94,8
1919-22	32,7	44,6	52,1	67,6	113,2	104,4	82,9	87,2	77,1	82,2	88,3	85,3
SEXE FÉMININ FEMALES	MORTALITÉ TUBERCULEUSE — POPULATION URBAINE TUBERCULOSIS MORTALITY — URBAN POPULATION											
1889-92	100	100	100	100	100	100	100	100	100	100	100	100
1899-02	93,1	109,6	124,2	135,0	127,7	123,5	111,8	116,1	127,3	116,5	104,7	65,6
1909-12	45,1	69,4	73,5	93,1	103,2	117,1	94,7	97,5	92,6	88,1	102,6	76,2
1919-22	30,2	51,5	53,8	76,2	106,4	117,0	89,5	80,9	78,8	78,9	81,1	94,3
SEXE MASCULIN MALES	MORTALITÉ GÉNÉRALE — GENERAL MORTALITY											
1889-92	100	100	100	100	100	100	100	100	100	100	100	100
1899-02	97,7	80,2	84,0	97,7	87,7	85,0	87,1	87,9	89,5	93,0	93,6	63,3
1909-12	52,8	50,2	52,5	57,7	80,6	71,7	69,6	73,9	61,1	69,8	67,0	74,0
1919-22	30,5	36,0	36,1	38,4	74,8	64,3	56,1	49,7	41,6	51,6	43,5	17,5
SEXE FÉMININ FEMALES	MORTALITÉ GÉNÉRALE — GENERAL MORTALITY											
1889-92	100	100	100	100	100	100	100	100	100	100	100	100
1899-02	43,8	31,0	33,3	42,6	67,8	72,2	76,7	72,2	74,2	88,3	100	100
SEXE MASCULIN MALES	MORTALITÉ TUBERCULEUSE — TUBERCULOSIS MORTALITY											
1889-92	100	100	100	100	100	100	100	100	100	100	100	100
1899-02	100,1	84,5	77,0	74,9	90,1	97,5	90,9	77,9	80,7	69,9	65,5	85,3
1909-12	47,8	45,7	55,8	58,6	70,8	90,3	72,4	63,5	58,4	54,3	48,1	93,7
1919-22	31,0	31,4	32,4	39,3	80,9	84,9	50,0	47,8	42,7	39,9	32,8	38,4
SEXE FÉMININ FEMALES	MORTALITÉ GÉNÉRALE — GENERAL MORTALITY											
1889-92	100	100	100	100	100	100	100	100	100	100	100	100
1919-22	40,3	25,2	30,1	44,1	64,3	80,0	61,2	69,3	83,7	86,4	91,2	100

TABLEAU 46. — TABLE 46.

DIMINUTION COMPARÉE DE LA MORTALITÉ TUBERCULEUSE ET DE LA MORTALITÉ GÉNÉRALE, SELON L'ÂGE ET LE SEXE, AU DANEMARK ET EN SUÈDE (POPULATION URBAINE.)

(Les taux de la première période quinquennale sont pris comme unités = 100.)

COMPARATIVE DECLINE OF TUBERCULOSIS MORTALITY AND GENERAL MORTALITY, ACCORDING TO AGE AND SEX, IN DENMARK AND IN SWEDEN (URBAN POPULATION.)

(The rates for the first five-year period are taken as units = 100.)

Danemark — Denmark											
SEXE MASCULIN MALES	MORTALITÉ TUBERCULEUSE — TUBERCULOSIS MORTALITY										
	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	75 & +
1890-94	100	100	100	100	100	100	100	100	100	100	100
1900-04	67,7	61,4	68,9	62,8	75,4	74,2	64,3	72,5	79,4	70,9	69,3
1910-14	36,8	34,1	41,7	57,2	63,5	57,4	48,3	43,6	49,5	43,0	29,0
1920-24	26,5	20,7	32,0	53,0	53,1	39,4	26,3	26,4	22,5	29,7	26,3
SEXE MASCULIN MALES	MORTALITÉ GÉNÉRALE — GENERAL MORTALITY										
1890-94	100	100	100	100	100	100	100	100	100	100	100
1920-23	44,1	25,9	38,2	60,4	61,5	59,1	49,1	56,7	59,6	80,0	100
SEXE FÉMININ FEMALES	MORTALITÉ TUBERCULEUSE — TUBERCULOSIS MORTALITY										
1890-94	100	100	100	100	100	100	100	100	100	100	100
1900-04	71,0	65,2	57,2	71,2	92,5	74,8	66,3	68,8	71,1	68,1	73,5
1910-14	37,7	34,8	32,5	69,0	88,4	73,3	54,3	52,4	48,0	41,7	46,0
1920-24	25,9	23,0	28,8	65,9	79,4	51,1	35,9	46,3	38,6	36,6	31,2
SEXE FÉMININ FEMALES	MORTALITÉ GÉNÉRALE — GENERAL MORTALITY										
1890-94	100	100	100	100	100	100	100	100	100	100	100
1920-24	37,9	23,1	33,7	63,8	80,5	70,6	67,6	89,2	87,0	90,6	100
Suède — Sweden											
SEXE MASCULIN MALES	MORTALITÉ TUBERCULEUSE — TUBERCULOSIS MORTALITY										
	0-4	5-9	10-19	20-39	40-59	60 & +					
1892-93	100	100	100	100	100	100					
1919-22	44,4	42,8	68,6	72,2	42,7	41,0					
SEXE FÉMININ FEMALES											
1892-93	100	100	100	100	100	100					
1919-22	45,8	40,3	72,5	84,9	52,6	41,1					

TABLEAU 47. — TABLE 47.

ÉVOLUTION DE LA MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES) PAR PROVINCES EN NORVÈGE.
(POPULATIONS URBAINE ET RURALE ENSEMBLE.)

EVOLUTION OF MORTALITY FROM TUBERCULOSIS (ALL FORMS) BY PROVINCES IN NORWAY.
(URBAN AND RURAL POPULATIONS TOGETHER.)

Provinces	1881- 1885	1886- 1890	1891- 1895	1896- 1900	1901- 1905	1906- 1910	1911- 1915	1916- 1920	1921- 1925	1926	1927	1928
Östfold	30,1	29,4	29,6	30,8	27,4	22,3	19,1	16,6	14,8	11,9	12,5	11,3
Akershus	28,9	28,0	30,0	33,6	26,2	21,2	18,3	15,5	15,4	12,5	11,4	11,3
Oslo	39,6	35,6	35,0	34,6	29,8	25,9	22,5	20,1	17,8	14,6	16,6	16,4
Hedmark	26,8	24,7	24,0	28,0	28,9	25,1	21,9	23,2	17,6	16,6	14,7	13,7
Opland	22,4	20,8	21,9	22,5	21,8	19,2	17,1	17,4	15,0	10,5	11,3	13,1
Buskerud	32,5	31,3	30,7	32,8	29,8	24,1	19,9	17,5	16,4	15,4	14,7	12,4
Vestfold	36,2	31,0	31,3	33,0	25,9	23,2	18,8	17,9	15,4	10,9	11,9	13,0
Telemark	40,9	39,0	37,7	35,8	32,1	28,6	24,7	23,5	20,2	17,2	16,2	14,9
Aust-Agder	48,4	50,2	47,0	41,1	34,6	28,2	23,8	21,4	19,2	17,4	17,5	14,6
Vest-Agder	57,9	55,2	53,6	50,3	37,7	32,4	25,9	23,2	20,5	16,6	16,1	15,5
Rogaland	50,6	44,7	48,3	41,7	35,7	29,3	23,5	22,9	19,7	16,1	18,5	16,4
Hordaland	28,0	26,6	28,3	29,0	22,6	22,1	20,8	21,2	20,6	17,0	17,0	16,0
Bergen	37,7	38,4	41,7	36,6	31,9	26,6	24,9	25,8	21,3	16,7	17,8	15,7
Sogn og Fjordane	15,9	19,5	22,8	24,2	24,2	22,4	26,6	25,2	22,7	21,8	17,7	16,6
Møn	21,5	25,6	31,2	33,6	30,5	29,1	26,8	26,2	22,8	19,0	19,4	16,7
Sør-Trøndelag	32,9	35,5	36,3	39,9	36,5	39,2	35,6	31,4	28,8	23,0	24,1	19,9
Nord-Trøndelag	27,2	25,3	29,2	31,9	27,9	29,8	28,8	26,7	25,3	19,4	20,0	17,6
Nordland	22,0	25,5	24,8	27,4	26,1	28,7	29,3	30,3	27,3	22,4	24,1	18,9
Tromsø	21,2	23,9	25,9	34,2	30,0	30,6	29,5	32,3	29,9	29,7	24,5	20,3
Finmark	26,5	35,9	39,9	39,6	50,6	50,9	49,0	44,2	42,9	33,5	30,2	29,3

TABLEAU 48. — TABLE 48.

ÉVOLUTION DE LA MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES),
PAR PROVINCES EN NORVÈGE.
EVOLUTION OF MORTALITY FROM TUBERCULOSIS (ALL FORMS) BY PROVINCES
IN NORWAY.

POPULATION RURALE. — RURALE POPULATION.
(Taux par 10.000 habitants. — Rates per 10,000 population.)

	1881-85	1886-90	1891-95	1896-00	1901-05	1906-10	1911-15	1916-20
Östfold	30,2	29,4	30,5	29,6	26,4	20,9	17,1	15,6
Akershus.	29,0	27,8	30,1	33,9	25,9	21,2	18,3	15,4
Oslo	—	—	—	—	—	—	—	—
Hedmark	26,4	24,1	23,6	27,9	29,1	25,0	22,2	23,3
Opland	22,2	20,9	21,4	22,0	20,9	19,0	16,2	16,8
Buskerud	32,1	30,0	31,6	33,7	29,5	23,6	19,7	16,8
Vestfold	33,0	28,1	30,6	32,7	26,3	32,1	17,8	17,0
Telemark	40,8	38,8	38,8	36,4	33,6	28,9	25,4	23,4
Aust-Agder.	50,5	52,6	49,1	42,6	37,0	29,9	24,8	22,4
Vest-Agder	55,6	53,5	55,9	51,4	37,8	32,9	27,2	23,3
Rogaland	43,8	39,9	48,1	40,3	34,8	28,3	24,1	22,3
Hordaland	28,0	26,6	28,3	29,0	22,6	22,1	20,8	21,2
Bergen.	—	—	—	—	—	—	—	—
Sogn-Fjord	16,0	19,3	22,8	23,9	24,2	22,5	26,8	25,2
Møn	18,5	21,7	25,9	31,5	28,7	27,7	26,1	26,5
S. Trøndelag	30,0	31,2	32,4	38,5	36,9	40,3	37,0	31,6
N. Trøndelag	26,3	24,6	28,5	31,9	27,2	28,7	28,2	25,6
Nordland	21,6	25,1	24,0	26,9	25,5	28,6	29,6	30,3
Tromsø	21,4	23,0	24,4	33,1	29,4	30,1	28,7	32,2
Finmark	23,3	31,4	35,8	34,4	50,3	50,8	48,8	40,4

TABLEAU 49. — TABLE 49.

ÉVOLUTION DE LA MORTALITÉ PAR TUBERCULOSE (TOUTES FORMES)
PAR PROVINCES EN NORVÈGE.
EVOLUTION OF MORTALITY FROM TUBERCULOSIS (ALL FORMS) BY PROVINCES
IN NORWAY.

POPULATION URBAINE. — URBAN POPULATION.
(Taux par 10.000 habitants. — Rates per 10,000 population.)

	1881-85	1886-90	1891-95	1896-00	1901-05	1906-10	1911-15	1916-20
Östfold	29,8	29,7	27,3	33,5	29,6	25,5	23,7	18,8
Akershus.	26,6	33,1	27,5	25,1	39,3	22,2	20,1	19,6
Oslo	39,6	35,6	35,0	34,6	29,8	25,9	22,5	20,1
Hedmark	37,7	39,4	32,7	29,4	24,6	26,7	15,9	21,7
Opland	30,1	20,7	37,1	32,2	37,7	21,5	29,4	24,9
Buskerud	33,5	34,9	28,3	30,3	30,3	25,4	20,5	19,4
Vestfold	43,7	37,3	32,5	33,4	25,4	25,2	20,7	19,4
Telemark	41,2	39,5	34,3	34,0	27,7	27,9	22,7	23,8
Aust-Agder.	38,3	37,3	37,0	34,3	27,3	23,2	20,8	18,7
Vest-Agder	64,6	60,1	46,8	47,3	37,7	31,1	22,5	23,1
Rogaland	68,8	56,1	48,7	44,0	37,2	31,0	22,8	23,7
Hordaland	—	—	—	—	—	—	—	—
Bergen.	37,7	38,4	41,7	36,6	31,9	26,6	24,9	25,8
Sogn-Fjord	6,7	36,6	11,6	62,1	23,4	16,4	14,7	27,6
Møn	40,6	47,5	57,8	43,3	37,9	35,1	29,5	25,0
S. Trøndelag	44,9	53,0	49,7	43,8	35,3	38,8	32,4	31,1
N. Trøndelag	43,8	37,7	39,9	32,6	36,8	43,1	35,7	40,5
Nordland	36,2	35,3	44,1	38,9	35,1	29,3	25,8	29,6
Tromsø	19,3	32,2	41,0	45,6	35,1	34,6	34,5	32,5
Finmark	36,0	51,0	55,2	59,4	52,1	51,4	50,0	50,4

TABLEAU 50. — TABLE 50.

ÉVOLUTION DE LA MORTALITÉ TUBERCULEUSE PAR PROVINCES EN SUÈDE.

EVOLUTION OF TUBERCULOSIS MORTALITY BY PROVINCES IN SWEDEN.

Populations urbaine et rurale ensemble. — Urban and Rural Populations together.

(Taux par 10.000 habitants. — Rate per 10,000 population.)

	1911	1912	1913	1914	1915	1916	1917	1918
Stockholm	26,0	28,7	26,0	27,3	27,3	24,9	23,1	23,5
Stockholm (Prov.)	18,7	19,5	20,2	20,3	19,3	19,7	18,5	15,7
Upsala	17,8	16,9	17,8	17,9	17,7	16,1	14,9	15,7
Södermanland . . .	16,7	18,5	15,3	16,5	15,6	16,0	12,6	15,1
Östergötland	16,0	15,6	13,9	14,9	15,4	14,9	14,4	13,1
Jönköping	15,1	14,1	13,5	14,9	14,9	15,0	14,8	15,3
Kronoberg	18,4	15,0	17,6	16,2	16,7	15,8	14,9	13,5
Kalmar	16,1	15,0	14,5	15,9	17,8	16,8	16,4	15,3
Gotland	18,8	13,7	17,0	19,6	18,6	17,1	17,2	13,9
Blekinge	20,1	18,0	17,1	19,2	20,8	16,4	17,2	17,0
Kristiansstad	18,4	14,9	14,8	14,5	15,8	13,7	12,9	13,9
Malmöhus	16,8	18,0	16,2	15,4	15,6	16,5	15,3	14,8
Halland	16,2	17,4	16,3	18,5	18,6	19,3	18,7	16,8
Göteborg Bohus . . .	23,9	25,6	23,0	23,9	25,3	24,1	25,3	23,1
Älvsborg	18,3	18,1	15,8	14,1	18,4	18,1	17,9	15,4
Skaraborg	13,6	14,4	13,8	13,5	14,6	15,8	13,8	13,1
Värmland	18,5	20,5	18,2	18,6	20,1	20,0	21,0	18,0
Örebro	14,0	14,4	14,5	18,0	17,6	14,1	15,7	14,8
Västmanland	20,0	20,3	20,2	17,8	18,5	20,4	17,8	15,7
Kopparberg	18,9	25,7	19,0	19,7	22,8	23,7	22,7	18,3
Jämsleborg	21,3	21,0	19,9	20,1	22,3	22,9	20,2	17,5
Västermanland	18,7	20,2	19,0	22,0	24,2	27,7	23,3	21,3
Jämtland	21,1	25,3	21,9	24,0	25,0	30,6	24,1	22,7
Västerbotten	22,1	23,8	21,0	24,7	25,0	28,9	29,3	24,2
Norrbottn	31,9	30,4	31,5	31,2	38,6	41,1	38,0	32,4
	1919	1920	1921	1922	1923	1924	1925	1926
Stockholm	24,0	20,9	16,6	17,0	16,0	16,9	15,9	15,5
Stockholm (Prov.)	17,0	15,2	12,4	13,9	13,9	14,7	13,4	12,1
Upsala	15,1	15,4	13,9	12,1	13,1	13,1	12,4	13,4
Södermanland	14,1	12,0	10,9	10,4	11,2	9,5	9,3	9,1
Östergötland	12,2	11,8	11,1	12,3	10,2	10,6	10,6	10,1
Jönköping	11,6	12,0	13,1	12,1	11,4	12,2	11,6	10,6
Kronoberg	13,4	15,6	13,4	13,2	11,1	13,6	12,1	13,2
Kalmar	14,5	15,0	13,0	12,6	12,4	11,6	12,2	13,1
Gotland	13,9	13,8	16,4	14,9	14,0	17,3	13,9	12,6
Blekinge	15,2	15,8	15,9	17,1	13,3	16,0	15,1	14,9
Kristiansstad	14,3	12,9	11,0	10,6	10,1	11,7	10,8	11,1
Malmöhus	14,0	12,4	13,0	12,4	11,0	11,9	11,5	9,2
Halland	15,8	13,6	14,1	13,5	11,5	14,2	14,8	10,4
Göteborg Bohus	20,8	19,4	18,6	18,0	18,1	17,0	17,1	14,0
Älvsborg	13,5	14,9	13,7	13,3	12,9	13,0	12,6	11,7
Skaraborg	12,9	11,8	10,5	12,9	10,4	10,4	11,1	9,0
Värmland	14,5	16,5	15,4	15,3	14,5	17,0	14,3	13,4
Örebro	13,1	12,9	13,8	12,6	12,4	13,2	12,1	10,9
Västmanland	16,0	14,6	14,5	12,1	12,0	13,3	14,4	10,0
Kopparberg	16,2	16,7	16,2	16,3	12,8	15,3	14,2	13,5
Jämsleborg	16,8	19,1	17,8	15,7	15,1	15,5	16,1	15,2
Västermanland	17,5	19,3	20,5	18,5	16,4	20,6	19,8	18,5
Jämtland	23,2	22,6	21,4	20,6	18,7	22,9	20,8	18,7
Västerbotten	20,9	21,6	23,0	19,7	19,2	21,4	20,5	18,3
Norrbottn	27,2	28,9	29,5	29,2	29,5	30,8	30,3	27,9

TABLEAU 51. — TABLE 51.

MORTALITÉ TUBERCULEUSE PAR PROVINCES EN SUÈDE.

TUBERCULOSIS MORTALITY BY PROVINCES IN SWEDEN.

(Taux par 10.000 habitants. — Rates per 10,000 population.)

	POPULATIONS URBAINE ET RURALE ENSEMBLE URBAN AND RURAL POPULATIONS TOGETHER		POPULATION RURALE RURAL POPULATION		POPULATION URBAINE URBAN POPULATION			POPULATIONS URBAINE ET RURALE ENSEMBLE URBAN AND RURAL POPULATIONS TOGETHER		POPULATION RURALE RURAL POPULATION		POPULATION URBAINE URBAN POPULATION	
	1919 -22	1923 -26	1919 -22	1923 -26	1919 -22	1923 -26		1919 -22	1923 -26	1919 -22	1923 -26	1919 -22	1923 -26
Stockholm	19,6	16,2	—	—	19,6	16,2	Halland	14,2	12,7	13,8	12,7	15,9	12,6
Stockholm Pro- vince	—	13,5	14,6	13,6	—	12,8	Göteborg Bohus . .	19,2	16,5	17,9	15,7	20,2	17,1
Upsala	14,1	13,0	13,3	12,4	16,4	14,9	Älvsborg	13,8	12,6	12,9	11,9	17,3	14,8
Södermannland . .	11,9	9,8	10,3	8,8	15,5	11,8	Skaraborg	12,0	10,2	11,3	9,7	15,5	12,3
Östergötland . . .	11,8	10,4	10,2	9,8	15,1	11,6	Värmland	15,4	14,9	15,2	15,1	16,7	14,0
Jönköping	12,2	11,5	10,4	10,0	16,8	15,3	Örebro	13,1	12,2	12,1	12,0	17,4	13,1
Kronoberg	13,9	12,5	13,7	12,1	16,7	17,7	Västmanland	14,3	12,4	13,2	11,9	17,0	13,7
Kalmar	13,8	12,3	12,8	12,0	17,7	13,7	Kopparberg	16,3	14,0	16,1	14,3	18,4	11,3
Gotland	14,8	14,4	14,0	14,0	18,2	16,3	Gävleborg	17,3	15,5	16,4	14,4	21,0	19,4
Blekinge	15,9	14,8	14,5	14,0	19,8	16,7	Västermanland . . .	18,9	18,9	18,8	19,1	19,9	17,4
Kristiansstad . . .	12,2	10,9	12,1	11,2	12,9	8,3	Jämtland	21,9	20,3	22,1	20,5	20,8	18,7
Malmöhus	12,9	10,6	11,8	9,3	14,1	12,1	Västerbotten	21,3	19,9	21,7	20,0	14,9	19,8
							Norrbottn	28,7	29,7	29,1	30,6	26,2	22,9

TABLEAU 52. — TABLE 52.

MORTALITÉ TUBERCULEUSE PAR PROVINCES AU DANEMARK.
TUBERCULOSIS MORTALITY BY PROVINCES IN DENMARK.

(Taux par 10.000 habitants. — Rates per 10,000 population.)

	POPULATIONS URBAINE ET RURALE ENSEMBLE URBAN AND RURAL POPULATION TOGETHER				POPULATION (RURALE RURAL POPULATION				POPULATION URBAINE URBAN POPULATION			
	1920-25	1926	1927	1928	1920-25	1926	1927	1928	1920-25	1926	1927	1928
Copenhague - Copenhagen	11,5	10,7	9,6	9,6	—	—	—	—	11,5	10,8	9,6	9,6
Province de Copenhague } Province of Copenhagen }	9,3	6,8	7,1	6,1	8,8	6,1	6,1	5,3	9,7	7,7	8,2	7,2
Roskilde	6,9	4,8	3,9	4,9	6,9	4,8	4,0	4,2	6,8	4,7	3,6	6,3
Frederiksborg	8,7	8,5	7,7	7,2	8,7	9,7	8,8	7,6	8,6	4,7	4,2	5,9
Holbæk	6,4	4,8	5,0	4,7	6,4	4,6	4,9	4,7	6,2	5,8	4,9	4,8
Sorø	6,2	5,0	5,2	3,9	5,8	4,9	5,3	4,0	7,1	5,4	5,1	3,7
Præstø	6,8	5,2	4,5	4,4	6,8	5,8	4,0	4,4	6,8	6,9	6,5	4,4
Bornholm	9,9	7,9	5,2	7,9	7,8	4,3	3,4	6,0	12,7	12,7	7,6	10,5
Maribo	5,9	5,9	4,4	4,9	5,4	5,1	4,3	4,1	7,1	7,8	4,6	6,7
Odense	8,9	7,1	7,4	7,0	8,2	5,4	7,1	5,4	9,9	9,6	7,9	9,2
Assens	7,2	6,9	5,5	7,5	7,5	6,9	6,5	7,9	6,3	7,5	1,7	5,9
Svendborg	7,6	7,3	6,5	6,5	7,5	8,1	6,2	6,6	7,7	4,9	6,6	6,1
Hjørring	11,9	11,2	10,1	11,4	12,0	11,9	10,5	11,9	11,7	8,5	8,7	9,2
Thisted	12,9	9,5	12,3	12,0	12,7	9,2	13,3	12,1	13,8	10,5	8,0	11,9
Aalborg	12,6	8,5	9,9	8,5	12,4	8,1	10,1	8,6	12,9	8,9	9,7	8,3
Viborg	9,6	8,1	7,9	7,6	9,5	8,1	8,2	7,6	9,9	8,2	6,8	7,4
Randers	8,1	6,5	5,7	6,2	8,1	6,5	5,8	6,6	8,2	6,4	5,4	5,3
Aarhus	10,0	7,1	6,4	6,6	8,5	5,8	5,1	5,6	11,2	8,2	7,4	7,4
Skanderborg	8,7	6,3	5,4	7,4	8,6	6,8	5,7	7,3	8,8	5,5	4,9	7,6
Ringkøbing	11,1	10,8	9,9	8,1	11,1	11,3	9,7	7,8	11,2	8,9	10,7	9,4
Vejle	10,2	7,8	7,4	7,0	10,2	8,1	7,5	7,3	10,2	6,6	7,4	6,6
Ribe	11,0	8,0	10,1	7,0	10,2	8,1	9,9	6,4	13,3	7,8	10,7	8,7
Haderslev	10,6	9,1	9,7	7,1	9,9	6,8	9,0	7,0	12,6	9,2	11,8	7,3
Aabenraa	11,1	7,3	9,4	5,8	11,2	6,8	11,1	5,9	10,5	9,0	3,4	5,8
Sønderborg	9,2	7,3	11,2	8,5	10,2	7,1	11,3	10,8	6,8	7,9	10,8	3,2
Tønder	8,7	8,8	7,8	6,5	8,5	8,7	6,7	6,7	9,0	9,1	11,6	6,1
Færøerne	16,5	11,9	8,7	11,5	15,4	12,2	9,1	11,8	25,1	10,0	6,5	9,2

Official No.: **C. H. 970.**

LEAGUE OF NATIONS

Health Organisation

**THE PRINCIPLES
OF THE
PROPHYLAXIS OF LEPROSY**

**First General Report
of the Leprosy Commission**

GENEVA, APRIL 1931.

Series of League of Nations Publications

III. HEALTH ✓

1931. III. 2. ✓

CONTENTS.

	Page
I. THE PRINCIPLES OF THE PROPHYLAXIS OF LEPROSY :	
A. Introductory.	5
B. Treatment.	5
C. Isolation.	6
D. Organisation of Prophylaxis :	
1. Legislation.	7
2. Epidemiological Control	7
3. Education and Propaganda	7
4. Scientific Research	8
5. Isolation.	8
6. Dispensaries	8
7. Service for Discharged Patients	8
8. Children of Lepers	9
9. Marriage of Lepers	9
E. Summary and Conclusions.	9
II. TECHNICAL SUGGESTIONS :	
A. Uniformity of Terminology, Records and Technique of Examination :	10
1. Terminology :	
(a) " Leper "	10
(b) Designation of Lesions.	10
(c) Classification of Cases	10
(d) Active Signs	11
(e) Progress under Treatment	11
(f) " Cure "	11
2. Records	11
3. Technique of Examination.	11
B. Treatment.	11

I. THE PRINCIPLES OF THE PROPHYLAXIS OF LEPROSY.

A. INTRODUCTORY.

Despite the gaps which still exist in our knowledge of leprosy, the principles of the modern advance in the domain of science and hygiene should be applied to the prophylaxis of leprosy and the moment is opportune for the present generation to undertake a new international crusade against leprosy.

The prophylaxis of leprosy is only beginning in certain countries and must be methodically organised and gradually spread as a part of a scheme of preventive medicine and social hygiene.

The prophylaxis of leprosy is not a problem capable of solution by the application of any one measure, as the methods of dealing with it must vary with the geographical, economic, administrative, financial and other conditions of the countries where it exists.

Experience would seem to indicate that, divergent as are the various scientific conceptions and interpretations of the facts, it should be possible for leprologists to come to an agreement as to a practical programme, and to formulate working principles sufficiently accurate to be recommended to the health administrators, doctors and hygienists who have to deal with leprosy.

Nevertheless, the problem is so vast and complicated that, in order to achieve some immediate practical results, the whole question need not be dealt with at one and the same time. It is desirable to commence with the most important and urgent questions on which prophylaxis would seem to depend.

B. TREATMENT.

In the present stage of our knowledge regarding leprosy prophylaxis, the most important line of attack, in addition to that by isolation, is by treatment, carried out by specially trained personnel. Where satisfactory treatment, therapeutic and hygienic, has not been organised the only available weapon is compulsory segregation; where efficient treatment is possible, segregation may be made gradually less rigorous, on the condition that it is supplemented by out-patient treatment.

Treatment is both general and special. The leper must be subjected to general dietetic, medical, surgical and even mental treatment designed to improve his condition, increase his powers of resistance, and enable him to endure the special treatment and react favourably to it. Those illnesses which lower the resistance of the body must be promptly dealt with — for example, syphilis, malaria, and intestinal infections such as ankylostomiasis and dysentery. Lepers require a well-balanced diet rich in vitamins, while physical exercise and especially work in the open air are highly desirable.

It is generally accepted that the earlier the treatment by ~~chemotherapy~~ is instituted the better will be the results.

The condition known as "lepra reaction" often requires special therapeutic
measures

The chief special method of treatment of leprosy consists in the administration of chaulmoogra and its derivatives, but there are in addition certain forms of treatment which are used either alone or to supplement the above ; such as protein shock, metallothrapy, external applications of dioxide snow and trichloroacetic acid, various forms of electrical treatment, and radiotherapy.

Treatment by chaulmoogra and its derivatives is efficacious, however one may explain its action. Most leprologists do not regard it as absolutely efficacious, but its relative efficacy cannot be denied, although this varies with the conditions and the technique of administration.

Some authorities on leprosy make the objection that chaulmoogra has no specific action itself and that improvement is due to the general treatment alone. They maintain that the crucial test has never been carried out, viz., the comparison of two groups of lepers in a similar condition and stage of the disease, one of which groups is treated by chaulmoogra and the other not. A test experiment should if possible be organised on those lines, trying out the most effective forms of treatment against control.

The methods at present used in the administration of chaulmoogra cannot be regarded as finally adopted. There is need for further study to improve both the manner in which the remedy is prepared and the technique of its administration. The consensus of opinion of this commission, however, is that the intradermal injection of the ethyl esters of the fatty acids of the chaulmoogra group oils is the most effective method at present available.

C. ISOLATION.

Until recently, the compulsory segregation of lepers in special leprosaria has been the chief — almost the only — measure of prophylaxis, but, unaided by other measures, it has proved insufficient. The serious drawbacks of the measure, tending as it does to promote concealment and thus delaying diagnosis and treatment, are now generally recognised. In practically every country where the method is employed, steps have been taken to minimize the drawbacks of the system, by making leprosaria centres of treatment and by other means.

It is felt that the use of the term "segregation", which bears the odium of conditions now past, should be discontinued and that the term "isolation", which has a somewhat broader and more liberal meaning, should be used instead.

The isolation of infectious lepers, on a proper basis, still remains one of the essential measures in the prophylaxis of the disease. This measure is a well-recognised and useful means of preventing the spread of infectious or communicable diseases, and its value during the infectious stages of leprosy is undoubted. It may be administratively possible and advisable to make it compulsory.

The isolation of lepers should be carried out in accordance with the circumstances prevailing in the countries involved. It should always be associated with active treatment of the patients and educational propaganda among the general public and patients themselves, and should include measures which will ensure the observance of precautions essential for preventing the spread of the disease, as determined by the responsible health authority.

The nature and condition of the institutions in which lepers are isolated, the efficiency of the treatment given therein, and the extent to which the public is educated on the subject of leprosy, will greatly influence the popular attitude towards isolation measure, and thus its effectiveness.

In applying this measure, a clear practical distinction should be made between cases that are considered infectious and dangerous to the community and those that are considered non-infectious. Bacteriological examination is at present the best available basis for making this distinction, and its methods should be standardised.

D. ORGANISATION OF PROPHYLAXIS.

The essentials of the system, as already practised, are as follows :

1. LEGISLATION.

The progress made in the treatment of leprosy makes it necessary to readjust the regulations so that the old methods which were largely based on administrative and police control, may be modified in accordance to modern knowledge and social considerations.

The simpler and more elastic the legislation is, the better. It is desirable that it would provide for :

- (a) Notification, as for other infectious diseases ;
- (b) Isolation of bacteriologically positive and infectious cases, as far as this is possible ;
- (c) Facilities for treatment.

Regulations as to details (measure of disinfection, prohibition from engaging in certain occupations, etc.) should be so framed as to be capable of easy adaptation to social conditions and the gradual progress made in knowledge of the disease.

International agreements should be arranged to regulate the movements of lepers from one country to another.

2. EPIDEMIOLOGICAL CONTROL.

Prophylaxis requires as exact a census of lepers as possible, which should be carried out by specially trained officers, either qualified doctors or health visitors. The methods to be adopted will necessarily vary in different countries, as for example the appointment of special survey parties or the utilisation of existing health staff.

Epidemiological research should be carried on energetically, especially in those countries where there is evidence of local or general spread of the disease.

Early diagnosis is a fundamental requirement in the control of leprosy.

Special attention should be paid to regular examinations of school children.

3. EDUCATION AND PROPAGANDA.

In most countries where leprosy exists, a rational scheme of prophylaxis is hindered by ignorance and prejudice, public opinion wavering between indifference and blind panic.

Educational propaganda must be carried on, not only among the general public, but also among lepers themselves, to implant firmly the idea that leprosy, though contagious, is a remediable disease, resembling tuberculosis in this respect.

Propaganda may be of two types :

- (a) That based on dissemination of general knowledge regarding leprosy ;
- (b) That based on the conditions as disclosed after a local survey.

The methods adopted will vary to a certain extent in towns and villages. As the villages are generally the reservoirs of leprosy and most cases in the towns have migrated from the villages, the chief stress must be laid upon village propaganda.

The essential factor in the successful carrying out of propaganda is the personnel. The best propagandists are not necessarily qualified men, but those who are in close touch with and are acceptable to the village people. This propaganda should, however, be under the direction of qualified experts. Specially prepared pictorial posters, lantern slides, and cinema films are of considerable value in bringing before the public facts regarding the disease.

For the training of the medical profession, especially health officers and auxiliary workers, special courses should be arranged.

In countries where leprosy is a problem, medical curricula should provide for special lectures and demonstrations being delivered if possible by men with practical experience of the disease.

Experience indicates that one of the most potent educational influences on the general public is the result obtained by treatment and that inefficient treatment leads to discouragement.

4. SCIENTIFIC RESEARCH,

Every country where leprosy exists to an important degree should have at least one centre dealing with the theoretical and practical study of leprosy and including a clinical installation, with indoor and outdoor departments, and an organisation for epidemiological and laboratory research.

5. ISOLATION.

This matter has already been dealt with on page 6.

6. DISPENSARIES.

Cases which are considered as uninfectious, and especially early cases of this kind, should, as far as possible, be treated in dispensaries.

The most convenient form of dispensary is the dermatological clinic, but, under certain circumstances dependent on density of population and high incidence of the disease, special leprosy dispensaries may be found necessary. Facilities for treatment should be arranged in village centres, so that lepers may not be required to seek treatment in large towns whose inhabitants would be thereby endangered.

7. SERVICE FOR DISCHARGED LEPERS.

It is desirable that, where possible, patients who have lost all active signs of the disease should be kept under surveillance, as they need after-treatment, they must be re-examined periodically, and only too often they are prevented, for physical and social reasons, from finding a place in the community.

It is therefore desirable to organise the medical surveillance of persons who have suffered from leprosy, by means of an epidemiological control service and, if necessary, by providing special colonies for patients who have been discharged.

CHILDREN OF LEPERS.

As a general principle, it is highly desirable that children born of leprosy parents should be removed as soon as possible after birth and brought up where they are free from contact with lepers. It is specially important that this be done in the case of children born in leper institutions.

9. MARRIAGE OF LEPERS.

Marriage and cohabitation among lepers should be discouraged for medical and social reasons. In institutions, whether voluntary or compulsory, they should if possible be prohibited. In those compulsory institutions where they cannot for any reason be prohibited, and in leprosy asylums for almost incurable or hopeless cases where they would be allowed in order to make those institutions more popular, their deleterious effects should be impressed on patients and procreation should be discouraged by all legitimate means.

E. SUMMARY AND CONCLUSIONS.

1. Prophylaxis of leprosy is not a problem that admits of solution by the application of any one measure, since the means of dealing with it obviously vary with geographical, economic, administrative, financial and social conditions and with the incidence of the disease.

2. There is no reliable system of prophylaxis without treatment, and it is generally accepted that the earlier the treatment is instituted the better will be the results.

3. Leprosy resembles tuberculosis in being, in certain stages, a contagious but curable disease : curable at least in the sense that bacteriological examination becomes negative and other active signs disappear and remain absent permanently or for an undetermined period.

4. The prophylaxis of leprosy may be achieved by a system of medical, educative and legislative measures. It should provide for the isolation and treatment of infectious lepers and particularly for the treatment of early cases in clinics and dispensaries : also for the periodical examination of suspects. Special measures should be adopted for dealing with the children of lepers and for patients who have recovered either after treatment or spontaneously.

5. It is desirable that each country where leprosy exists to an important degree should have at least one centre for the study of the disease, with research laboratories and special courses for the medical profession and their assistants. Where this is not practicable, men should be sent to some foreign centre for training.

6. Arrangements should be made to include instruction in leprosy in the curriculum of all medical schools and colleges.

7. It is necessary to educate the public in regard to leprosy by modern methods of popular teaching and propaganda.

8. Isolation of infectious lepers is a necessary measure in a comprehensive campaign against leprosy, but it cannot be regarded *per se* as the sole means of prophylaxis. Its drawbacks can be mitigated by other measures applied concurrently. Isolation should be applied only to cases that are considered infectious.

9. Any form of treatment in order to give satisfactory results requires to be combined with suitable dietetic and general hygienic conditions.

10. For special treatment, oils of the chaulmoogra group and their esters and soaps are recommended.

11. The system of prophylaxis must be animated by the spirit of preventive medicine and social hygiene.

II. TECHNICAL SUGGESTIONS.

A. UNIFORMITY OF TERMINOLOGY, RECORDS AND TECHNIQUE OF EXAMINATION.

The lack of uniformity in these methods, of which the current literature affords ample evidence, is a serious handicap. It makes it difficult or impossible to compare reports of different workers, and often minimises the value of work done. It is highly desirable that steps be taken to promote uniformity in such matters. As the questions are largely technical and require careful and detailed study, it is now possible to point out only the more important features that require consideration.

1. TERMINOLOGY.

(a) "*Leper*".

This term should not be used without definition or qualification where there can be any doubt as to its meaning. For example, it is highly confusing when reports from some institutions deal solely with cases bacteriologically positive, when admitted or put under treatment, while the reports from others include also cases that have never been found bacteriologically positive or in which the disease has died out spontaneously. It is highly desirable that satisfactory distinctive terms be devised and generally adopted.

(b) *Designation of Lesions.*

Standard designations and definitions of the various lesions of leprosy should be arrived at and generally adopted.

(c) *Classification of Cases.*

The long accepted and most widely used primary classification recognises three types, maculo-anæsthetic, cutaneous (or nodular) and mixed. Because of certain fallacies of conception involved in this, more recent classifications recognise only two main divisions, which are subclassified according to the degree and nature of involvement. There is no uniformity of practice in this matter and it is desirable to evolve a scientific classification that will be acceptable to all.

(d) *Active Signs.*

Even when all evidence of active leprosy has remained absent for years, certain scars and deformities frequently persist. It is important, therefore, to have standardized criteria by which active lesions may be distinguished from permanent, inactive lesions.

(e) *Progress under Treatment.*

It is felt that confusion is to some extent caused by lack of generally accepted criteria of improvement and of the degree of improvement. While it may be difficult to arrive at absolute standards, an effort should be made to promote uniformity of practice in this matter.

(f) *"Cure".*

The word "cure" is liable to misinterpretations. It is therefore advisable, as far as possible, to avoid the use of this term.

2. RECORDS.

Uniformity is necessary also in regard to leprosy statistics, a knowledge of which is essential to determine the general results of treatment and the prophylactic campaign. It is desirable that health administrations and leprosy institutions should adopt standard record forms. These should cover all the essential features of leprosy work — *e.g.* :

- (a) Returns of numbers, distribution of patients, etc. ;
- (b) Medical reports of cases ;
- (c) Records of treatment and results ;
- (d) Records of relapses.

For this purpose, special forms and charts should, as far as possible, be standardised.

3. TECHNIQUE OF EXAMINATION.

The standardisation of methods, as far as this is practicable, is of a great importance in order that the maximum of efficiency be obtained and that results of various workers may be compared.

In modern prophylactic efforts, special stress is laid on early diagnosis and on distinction between presumably infectious and non-infectious cases. The diagnosis of early cases requires experience and careful application of special methods, lacking which many cases may be overlooked. The distinction between the so-called "bacteriologically positive" and "bacteriologically negative" cases must, admittedly, be based on the careful application of standard methods of examination. It is therefore most important that such standard methods be established.

B. TREATMENT.

The varying and uncertain results obtained with treatment are dependent not only on the different types of therapeutic agents used and of the methods of application, but also on a number of other facts, such as the types of cases treated, the

conditions under which they live, and the care and the skill used in carrying out the treatment. It is desirable that, in any comparison of results of treatment, these factors should be evaluated as far as possible. It must be recognised that, even in treating a large number of patients, each case must, as far as possible, be treated individually.

With regard to drugs, there is at present an unfortunate diversity of practice. A certain amount of improvement may be obtained by the use of any of a considerable number of remedies, but the experience in most of the larger treatment centres indicates that certain remedies are of superior efficacy. It is recognised that there is need for further experimentation, chemical and therapeutic, to improve upon the remedies now available. In the meantime, there should be extensive and careful comparison of those preparations which have been found the most valuable, and the best of these should be generally adopted as the basis of treatment and the criterion by which the value of other remedies is estimated.

The most commonly used drugs are the oils of the chaulmoogra group and their derivatives. Of the various preparations, the ethyl esters, the sodium salts and the refined oil are in common use. Whatever preparation is used, it should be pure and prepared by approved methods; otherwise uniformity of results cannot be expected.

The method of administration is not less important. Chaulmoogra preparations have been administered in various ways. The most commonly used methods have been the oral, intramuscular and subcutaneous; the intradermal method has more recently been adopted in certain of the larger centres. The most effective method should be definitely determined.

The results of experimental treatment are affected by the chronic nature of the disease and its irregular course, and by individual variations in the patients. The literature is replete with reports based on wholly inadequate numbers of cases treated for insufficiently long periods. Such reports may not only be valueless, but may be quite misleading and harmful. So important is this point that it is believed desirable to call special attention to it. It is essential to recognise that a comparison of the results of the different kinds of treatment is only possible if based on a sufficiently large number of cases treated.

It must be recognised that, as in tuberculosis, foci of bacilli persist, especially in certain deeper tissues, and that relapses may occur. This indicates that treatment should be continued for a considerable period after all active signs have disappeared, and that cessation of treatment should be followed by periodical re-examinations.

Official No.: **C. H. 968.**

Geneva, March 1931.

LEAGUE OF NATIONS

HEALTH ORGANISATION

**REPORT OF THE LABORATORY CONFERENCE
ON THE
SERODIAGNOSIS OF SYPHILIS**

**CONVENED AT MONTEVIDEO BY THE
INSTITUTE FOR THE PREVENTION OF SYPHILIS OF URUGUAY**

(September 15th—26th, 1930)

Series of League of Nations Publications

III. HEALTH ✓

1931. III. 4.

CONTENTS.

	Page
List of Members of the Organising Committee of the Conference	5
List of Participants of the Conference	6
Introduction by the President of the Conference	8
Methods compared	12
Organisation	13
Explanatory Note on Blood Serum Tests:	
1. Control Cases	14
2. Cases of Syphilis	15
3. Cases of Leprosy	15
4. Doubtful Cases	16
5. Neither Positive nor Negative Reactions (\pm)	16
6. Conclusions	17
Explanatory Note on the Examination of Cerebro-spinal Fluids	20
<i>Annex 1.</i> — Tables 1 to 6 giving a Summary of the Results obtained by the Various Serological Methods:	
No. 1, Blood Serum. — Non-Syphilitic Cases	23
No. 2, Blood Serum. — Syphilitic Cases	24
No. 2a Blood Serum. — Results of "Meinicke's Clarification Test" carried out by Dr. E. Dussert-Jolland	25
No. 2b Blood Serum. — Results of the "Sero-hæmoflocculation" Test carried out by Dr. A. Prunell . .	26
No. 3, Blood Serum. — Cases of Leprosy without Syphilis	27
No. 4, Blood Serum. — Doubtful Cases	28
No. 5, Blood Serum. — Diagnostic Value of the \pm Reaction (doubtful)	29
No. 6, Blood Serum. — Cerebro-spinal Fluids	30
<i>Annex 2.</i> — Tables giving the Detailed Results obtained by the Various Serological Methods:	
No. 1, Blood Serum	32 to 87
No. 2, Cerebro-spinal Fluids	88 to 99

	Page
<i>Annex 3.</i> — List of Institutions which supplied Samples of Blood and Cerebro-spinal Fluid to the Conference	100
<i>Annex 4.</i> — Description of Methods used by:	
Dr. A. de Assis	101
Dr. E. Dussert-Jolland	104
Professor R. L. Kahn	106
Dr. J. E. Moreau	117
Professor R. Müller	118
Dr. A. Prunell	120
Dr. P. Puppo	121
Drs. R. Scaltritti and J. Cassiniga.	122
Drs. A. Sordelli and J. Miravent	123
Drs. J. Torrazza and J. A. Lorenzo	124
Dr. E. J. Wyler.	126
<i>Annex 5.</i> — Observations on the Results obtained:	
Dr. A. de Assis	129
Professor R. L. Kahn	129
Dr. J. E. Moreau	130
Professor R. Müller	130
Dr. A. Prunell	131

LIST OF MEMBERS OF THE ORGANISING COMMITTEE
OF THE CONFERENCE.

Dr. Alejandro GALLINAL,
Dr. José SCOSERIA,
Dr. Hector DEL CAMPO,
Dr. Maximo HALTY,
Dr. Alberto SCALTRITTI,
Dr. Baldomero CUENCAS Y LAMAS,
Dr. Alberto ANSELMI,
Dr. José MARTIRENE,
Dr. José BRITO FORESTI
Dr. Julio C. ESTOL,
Dr. José MAINGINOU,
Dr. Eduardo BASTOS,
General Pedro QUINTANA,
Dr. Eduardo FERREIRA.

Executive Committee of the Organising Committee:

President:

Dr. José SCOSERIA, Chairman of the National Health Council
of Uruguay.

Vice-President:

Dr. Maximo HALTY, Associate Professor of Dermatology and
Venereology at the Faculty of Medicine of Montevideo.

Secretary:

Dr. Hector DEL CAMPO, Technical Director of the Institute for
the Prevention of Syphilis of Montevideo.

Members:

Dr. Alejandro GALLINAL, Chairman of the Honorary Committee
of the Institute for the Prevention of Syphilis, Montevideo;
Dr. Alberto ANSELMI, General Director of the Military and
Naval Health Services;
Dr. José MARTIRENE, General Director of the National Public
Relief Department;
Dr. Alberto SCALTRITTI, Director of the Laboratory of the
Institute for the Prevention of Syphilis, Montevideo.

LIST OF PARTICIPANTS OF THE CONFERENCE.

Chairman (appointed by the Health Organisation of the League of Nations):

Professor J. JADASSOHN, Director of the Dermatological Clinic of the University of Breslau; Member of the Health Committee of the League of Nations; President of the Committee of Experts on Syphilis of the Health Organisation of the League of Nations.

Participants from South American Countries:

Argentine Republic:

Dr. A. SORDELLI and Dr. J. M. MIRAVENT, Bacteriological Institute of the National Health Department, Buenos Aires.

Brazil:

Professor O. DA SILVA ARAUJO, Institute for the Prevention of Venereal Diseases and Leprosy, Rio de Janeiro;
Dr. A. DE ASSIS, Institute "Vital Brazil", Rio de Janeiro.

Chile:

Dr. E. DUSSERT-JOLLAND, Bacteriological Institute of Chile, Santiago de Chile.

Paraguay:

Professor M. IDAYAGO and Dr. M. SAN JURGO, Institute for the Prevention of Syphilis, Asunción.

Uruguay:

Dr. A. SCALTRITTI, Dr. R. SCALTRITTI and Dr. J. CASSINIGA, Institute for the Prevention of Syphilis, Montevideo;
Dr. J. TORRAZZA and Dr. J. A. LORENZO, Laboratory attached to the Clinics of the Faculty of Medicine, Montevideo;
Dr. P. PUPPO, Laboratory of the Army Medical Services, Montevideo;
Dr. A. PRUNELL and Dr. J. E. MOREAU, Public Relief Department, Montevideo.

Participants who attended the Laboratory Conference convened at Copenhagen in 1928 by the Health Organisation of the League of Nations:

Professor R. L. KAHN, Michigan University, Ann Arbor (United States of America).

**Professor R. MÜLLER and Mmc. S. BERZELLER, Sero-diagnostic
Institute of the General Hospital, Vienna (Austria).**

Dr. E. J. WYLER, Ministry of Health, London (Great Britain).

Technical Secretariat of the Conference:

**Dr. J. R. MÖRCH, Danish State Institute for Serum, Copenhagen
(Denmark).**

**Professor O. E. W. OLSEN, Member of the Health Section of
the Secretariat of the League of Nations.**

INTRODUCTION.

The opening of the present century marks the beginning of an energetic world campaign against syphilis. There has been increasing recognition of the dangers of the disease from the standpoint of the individual and of society alike. Apart from propaganda amongst every class of the population, treatment constitutes the most efficacious means of prophylaxis, inasmuch as it helps to reduce the number of recent cases of infection and protects those already infected from serious consequences of the disease. It is a fundamental principle of modern medicine that adequate treatment must be based on accurate diagnosis, and, as regards the diagnosis of syphilis in particular, serological methods are chiefly responsible for the progress that has been made. The serodiagnosis of syphilis serves to detect countless cases in which clinical diagnosis and microscopical examination have failed, and also determines the degree of efficacy of the treatment with much greater certainty than seemed possible before the discovery of serological methods.

The serological methods employed in the diagnosis of syphilis thus constitute a most valuable means of combating the disease. These methods deserve, therefore, our constant attention, and their improvement is of capital importance. Despite the merits of those who have already assisted in this work, the results are not yet entirely satisfactory, inasmuch as mathematical accuracy has not yet been achieved in connection with any one biological reaction. The fate of the patients depends, however, to a large extent upon the accuracy of these methods and, in connection with the diagnosis of syphilis in particular, a method must be found which furnishes with syphilitic sera as high a percentage as possible of positive results, and does not produce non-specific reactions.

The various methods recommended have hitherto often been open to objection for one or other reason and sometimes

produced inexplicably divergent results when used by the different serologists. The Laboratory Conferences on the serodiagnosis of syphilis convened by the League of Nations Health Organisation in 1923, 1928 and 1930 were intended to demonstrate the causes of these divergencies and to determine the value of different methods; the discussions also gave a definite impetus to serological researches, as may be seen by the improvement in methods, particularly flocculation methods, during the last few years.

The generosity of the Uruguayan Government enabled the Conference convened by the Montevideo Institute for the Prevention of Syphilis to continue the work begun by these earlier Conferences. The excellent arrangements made by the Honorary Committee of the Institute, the active assistance of its collaborators, the preparations made by the Organising Committee for the Conference and its Executive Committee presided over by Professor José Scoseria, and, lastly, the many facilities offered by the modern services of the Institute enabled those participating in the Conference to carry out their work under the most favourable conditions and to arrive at the very interesting results embodied in the report. These form an important contribution to our knowledge of the value of the different methods of serodiagnosis (Bordet-Wassermann test and its modifications, and the flocculation tests): the findings demonstrate anew the great improvements made in connection with flocculation tests and make it possible to determine more satisfactorily than has hitherto been the case which of these methods are to be preferred.

I regard it as a signal honour that I should have been chosen to preside over this Conference, as the result of a letter from the Uruguayan Minister of Foreign Affairs¹

¹ The Council of the League of Nations, at its meeting on May 15th, 1930, approved the following resolution adopted by the Health Committee at its fifteenth session in March 1930:

“The Health Committee,
“Attaches great interest to the organisation at Montevideo
of a South American Serological Congress;

of November 26th, 1929, to the Secretary-General of the League of Nations, inviting the League of Nations Health Committee to appoint the President of the Montevideo Conference, and I welcomed the opportunity thus given me of seeing personally the keen interest taken by the South-American countries in the progress of serology and syphilography. In order to continue the work already done and at the same time to strengthen co-operation between the Institutes on the different continents, the Montevideo Conference adopted the following resolution:

“The Conference,

“Congratulates the Montevideo Institute for the Prevention of Syphilis on its action in convening in South America a Laboratory Conference on the serodiagnosis of syphilis, organised on the same principles as the Conferences of this nature previously convened by the League of Nations Health Organisation;

“And recognising the great value of the results of this Conference, due to the fact that the serologists of the different South-American countries were enabled, by employing as experimental material the same sera and cerebro-spinal fluids, to compare the efficacy of their methods in relation to those found to be best at the previous Laboratory Conference held at Copenhagen;

“Recommends that the Health Organisation of the League of Nations should invite the Montevideo Institute for the Prevention of Syphilis to continue the work of the Conference on the serodiagnosis of syphilis and should co-ordinate, in collaboration with the Danish State Serum Institute — which acts as the central laboratory

“Is glad to note that work similar to that of the Laboratory Conference held at Copenhagen for comparing the various methods for the serodiagnosis of syphilis, will be carried out in Latin America;

“Realising the benefit to be gained by effective co-operation in the work of the Congress:

“Decides to ask its President to do everything possible to facilitate the work of the Congress, and to select its President.”

of the Health Organisation — and with the League of Nations Secretariat, comparative studies on this subject by the various South-American serological laboratories.¹”

*(Signed) J. JADASSOHN,
President of the Conference.*

¹ The following resolution was adopted by the Health Committee at its meeting held in May 1931, after the present report had been communicated by the President of the Conference:

“The Health Committee:

“Desires to express to the Government of Uruguay, to the Institute for the Prevention of Syphilis at Montevideo, and to Professor José Scoseria, Chairman of the Organising Committee, its congratulations on the success of this first Laboratory Conference in South America;

“Expresses its thanks to Professor Jadassohn for the manner in which he carried out the task entrusted to him; and

“Approves the suggestions contained in the resolution of the Conference.”

METHODS COMPARED.

The twelve following methods were compared:

1. *Bordet-Wassermann* (B.-W. R.), original and modified methods:

- (a) B.-W. R. as described by A. de Assis, performed by Dr. A. de Assis;
- (b) B.-W. R. as described by J. E. Moreau and performed by Dr. J. E. Moreau;
- (c) B.-W. R. original method, performed by Dr. P. Puppo;
- (d) B.-W. R. as described by A. Scaltritti and performed by Dr. R. Scaltritti and Dr. J. Casiniga;
- (e) B.-W. R. as described by A. Sordelli in collaboration with J. M. Miravent, A. Pasalagua and A. Favaloro, performed by Dr. A. Sordelli and Dr. J. M. Miravent;
- (f) B.-W. R. as described by J. Torrazza and J. A. Lorenzo, performed by Dr. J. Torrazza and Dr. J. A. Lorenzo;
- (g) B.-W. R. modification as described by E. J. Wyler in the *Medical Research Council Special Report Series* No. 129, performed by Dr. E. J. Wyler.

2. *Flocculation Tests*:

- (a) Kahn's "standard" test, described by R. L. Kahn and performed by Professor R. L. Kahn;
- (b) Kahn's "presumptive" test, described by R. L. Kahn and performed by Professor R. L. Kahn;
- (c) Meinicke's clarification test (M.K. R.), described by E. Meinicke and performed by Dr. E. Dussert-Jolland;
- (d) Müller's clotting test (M.B. R. II), described by R. Müller, performed by Professor R. Müller, assisted by Mme. S. Berczeller.

3. *Prunell's Sero-haemo-flocculation Test*, described by
A. Prunell and performed by Dr. A. Prunell.

A summary description of the technique of the various methods employed appears in Annex 4 of this report.

ORGANISATION.

During the Conference, altogether 966 blood serum samples and 200 samples of cerebro-spinal fluid were examined. The greater portion of these samples was supplied by the anti-venereal hospitals and dispensaries of Montevideo. Thanks to the excellent organisation of these institutions, the Conference regularly received the number of samples necessary for each day (100 blood serum samples and twenty samples of cerebro-spinal fluid) so that, as a general rule, these samples could be distributed for examination from twenty-four to thirty-six hours after they had been taken. A small portion of them (seventy-eight) was supplied by foreign hospitals (Buenos Aires, Rio de Janeiro) and sent to Montevideo by air. These samples were from seventy-two to ninety-six hours old when distributed.

Each sample of blood and of cerebro-spinal fluid was divided up into a number of small samples corresponding to the number of research workers, just as had been done at the Laboratory Serological Conference organised by the Health Committee of the League of Nations at Copenhagen. These samples were distributed for examination bearing only a number, so that, in every case, the research worker was unaware of its origin or of the clinical diagnosis. The clinical diagnosis was not divulged until all the research workers had submitted a written report on the results obtained. The classification of the cases of syphilis examined and also the clinical examination, where discrepancies were noted between the serological findings and the clinical diagnosis, were carried out during the Conference by Professor J. Jadassohn. In cases where there was a divergence between the serological and clinical diagnoses, a fresh examination was made with a new sample whenever possible. After the Conference, the

syphilologists — Dr. H. del Campo, Dr. M. Halty, and Dr. P. R. Alonso — carried out a clinical examination of a certain number of cases which were not entirely clear.

The results of the serological tests were noted by the research workers in accordance with the conclusions reached at the Conference on the Serodiagnosis of Syphilis held at Copenhagen in 1928, as follows:

- (1) A negative reaction was shown as — (minus) or “negative”;
- (2) A positive reaction was shown as + and defined as a reaction of at least a degree of positivity which the serologist generally obtained only with sera derived from cases of syphilis (and from a few well-defined pathological conditions such as frambœsia and malaria);
- (3) A reaction stronger than + was shown as ++;
- (4) A reaction which was neither definitely negative nor positive as defined in paragraph 2 was shown as ±.

EXPLANATORY NOTE ON BLOOD SERUM TESTS.

1. Control Cases.

Of the 966 sera examined, 304 were derived from cases in which neither a detailed clinical examination nor the serodiagnosis had given any grounds for assuming the existence of syphilitic infection. Isolated positive reactions obtained with the sera of this group should therefore be termed *non-specific* and, indeed, in a great number of cases, the examination of a new sample gave negative results. The results obtained from an examination of this control material are given in Table 1, Annex 1. It must be remembered, however, in regard to this, that, in certain cases, in spite of the most careful clinical examination (lumbar puncture, radiography), a latent syphilitic infection may nevertheless have existed. At the same time, it should be emphasised that, where most of the investigators have recorded a negative result, a positive result is in all probability to be regarded as non-specific.

2. Cases of Syphilis.

From known cases of syphilis both treated and untreated in all stages of the disease 623 samples were derived:

	Cases
Syphilis (primary) I . .	33
Syphilis (secondary) II. .	46
Syphilis (tertiary) III . .	74
Syphilis (latent)	412
Syphilis congenital . . .	14
<i>Tabes dorsalis</i>	20
<i>Dementia paralytica</i> . . .	24

A direct comparison between the results obtained by the majority of research workers taking part in the Conference, who examined almost all the samples, will be found in Table 2, Annex 1.

The results obtained by Dr. Dussert-Jolland,¹ whose arrival was retarded because of the unfavourable weather conditions which had interrupted his voyage, and also the results obtained by Dr. A. Prunell² were compared separately with the results obtained from other methods on the basis of samples examined by each of the two methods (Tables 2a and 2b, Annex 1).

3. Cases of Leprosy.

Table 3, Annex 1, shows the results obtained by the various methods employed in the examination of twenty-seven cases of leprosy³ (nervous, tubercular and mixed). A detailed clinical examination of these cases gave no indication of syphilis either clinical or in the case-history. However, owing to the fact which was already known and was confirmed by these tests — as far as the twelve methods compared were concerned — that leprosy gives non-specific reactions in serodiagnostic syphilis tests, these cases were placed in a group apart and were not considered as non-specific control cases.

¹ Excluding Nos. 101-200, the tests having been made with inactive serum.

² See the "Observations" made by Dr. A. Prunell, Annex 5.

³ Nos. 68, 518, 957, 69, 71, 519, 947, 72, 396, 406, 407, 420, 432, 446, 772, 774, 905, 943, 944, 945, 949, 950, 951, 952, 953, 955, 956.

4. *Doubtful Cases.*

The result of the examination of fourteen sera, ¹ thirteen of which were derived from women who had been registered as prostitutes for a certain number of years, will be found in Table 4, Annex 1. In these cases, definite clinical symptoms of syphilis were not discovered. After having consulted Professor J. Jadassohn and the clinicians of Montevideo, it was, however, thought better not to consider the positive reaction obtained in this group as non-specific, but to classify these reactions in a special group, as doubtful cases, on the basis of previous experience with regard to the prevalence of syphilis among prostitutes. In one of these cases (No. 789), the diagnosis could not be cleared up, as the patient was at the point of death.

5. *Neither Positive nor Negative Reactions (±).*

Although the sensitiveness and specificity of the sero-diagnostic method are determined primarily by the percentage of positive reactions obtained in cases of syphilis and in control cases, reactions which were neither positive nor negative (±) also play an important part. On the one hand, a great number of ± reactions signify that, in these cases, the question put by the clinician to the serologist remains unanswered; on the other hand, a ± reaction in a case of treated syphilis, for example, should be considered as a weakly positive reaction. It is important to know, therefore, the proportion of the cases in which the ± reaction denotes syphilis — that is to say, to determine the relative diagnostic value of ± reactions, since this value is not apparent from the absolute number of ± reactions obtained in cases of syphilis and in control cases. It is determined by calculating the ratio between the percentage of ± reactions in cases of syphilis and in control cases. This ratio is shown in Table 5, Annex 1, in respect of the methods examined at the Montevideo Conference. It will be seen that the value of the reactions (*i.e.*, the proportion of cases in which a ± reaction denotes syphilis) varies greatly, thus ± in the reaction obtained from the B.-W. as modified by Sordelli-Miravent

¹ Nos. 296, 298, 963, 302, 309, 968, 314, 317, 326, 961, 536, 960, 789, 958.

and Kahn "standard" methods, for example, denotes syphilis in nine cases out of ten, in three cases out of five with the B.-W. method carried out by Wyler, but only in one case out of three with the B.-W. method performed by Moreau. At the same time, it must be remembered that, when a technique such as that employed by Wyler affords a large number of \pm reactions, these, though qualified by the three-fifth factor, give information of considerable value to the clinician.

6. *Conclusions.*

In judging the results obtained at serological laboratory conferences, some account must be taken of the fact that they were obtained, as it were, against time and in a strange laboratory, where, in spite of all the precautions taken, the conditions are frequently not as favourable as those in which work is usually carried on at home. No great importance should therefore be attributed to the slight differences shown in the percentage of positive results in cases of syphilis, nor should too much weight be attached to an occasional non-specific reaction, the more so as, owing to the short time at disposal, it was not possible in every case to be certain that a clinical observation would have excluded the possibility of syphilitic infection (for example, in cases of *ulcer of the penis*).

The results obtained at the Montevideo Conference completely agree with those reached at the Copenhagen Conference in 1928, where the best of the precipitation tests were demonstrated to be superior as regards sensitiveness and equal as regards specificity to the B.-W. reaction and its modifications. The majority of serologists taking part in the Montevideo Conference agreed that, in the hands of Professor Kahn himself, the Kahn "standard" test, which (as was the case also at the Copenhagen Conference) proved to be absolutely specific and extremely sensitive, was the best of those demonstrated at the Conference.

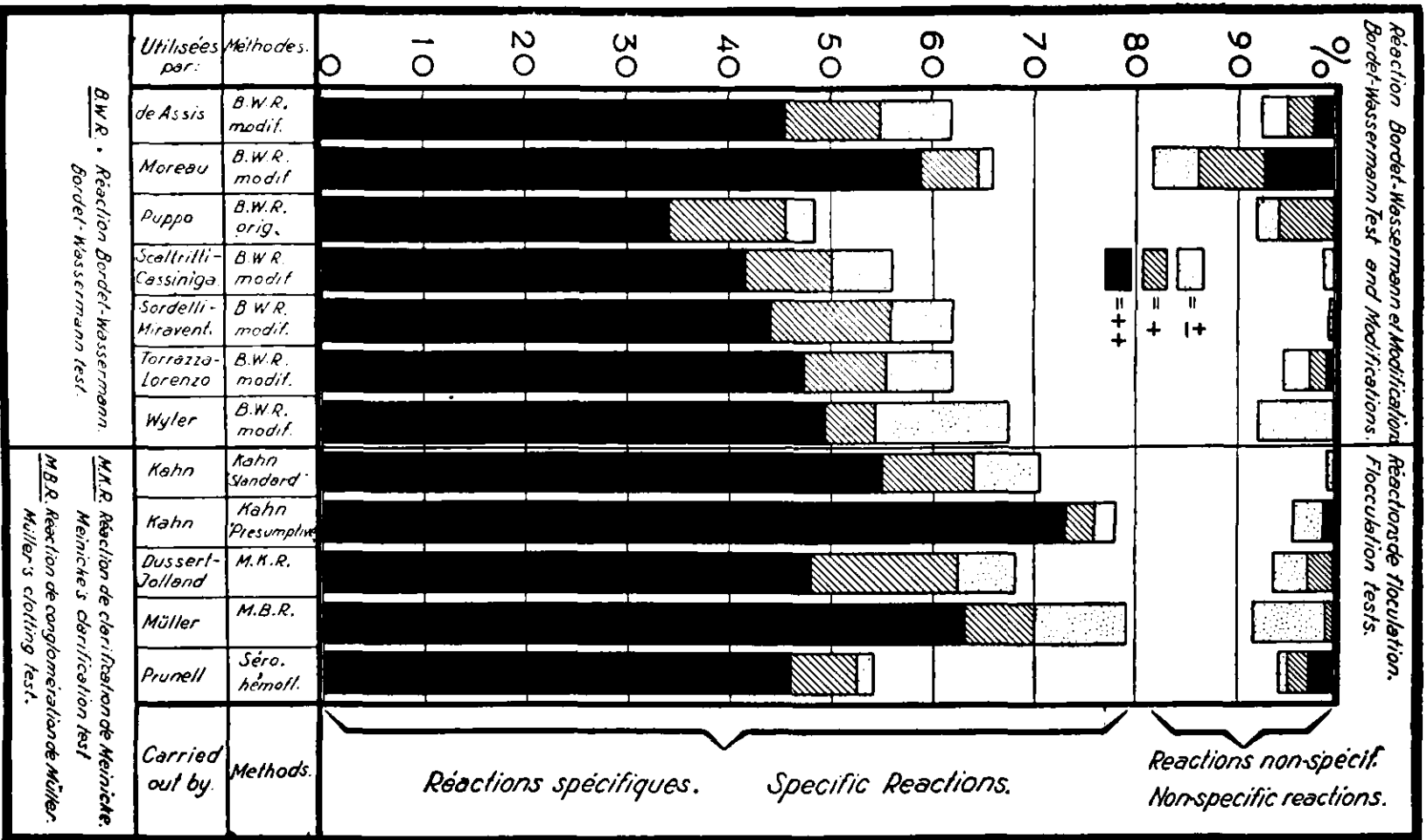
Müller's clotting test (modification II) and Kahn's "presumptive" test (this latter test being specially designed for the control of syphilis in course of treatment) both gave a greater number of positive reactions with syphilitic material than did the Kahn "standard" test, but also two and three

non-specific reactions respectively. Three out of the seven modifications of the B.-W. method which were compared (Sordelli, Wyler, Scaltritti-Cassiniga) gave absolutely specific results, but a smaller number of positive results with syphilitic material than did the precipitation methods mentioned above. Other modifications of the B.-W. method, without giving particularly sensitive results with syphilitic material, gave from 6 to 13.9 per cent non-specific reactions.

The sensitiveness and specificity of the various methods are indicated below (see also diagram):

Method	Syphilitic Percentage of positive reactions	Controls Percentage of positive reactions	Controls Number of positive reactions
Less than 1 per cent of non-specific reactions			
Kahn's "presumptive" test	75.6	1.0	3
Müller's clotting test (M.B. R.II) .	69.3	0.7	2
Kahn's "standard" test	63.9	0	0
Modified B.-W. test performed by Sordelli and Miravent	55.9	0	0
Modified B.-W. test performed by Wyler	54.4	0	0
Modified B.-W. test performed by Scaltritti and Cassiniga	49.9	0	0
More than 1 per cent of non-specific reactions			
Modified B.-W. test performed by Moreau	64.7	13.9	42
Meinicke's clarification test (M.K. R. performed by Dussert-Jolland . .	62.2	2.4	6
Modified B.-W. test performed by Torrazza and Lorenzo	55.5	2.6	8
Modified B.-W. test performed by de Assis	54.9	4.3	13
Sero-hæmo-flocculation test performed by Prunell	52.4	4.5	6
Modified B.-W. test performed by Puppo	45.4	5.6	17

Even most sensitive methods have resulted, in certain cases, in negative reactions where methods otherwise less sensitive have given positive; it was therefore urged that two different diagnostic methods should be employed simultaneously.



SENSITIVENESS AND SPECIFICITY OF THE VARIOUS METHODS.

Thus a greater guarantee is obtained against possible errors, miscalculations, etc. This is substantially in agreement with the recommendations of the Laboratory Conference at Copenhagen in 1928.

EXPLANATORY NOTE ON THE EXAMINATION OF CEREBRO-SPINAL FLUIDS.

Out of 200 samples of cerebro-spinal fluid, fifty-three were derived from syphilitic cases (*dementia paralytica*, *tabes dorsalis*, meningo-vascular-spinal syphilis) and 147 from patients suffering from other complaints, particularly nervous and mental disease. The quantity of cerebro-spinal fluid received was not sufficient for all the serologists participating in the Conference to take part in the research work; this was therefore limited to four modifications of the B.-W. method and three flocculation methods. All the samples of cerebro-spinal fluid distributed were perfectly fresh (at most, four hours old).

Only two of the diagnostic methods compared showed absolute specificity; Kahn's "standard" test and Dr. Wyler's. Kahn's test was the more sensitive of the two as was also demonstrated by a comparison between the two methods applied to the much more ample material of 317 specimens (exclusively composed of samples of clear and fresh cerebro-spinal fluid) which was made in London in 1928 at the instance of the Health Organisation of the League of Nations (see document C.H.726).¹ All the other methods (B.-W. test described by de Assis, Scaltritti-Cassiniga, Torrazza-Lorenzo; Kahn's "presumptive" test and Müller's clotting test II) gave, with syphilitic material, a greater number of positive results than the two methods mentioned above, but also one, or several non-specific reactions. A summary of the results obtained is given in Table 6, Annex 1, but the number of samples of cerebro-spinal fluid examined does not appear large enough to allow of a more detailed analysis or to warrant definite conclusions.

¹ It is to be noted that in the comparison referred to, the Kahn test showed less sensitiveness in 238 other specimens which were cloudy.

ANNEXES.

Annex 1.

**TABLES SUMMARISING THE RESULTS OBTAINED
BY COMPARISON OF THE VARIOUS SEROLOGICAL
METHODS.**

Signs used in the tables of Annexes 1 and 2:

- ++ = strong positive.**
 - + = positive.**
 - ± = neither positive nor negative.**
 - a.c. = anticomplementary reaction.**
 - 0 = test not done.**
 - † = treated cases of syphilis.**
 - = positive reactions in cases not diagnosed clinically as "syphilis".**
 - ◻ = positive reactions in cases classified as "doubtful".**
-

Tableau N° 1 : Sérum sanguin. — Table 1 : Blood Serum.

Cas non syphilitiques (304 cas).

Non-syphilitic Cases (304 Cases).

Méthode Method	Effectuée par: Carried out by:	Nombre d'échantillons examinés Number of samples tested	Nombre de Réactions Number of Reactions						+ et-and ++ p. 100
			—	a.c.	±	+	++	+ et-and ++	
B.-W. R.	de Assis	304	283	0	8	8	5	13	4,3
"	Moreau	303	247	0	14	20	22	42	13,9
"	Puppo	304	278	1	8	17	0	17	5,6
"	Scaltritti-Cassiniga . .	304	300	0	4	0	0	0	0
"	Sordelli-Miravent . .	304	301	1	2	0	0	0	0
"	Torrazza-Lorenzo . .	304	288	1	7	6	2	8	2,6
"	Wyler	304	280	0	24	0	0	0	0
Kahn « standard » R. . .	Kahn	304	302	—	2	0	0	0	0
Kahn « presumptive » R.	Kahn	304	292	—	9	1	2	3	1,0
M.K. R.	Dussert-Jolland . . .	248	233	—	9	6	0	6	2,4
M.B. R.II.	Müller	304	279	—	23	2	0	2	0,7
S.H. R.	Prunell	133	126	—	1	3	3	6	4,5

B.-W. R. = Réaction Bordet-Wassermann. — Bordet-Wassermann test.

M.K. R. = Réaction de clarification de Meinicke. — Meinicke's clarification test.

M.B. R.II. = Réaction de conglomération de Müller. — Müller's clotting test.

S.H. R. = Réaction « sérohémofloculation » de Prunell. — Prunell's "sero-hæmo-flocculation" test.

Tableau N° 2 : Sérum sanguin. — Table 2 : Blood Serum.
Cas syphilitiques (623 cas).
Syphilitic Cases (623 Cases).

Methode Method	Effectuée par: Carried out by:	Nombre d'échantillons examinés Number of samples tested	Nombre de réactions Number of Reactions						+ et-and ++ p. 100
			—	a.c.	±	+	++	+ et-and ++	
B.-W. R.	de Assis	623	236	1	44	57	285	342	54,9
»	Moreau	621	199	7	13	35	367	402	64,7
»	Puppo	623	324	0	16	71	212	283	45,4
»	Scaltritti-Cassiniga . .	623	272	4	36	53	258	311	49,9
»	Sordelli-Miravent . .	621	229	6	39	74	273	347	55,9
»	Torrazza-Lorenzo . .	623	233	1	43	50	296	346	55,5
»	Wylér	623	200	4	80	30	309	339	54,4
Kahn « standard » R. . .	Kahn	623	184	—	41	55	343	398	63,9
Kahn « presumptive » R..	Kahn	623	139	—	13	15	456	471	75,6
M.K. R.	Dussert-Jolland . . .	526	169	—	30	75	252	327	62,2
M.B. R.II.	Müller	623	135	—	56	39	393	432	69,3
S.H. R.	Prunell	254	114	—	3	16	117	133	52,4

- B.-W. R. = Réaction Bordet-Wassermann. — Bordet-Wassermann test.
M.K. R. = Réaction de clarification de Meinicke. — Meinicke's clarification test.
M.B. R.II. = Réaction de congglomération de Müller. — Müller's clotting test.
S.H. R. = Réaction « sérohémofloculation » de Prunell. — Prunell's "sero-hæmo-flocculation" test.

Tableau N° 2a : Sérum sanguin. — Table 2a : Blood Serum.

RÉSULTATS DE LA RÉACTION DE CLARIFICATION DE MEINICKE UTILISÉE PAR LE D^r DUSSERT-JOLLAND COMPARÉS AUX
RÉSULTATS CORRESPONDANTS OBTENUS PAR L'EMPLOI DES AUTRES MÉTHODES.

RESULTS OF "MEINICKE'S CLARIFICATION TEST" (DR. DUSSERT-JOLLAND) COMPARED WITH THE RESULTS
OBTAINED BY THE OTHER METHODS.

Cas syphilitiques (526 cas).
Syphilitic Cases (526 Cases).

Méthode Method	Effectuée par: Carried out by:	Nombre d'échantillons examinés Number of samples tested	Nombre de réactions Number of Reactions						+ et-and ++ p. 100
			-	a.c.	±	+	++	+ et-and ++	
B.-W. R.	de Assis	526	207	1	38	47	233	280	53,2
»	Moreau	524	167	7	13	32	305	337	64,3
»	Puppo	526	273	0	16	64	173	237	45,1
»	Scaltritti-Cassiniga . .	526	231	1	31	46	217	263	50,0
»	Sordelli-Miravent . .	526	194	4	31	67	230	297	56,5
»	Torrazza-Lorenzo . .	526	197	1	30	42	256	298	56,8
»	Wyler	526	179	1	62	27	257	284	54,0
Kahn « standard » R. . .	Kahn	526	158	—	31	50	287	337	64,1
Kahn « presumptive » R.	Kahn	526	126	—	9	10	381	391	74,3
M.K. R.	Dussert-Jolland . . .	526	169	—	30	75	252	327	62,2
M.B. R.	Müller	526	118	—	49	31	328	359	68,3

B.-W. R. = Réaction Bordet-Wassermann. — Bordet-Wassermann test.

M.K. R. = Réaction de clarification de Meinicke. — Meinicke's clarification test.

M.B. R.II. = Réaction de congglomération de Müller. — Müller's clotting test.

S.H. R. = Réaction « sérohémofloculation » de Prunell. — Prunell's "sero-hæmo-flocculation" test.

Tableau N° 2b : Sérum sanguin. — Table 2b : Blood Serum.

RÉSULTATS DE LA RÉACTION « SÉROHÉMOFLOCCULATION » (D^r A. PRUNELL) COMPARÉS AUX RÉSULTATS CORRESPONDANTS OBTENUS PAR L'EMPLOI DES AUTRES MÉTHODES.
RESULTS OF THE SERO-HÆMO-FLOCCULATION TEST (DR. A. PRUNELL) COMPARED WITH CORRESPONDING RESULTS OBTAINED BY OTHER METHODS.

Cas syphilitiques (254 cas).
Syphilitic Cases (254 Cases).

Méthode Method	Effectuée par: Carried out by:	Nombre d'échantillons examinés Number of samples tested	Nombre de réactions Number of Reactions						+ et-and ++
			—	a.c.	±	+	++	+ et-anci ++	
B.-W. R.	de Assis	254	90	1	19	27	117	144	56,7
»	Moreau	252	77	2	4	18	151	169	67,1
»	Puppo	254	141	0	0	26	87	113	44,5
»	Scaltritti-Cassiniga . .	254	104	3	10	22	115	137	54,0
»	Sordelli-Miravent . .	252	91	4	15	25	117	142	56,3
»	Torrazza-Lorenzo . .	254	96	1	19	25	113	138	54,3
»	Wyler	254	75	3	30	8	138	146	57,5
Kahn « standard » R. . .	Kahn	254	61	—	17	23	153	176	69,3
Kahn « presumptive » R.	Kahn	254	44	—	5	5	200	205	80,7
M.B. R.II.	Müller	254	36	—	24	19	175	194	76,4
S.H. R.	Prunell	254	114	—	3	16	117	133	52,4

B.-W. R. = Réaction Bordet-Wassermann. — Bordet-Wassermann test.
M.K. R. = Réaction de clarification de Meinicke. — Meinicke's clarification test.
M.B. R.II. = Réaction de congglomération de Müller. — Müller's clotting test.
S.H. R. = Réaction « sérohémoflocculation » de Prunell. — Prunell's "sero-hæmo-flocculation" test.

Tableau N° 3 : Sérum sanguin. — Table 3 : Blood Serum.

Cas de lèpre (27 cas) sans syphilis.

Cases of Leprosy (27 Cases) (without Syphilis).

Méthode Method	Effectuée par: Carried by out:	Nombre d'échantillons examinés Number of samples tested	Nombre de réactions Number of Reactions					
			—	a.c.	±	+	++	+ et-and ++
B.-W. R.	de Assis	27	13	0	3	0	11	11
»	Moreau	27	22	0	0	2	3	5
»	Puppo	26	15	1	1	2	7	9
»	Scaltritti-Cassiniga	27	18	0	2	3	4	7
»	Sordelli-Miravent	27	12	0	4	4	7	11
»	Torrazza-Lorenzo	27	15	1	0	0	11	11
»	Wylér	27	14	0	4	2	7	9
Kahn « standard » R.	Kahn	27	18	—	0	0	9	9
Kahn « presumptive » R.	Kahn	27	18	—	0	0	9	9
M.K. R.	Dussert-Jolland	15	14	—	3	0	1	1
M.B. R.II.	Müller	27	17	—	0	3	7	10
S.H. R.	Prunell	6	3	—	0	2	1	3

B.-W. R. = Réaction Bordet-Wassermann. — Bordet-Wassermann test.

M.K. R. = Réaction de clarification de Meinicke. — Meinicke's clarification test.

M.B. R.II. = Réaction de congglomération de Müller. — Müller's clotting test.

S.H. R. = Réaction « sérohémofloculation » de Prunell. — Prunell's "sero-hæmo-flocculation" test.

Tableau N° 4 : Sérum sanguin. — Table 4 : Blood Serum.

Cas douteux (14 cas) (Prostituées). — Doubtful Cases (14 Cases) (Prostitutes).

Méthode Method	Effectuée par: Carried out by:	Nombre d'échantillons examinés Number of samples tested	Nombre de réactions Number of Reactions					
			—	a.c.	±	+	++	+ et-anc. ++
B.-W. R.	de Assis	14	10	0	1	2	1	3
"	Moreau	14	9	0	0	3	2	5
"	Puppo	14	11	0	0	3	0	3
"	Scaltritti-Cassiniga	14	12	0	1	1	0	1
"	Sordelli-Miravent	14	11	0	0	3	0	3
"	Torrazza-Lorenzo	14	8	0	2	4	0	4
"	Wyler	14	6	0	8	0	0	0
Kahn « standard » R.	Kahn	14	9	—	4	1	0	1
Kahn « presumptive » R.	Kahn	14	5	—	0	1	8	9
M.K. R.	Dussert-Jolland	10	6	—	2	1	1	2
M.B. R.II.	Müller	14	6	—	1	3	4	7
S.H. R.	Prunell	7	7	—	0	0	0	0

B.-W. R. = Réaction Bordet-Wassermann. — Bordet-Wassermann test.

M.K. R. = Réaction de clarification de Meinicke. — Meinicke's clarification test.

M.B. R.II. = Réaction de congglomération de Müller. — Müller's clotting test.

S.H. R. = Réaction « sérohémofloculation » de Prunell. — Prunell's "sero-hæmo-flocculation" test.

Tableau N° 5 : Sérum sanguin — Table 5 : Blood Serum.
Valeur diagnostique de la réaction ± (ni positive ni négative).
Diagnostic Value on the ± Reaction (neither Positive nor Negative).

Méthode Method	Effectuée par: Carried out by:	Cas syphilitiques Syphilitic Cases			Cas non syphilitiques Non-syphilitic Cases			Valeur relative de ± Relative value of ±
		Nombre de cas Number of cases	Nombre de ± Number of ±	Nombre de ± Number of ± p. 100	Nombre de cas Number of cases	Nombre de ± Number of ±	Nombre de ± Number of ± p. 100	
B.-W. R.	de Assis	623	44	7,1	304	8	2,6	ab. - env. 2,7: 1
»	Moreau	621	13	2,1	303	14	4,6	0,5: 1
»	Puppo	623	16	2,6	304	8	2,6	1: 1
»	Scaltritti-Cassiniga . .	623	36	5,8	304	4	1,3	4,5: 1
»	Sordelli-Miravent . .	621	39	6,3	304	2	0,7	9: 1
»	Torrazza-Lorenzo . .	623	43	6,9	304	7	2,3	3: 1
»	Wylér	623	80	12,8	304	24	7,9	1,6: 1
Kahn « standard » R. . .	Kahn	623	41	6,6	304	2	0,7	9,4: 1
Kahn « presumptive » R.	Kahn	623	13	2,1	304	9	3,0	0,7: 1
M.K. R.	Dussert-Jolland . . .	526	30	5,7	248	9	3,6	1,6: 1
M.B. R.II.	Müller	623	56	9,0	304	23	7,6	1,2: 1
S.H. R.	Prunell	254	3	1,2	133	1	0,7	1,7: 1

B.-W. R. = Réaction Bordet-Wassermann. — Bordet-Wassermann test.
M.K. R. = Réaction de clarification de Meinicke. — Meinicke's clarification test.
M.B. R.II. = Réaction de congglomération de Müller. — Müller's clotting test.
S.H. R. = Réaction « sérohémofloculation » de Prunell. — Prunell's "sero-hæmo-flocculation" test.

Tableau N° 6 : Liquide céphalo-rachidien. — Table 6 : Cerebro-spinal Fluids.

Méthode Method	Effectuée par: Carried out by:	Nombre d'échantillons examinés Number of samples tested	Nombre de réactions Number of Reactions					
			—	a.c.	±	+	++	+ et-and ++
<i>Cas de syphilis (53 cas) — Cases of Syphilis (53 Cases).</i>								
B.-W. R.	de Assis	53	13	0	0	1	39	40
„	Scaltritti-Cassiniga . .	52	11	0	2	5	34	39
„	Torrazza-Lorenzo . .	51	10	1	3	2	35	37
„	Wyler	53	14	1	10	6	22	28
Kahn « standard » R. . .	Kahn	53	20	—	0	5	28	33
Kahn « presumptive » R.	Kahn	47	8	—	4	2	33	35
M.B. R.II.	Müller	52	16	—	1	10	25	35
<i>Cas non syphilitiques (147 cas) — Non-syphilitic Cases (147 Cases).</i>								
B.-W. R.	de Assis	147	140	0	4	3	0	3
„	Scaltritti-Cassiniga . .	147	145	0	1	1	0	1
„	Torrazza-Lorenzo . .	146	141	0	4	0	1	1
„	Wyler	147	147	0	0	0	0	0
Kahn « standard » R. . .	Kahn	146	143	—	3	0	0	0
Kahn « presumptive » R.	Kahn	142	135	—	3	3	1	4
M.B. R.II.	Müller	146	145	—	0	1	0	1

B.-W. R. = Réaction Bordet-Wassermann. — Bordet-Wassermann test.

M.K. R. = Réaction de clarification de Meinicke. — Meinicke's clarification test.

M.B. R.II. = Réaction de congglomération de Müller. — Müller's clotting test.

S.H. R. = Réaction « sérohémofloculation » de Prunell. — Prunell's "sero-hæmo-flocculation" test.

Annex 2.

**TABLES GIVING THE DETAILED RESULTS
OBTAINED BY THE VARIOUS SEROLOGICAL
METHODS:**

No. 1.—BLOOD SERUM.

No. 2.—CEREBRO-SPINAL FLUIDS.

Table 1.
RESULTS OF THE COMPARISON OF VARIOUS SEROLOGICAL METHODS.
BLOOD SERA.

Diagnosis											No.	
Syphilis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	The.	Grav.	Tumor var.	Diagn. aliae		Observations
										Epilepsia		1
										Alcoholismus		2
						•					Malaria ther.	3
						•						4
										Psychos cycl.	Cf. n° 516	5
										Melancholia		6
										Debil. ment.		7
										Dement. præcox		8
										Dolores		9
			•									10
			•									11
		•										12
							•					13
							•					14
										Morbilli		15
												16
•												17
		•										18
			•							Eczema		19
			•									20
			•							Granulom. ven.	Cf. n° 523	21
			•									22
	•											23
	•		•							Chancre phaged.	Cf. n° 522-920	24
												25
				•								26
										Trichophyt.		27
									•			28
	•											29
			•									30
			•									31
										Alopecia area. tot.		32
	•											33
•												34
										Psoriasis		35

Table 1.

Diagnosis												No.
Syphilis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
	• ^t											36
			• ^t							Icterus		37
										Ulcus		38
			• ^t									39
		• ^t										40
			• ^t									41
			• ^t									42
			• ^t									43
		• ^t										44
		• ^t										45
	• ^t	• ^t										46
		• ^t								Granulom. ven.		47
			•									48
										Mania	Cf. n° 521	49
										Dement. traumat.		50
										Delirium		51
										Debil. ment.	Cf. n° 517	52
										Dement. senil		53
										Alcoholismus		54
										Dement. præc.		55
										Confus. ment.		56
										Debil. ment.		57
										Debil. ment.		58
										Melancholia		59
										Psychos.		60
			• ^t									61
		•										62
	• ^t											63
	• ^t											64
			• ^t									65
	• ^t											66
			• ^t									67
										Lepra tuberosa	Cf. n° 518	68
										Lepra tuberosa		69
										Scarlatina		70

Tableau 1.

No.	Date	B.-W. R.							Kahn R.		Méhike L. R.	Müller B. R.	R. Serenonnes
		Araujo-de Assis	Moreau	Puppo	R. Scatritti-Cassiniga	Sordelli	Torrazza-Lorenzo	Wylser	Kahn standard	Kahn presumptive	Dussert-Jolland	Müller	Prunell
71	15/9	-	#	-	-	+	-	+	-	-	-	-	+
72		-	-	-	-	-	-	-	-	-	-	-	-
73		-	-	-	-	-	-	-	-	-	-	-	-
74		-	-	-	-	-	-	-	-	-	-	-	-
75		+	#	-	+	#	+	#	#	#	+	#	+
76		#	#	+	#	#	#	#	#	#	#	#	-
77		-	-	-	-	-	-	-	-	-	-	-	-
78		-	-	-	-	-	-	-	-	-	+	#	-
79		-	-	-	-	-	-	-	-	-	-	+	-
80		-	-	-	-	-	-	-	-	-	-	+	-
81	#	#	#	#	#	#	#	#	#	#	#	#	
82	-	-	-	-	-	-	-	-	-	-	-	-	
83	-	-	-	-	-	-	-	-	-	-	-	-	
84	+	#	-	#	#	+	#	#	#	#	#	#	
85	-	+	-	-	-	-	-	-	-	+	-	-	
86	#	#	#	#	#	#	#	#	#	#	#	#	
87	-	-	-	-	-	-	-	-	-	-	-	-	
88	-	-	-	-	-	-	-	-	-	-	-	-	
89	-	-	-	-	-	-	-	-	-	-	-	-	
90	-	-	-	-	-	-	-	-	-	-	-	-	
91	-	-	-	-	-	-	-	-	-	-	-	-	
92	#	#	#	#	#	#	#	#	#	#	#	+	
93	-	-	-	-	-	-	-	-	-	-	-	-	
94	#	#	-	#	#	-	#	#	#	+	#	-	
95	-	+	-	-	-	-	+	#	#	-	+	-	
96	-	-	-	-	-	-	-	-	-	-	-	-	
97	-	-	-	-	-	-	-	-	-	-	-	-	
98	-	+	-	-	-	-	-	+	-	-	-	-	
99	#	#	#	#	#	#	+	#	#	#	+	#	
100	#	#	#	#	#	#	#	#	#	#	#	#	
101	16/9	-	-	-	-	-	-	-	-	-	-	-	
102		#	#	#	+	+	#	+	#	#	#	-	
103		#	#	#	#	#	#	#	#	#	#	#	
104		#	#	+	#	#	#	#	#	#	#	#	
105		+	#	+	+	+	+	+	+	+	+	+	

* Série n° 101-200

Tableau 1.

No.	Date	B.-W. R.							Kahn R.		Melnick K. R.	Müller B. R.	R. Serre-hemoléc.
		Araujo-de Assis	Moreau	Puppo	R. Scaltritti-Cassiniga	Sordelli	Torrazza-Lorenzo	Wylar	Kahn standard	Kahn presump-tive	Dussert-Jolland	Müller	Prunell
106	16/9	+	#	|	|	+	+	+	#	#	+	#	#
107		+	#	+	|	+	|	+	#	#	#	#	#
108		+	#	+	+	+	+	+	#	#	#	#	#
109		#	#	#	#	#	+	#	#	#	#	#	#
110		#	#	#	#	#	#	#	#	#	|	#	#
111		|	|	|	|	|	|	|	|	|	+	|	|
112		#	#	#	#	#	#	#	#	#	+	#	|
113		|	+	|	|	|	+	+	|	+	+	+	+
114		|	|	|	|	|	|	|	|	|	+	+	+
115		+	#	|	|	|	|	+	#	#	|	#	+
116		#	#	#	#	#	0	+	#	#	0	#	#
117		|	|	|	|	|	|	+	+	+	+	#	+
118		#	#	#	#	#	#	#	#	#	0	#	#
119		#	#	#	#	+	#	+	#	#	#	#	#
120	#	#	#	#	+	#	+	#	#	#	#	#	
121	+	#	|	|	|	+	|	|	#	#	+	#	
122	|	|	|	|	|	|	|	|	#	+	+	|	
123	#	#	#	#	#	#	#	#	#	+	+	#	
124	|	|	|	|	|	|	|	|	+	+	|	|	
125	#	#	|	|	+	+	+	#	#	+	#	#	
126	#	#	#	#	#	#	#	#	#	+	#	#	
127	#	#	|	|	+	+	|	+	+	+	#	|	
128	+	#	|	|	|	0	|	+	#	0	#	+	
129	|	|	|	|	|	|	|	|	|	#	+	|	
130	|	|	|	|	|	|	|	+	#	#	+	|	
131	|	|	|	|	|	|	|	|	|	+	|	|	
132	|	|	|	|	|	|	|	|	|	+	|	|	
133	+	#	|	|	|	+	|	+	#	0	|	|	
134	|	|	|	|	|	|	|	+	#	|	#	|	
135	|	|	|	|	|	|	|	|	|	+	|	|	
136	#	#	|	|	a.c.	+	+	#	#	+	#	|	
137	|	|	|	|	|	|	|	+	|	+	|	+	
138	|	|	|	|	|	|	|	|	|	|	|	+	
139	#	#	#	#	#	#	#	#	#	|	#	#	
140	#	#	#	#	#	#	#	#	#	#	#	#	

* Serum n° 101-102 inact.

Tableau 1.

No.	Date	B.-W. R.						Kahn R.		Meincke K. R.	Müller B. R.	R. Serre-honellac.
		Araujo-de Assis	Moreau	Puppo	R. Scallritti-Cassiniga	Sordelli	Torrazza-Lorenzo	Wylér	Kahn standard.				Kahn presump-tive	Dussert-Jolland	Müller	Prunell
141	16/9	|	#	|	|	|	|	|	|	|	|	|
142		#	#	#	#	#	#	#	#	#	#	#
143		|	|	|	|	|	|	|	|	|	|	|
144		|	|	|	|	|	|	|	|	++	|	|
145		|	#	|	|	|	|	+	+	#	#	|
146		#	#	#	#	#	#	+	#	#	|	|
147		#	#	#	#	#	#	#	+	#	|	#
148		+	#	|	+	+	+	#	#	#	#	#
149		#	#	#	#	#	#	#	#	#	#	#
150		#	#	#	#	#	#	#	#	+	#	#
151		#	#	#	#	#	#	#	#	#	#	#
152		|	#	|	|	|	|	|	|	|	|	+
153		#	#	+	#	#	#	+	#	#	o	#
154		#	#	#	#	#	#	#	#	#	#	#
155		|	+	|	|	|	|	|	|	|	o	|
156		#	#	#	#	#	#	#	#	#	+	#
157		|	|	|	|	|	|	|	|	|	+	|
158	|	|	|	|	|	|	|	|	|	o	|	
159	|	#	|	|	|	|	|	|	|	+	|	
160	|	|	|	|	|	|	|	+	#	#	|	
161	#	#	#	#	#	#	#	#	#	+	#	
162	|	|	|	|	|	|	|	|	|	+	|	
163	#	#	|	#	#	#	+	#	#	#	#	
164	+	#	|	|	|	|	+	+	#	#	#	
165	|	#	|	|	+	#	+	#	#	#	#	
166	#	#	#	#	#	#	#	#	#	#	#	
167	|	+	|	|	|	|	+	#	#	#	#	
168	+	|	|	|	|	+	+	#	#	#	#	
169	|	#	|	|	|	|	|	+	+	+	|	
170	|	#	|	|	|	|	|	+	+	+	#	
171	#	#	#	#	#	#	|	#	#	#	#	
172	|	|	|	|	|	|	a.c.	|	#	#	#	
173	|	|	|	|	|	|	|	|	|	o	|	
174	+	#	|	|	|	|	|	|	|	+	#	
175	#	#	#	#	#	#	#	#	#	o	#	

* Sérum n° 101-102 inact.

Tableau 1.

No.	Date	B.-W. R.							Kahn R.		Meincke K. E.	Müller B. E.	B. Sere- hemofloc.
		Araujo- de Assis	Moreau	Puppo	R. Scaltritti- Cassiniga	Sordelli	Torrazza- Lorenzo	Wylér	Kahn "standard"	Kahn presump- tive	Dussert- Jolland	Müller	Prunell
176	16/9	#	#	#	#	#	#	#	#	#	#	#	
177		|	|	|	|	|	|	|	|	|	|	|	
178		|	|	|	|	|	|	|	|	|	|	|	
179		|	|	|	|	|	|	|	|	|	|	|	
180		|	|	|	|	|	|	|	|	|	+	|	
181		|	|	|	|	|	|	|	|	|	|	|	
182		|	|	|	|	|	|	|	|	|	|	|	
183		|	|	|	|	|	|	|	|	|	|	|	
184		|	|	|	|	|	|	|	|	|	|	|	
185		#	#	#	#	#	#	#	#	#	#	#	
186		#	#	#	#	#	#	#	#	#	#	#	
187		|	|	|	|	|	|	|	|	|	|	|	
188		#	+	#	#	#	#	#	#	#	|	+	
189		|	|	|	|	|	|	|	|	|	|	|	
190		|	|	|	|	|	|	|	|	|	|	|	
191		#	#	#	#	#	#	#	#	#	#	#	
192		|	|	|	|	|	|	|	|	|	|	|	
193		|	|	|	|	|	|	|	|	|	|	|	
194		|	|	|	|	|	|	|	|	|	+	|	
195		|	|	|	|	|	|	|	|	|	|	|	
196	|	|	|	|	|	|	|	|	|	|	|		
197	#	|	|	|	a.c.	a.c.	a.c.	|	|	|	|		
198	|	|	|	|	|	|	|	|	|	o	|		
199	#	#	#	#	|	|	|	|	|	|	|		
200	#	#	#	#	#	#	#	#	#	#	#		
201	17/9	+	#	|	+	+	+	+	#	#	#		
202		|	|	|	|	|	|	|	|	|	|		
203		#	#	#	#	#	#	#	#	#	#		
204		#	#	#	#	#	#	#	#	#	#		
205		#	#	|	#	#	#	#	#	#	#	#	
206		#	#	#	#	#	#	#	#	#	#	#	
207	|	+	|	|	|	|	|	|	|	|	|		
208	|	|	|	+	|	|	|	|	|	|	|		
209	|	|	|	|	|	|	|	|	|	|	|		
210	|	|	|	|	|	|	|	|	|	|	|		

* Serum n° 1/1-2/0 inact.

Table 1.

Diagnosis												No.
Syphilis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
• ^t												176
		• ^t								Herpes		177
										Gon.		178
										Gon.		179
												180
										Ulcus simpl.		181
											Lues cong. ?	182
			• ^t									183
										Eczema		184
	• ^t											185
•				•								186
											Cf. n° 931 .	187
		• ^t										188
										Herpes gen.		189
										Balanopostit.		190
•												191
		•										192
										Gon.		193
										Erythrod exfol.		194
	•									Condylom. ac.	Cf. n° 921	195
			• ^t									196
			• ^t									197
			• ^t									198
• ^t			• ^t									199
			• ^t									200
			• ^t									201
			• ^t									202
	• ^t		• ^t									203
	• ^t		• ^t									204
	• ^t		• ^t									205
			•							Debil. mental.	Cf. n° 926	206
										Epilepsia cf. n° 922	Sine antec.	207
										Delirium	Cf. n° 903	208
										Mania		209
										Sanus		210

Table 1.

Diagnosis											No.	
Syphilis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae		Observations
						•						211
										Dement. præcox		212
										Dement. præcox		213
										Debil. mental. cf 901	Sine antec.	214
										Debil. mental. cf 932	Sine antec.	215
										Dement. senil. cf. 937	Sine antec.	216
			• t							Dementia præcox	Cf. n° 930	217
										Epilepsia		218
										Epilepsia	Cf. n° 928	219
										Debil. mental. cf. 927- [938]	Sine antec.	220
			•							Psychosis	Cf. n° 925	221
										Debil. ment.	Cf. n° 936	222
										Psychosis		223
						•					Malaria ther.	224
										Delirium		225
										Psychosis		226
						•						227
										Debil. ment.		228
										Delirium		229
										Sanus	Cf. n° 902	230
										Dementia senil.		231
										Delirium		232
										Psychosis	Cf. n° 923	233
										Dementia præcox		234
			• t									235
			• t									236
			• t									237
			• t									238
			• t									239
	• t		• t									240
			• t									241
			• t									242
			• t									243
			• t									244
			• t		• t							245

Tableau 1.

No.	Date	B.-W. R.							Kahn R.		Meincke K. R.	Müller B. R.	N. Sorensen
		Araujo-de Assis	Moreau	Puppo	R. Scatritti-Cassiniga	Sordelli	Torrazza-Lorenzo	Wylér	Kahn standard	Kahn presumptive	Dussert-Jolland	Müller	Prunell
246	17/9	|	|	|	|	|	|	|	|	|	|	|	|
247		|	|	|	|	|	|	|	|	|	|	|	|
248		#	#	#	#	#	#	#	#	#	#	#	#
249		|	#	|	#	|	#	#	#	#	#	#	#
250		#	#	#	#	#	#	#	#	#	#	#	#
251		#	#	#	#	#	#	#	#	#	#	#	#
252		|	|	|	|	|	|	|	|	|	|	|	|
253		|	|	|	|	|	|	|	|	|	|	|	|
254		|	|	|	|	|	|	|	|	|	|	|	|
255		|	#	|	|	|	|	|	|	|	|	|	|
256	a.c.	|	|	+	a.c.	a.c.	a.c.	a.c.	#	#	#	#	|
257	|	|	|	|	|	|	|	|	|	|	|	|	|
258	|	|	|	|	|	|	|	|	|	|	|	|	|
259	|	#	#	|	|	|	|	|	|	|	|	|	|
260	#	#	#	#	#	#	#	#	#	#	#	#	#
261	#	#	#	+	#	+	#	#	#	#	#	+	#
262	|	|	|	|	|	|	|	|	|	|	|	|	|
263	|	|	#	#	#	+	#	#	#	#	#	#	#
264	|	|	|	+	#	|	#	#	#	#	#	|	#
265	#	#	+	#	#	#	#	#	#	#	#	#	#
266	#	#	#	#	#	#	#	#	#	#	#	#	#
267	|	|	|	|	|	|	|	|	|	|	|	|	|
268	|	#	#	|	|	|	|	|	|	|	|	|	|
269	|	|	|	|	|	|	|	|	|	|	|	|	|
270	#	#	#	#	#	#	#	#	#	#	#	#	#
271	#	#	#	#	#	#	#	#	#	#	#	#	#
272	|	|	|	|	|	|	|	|	|	|	|	|	|
273	#	#	#	#	#	#	#	#	#	#	#	#	#
274	#	#	#	#	#	#	#	#	#	#	#	#	#
275	+	#	#	|	|	|	|	|	|	|	|	|	|
276	|	|	|	|	|	|	|	|	|	|	|	|	|
277	#	#	#	+	#	#	#	#	#	#	#	#	#
278	#	#	#	#	#	#	#	#	#	#	#	#	#
279	+	#	#	|	+	+	#	#	#	#	#	+	#
280	#	#	#	+	#	+	#	#	#	#	#	+	#

Table 1.

Diagnosis												No.
Syphillis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
			•									351
			•									352
			•							Vitium cordis		353
			•							Dolores capit.		354
			•							Dolores		355
	•		•									356
			•									357
			•					•				358
			•							Atherosclerosis		359
			•									360
			•									361
			•									362
			•									363
			•									364
			•							Sana	Puella publ.	365
			•									366
			•							Sana	Puella publ.	367
			•								Puella publ.	368
			•									369
			•							Cf. n° 969	Puella publ.	370
			•									371
			•									372
			•									373
			•									374
			•									375
			•									376
			•									377
			•							Ulcus Aug. 30		378
			•									379
			•									380
			•									381
		•	•									382
		•	•									383
			•									384
			•							Sanus		385

Tableau 1.

No.	Date	B.-W. R.						Kahn R.		Meincke K. R.	Müller B. R.	R. Sarcenoff.	
		Araujo-de Assis	Moreau	Puppo	R. Scatritti-Cassiniga	Sordelli	Torrazza-Lorenzo	Wylor	Kahn "standard"				Kahn presumptive	Dussert-Jolland	Müller	Prunell
386	18/9	|	|	|	|	|	|	|	|	|	|	|	
387		|	|	|	|	|	|	|	|	|	|	|	
388		#	#	#	#	#	#	#	#	#	#	#	
389		#	+	#	#	#	#	#	#	#	#	#	
390		|	|	|	|	|	|	|	|	|	|	|	
391		|	|	|	|	|	|	|	|	|	|	|	
392		|	|	|	|	|	|	|	|	|	|	|	
393		|	|	|	|	|	|	|	|	|	|	|	
394		|	|	|	|	+	|	|	|	|	|	|	
395		|	|	|	|	|	|	|	+	#	+	#	|
396		#	-	+	+	+	#	+	#	#	+	+	#
397		#	a.c.	#	-	#	#	#	-	+	+	#	#
398		#	#	#	#	#	#	#	#	#	#	#	#
399		#	+	#	#	#	#	#	#	#	#	#	#
400	#	|	|	|	|	|	|	+	#	|	+	|	
401	19/9	|	#	#	#	#	#	#	#	#	#	#	
402		|	|	|	|	|	|	|	|	|	|	|	
403		#	a.c.	#	#	#	#	#	#	#	#	#	#
404		+	|	|	+	#	#	+	#	#	#	#	#
405		+	#	|	|	+	+	+	+	#	+	#	#
406		#	-	a.c.	#	#	#	#	#	#	-	+	
407		|	|	|	|	|	|	|	|	|	|	|	
408		#	#	#	#	#	#	#	#	#	#	#	
409		|	|	|	|	|	|	|	|	|	|	|	
410		#	#	#	#	#	#	#	#	#	#	+	#
411		|	|	|	|	|	|	|	|	|	|	|	
412		|	|	|	|	|	|	|	|	|	|	|	
413		|	#	|	|	+	|	+	|	#	|	#	|
414		|	|	|	|	|	|	|	|	|	+	#	|
415	|	|	|	|	|	|	|	#	#	+	#	|	
416	|	|	|	|	|	|	|	|	|	+	#	|	
417	#	#	#	#	#	#	#	#	#	+	#	|	
418	#	#	#	#	#	#	#	#	#	#	#	|	
419	#	+	#	#	#	#	#	#	#	#	#	|	
420	#	+	#	#	#	+	#	#	#	#	#		

Table 1.

Diagnosis												No.
Syphilis						Mb. alii (non-syphilitic)					Observations	
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae		
			•									386
			•?									387
		•										388
			•									389
			•									390
			•									391
			•									392
			•?									393
			•									394
			•									395
			•							Lepra	Rio de Janeiro	396
			•							Framboesia	Macacus Rio	397
			•								Rio de Janeiro	398
			•									399
			•									400
			•									401
			•							Sanus		402
			•									403
			•									404
			•									405
			•							Lepra tuberosa	Rio de Janeiro	406
			•							Lepra nervosa	nº 406-459	407
			•		•							408
			•							Leischmaniosis min.		409
		•										410
			•									411
			•									412
		•										413
			•									414
		•								Eczema		415
			•							Eczema		416
•			•							Ulcus mixte		417
		•										418
			•									419
			•							Lepra tuberosa		420

Table 1.

Diagnosis												No.
Syphillis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
					•					Staphylococia barb.		526
		• t										527
			• t									528
			• t									529
			• t									530
										Hemiplegia		531
										Insuf. ren.		532
										Parkinsonism.	Cf. n° 941	533
		• t										534
		• t										535
										Cf. n° 960	Sine antec.	536
			• t									537
			• t									538
			• t									539
			• t									540
			• t									541
			• t									542
			• t									543
		• t										544
										Rheumatismus		545
										Paranoia		546
										Psychosis		547
										Cf. n° 907	Sin. antec.	548
										Debil. ment.		549
						•						550
										Dement. præcox		551
										Dement. præcox		552
										Debil. mental		553
										Dement. præcox	Cf. n° 908	554
										Idiotia	Cf. n° 913	555
										Dement. præcox		556
										Dement. præcox	Cf. n° 910	557
						•						558
						• t						559
										Debil. ment.		560

Tableau 1.

N ^o .	Date	B.-W. R.							Kahn R.		Melnke R. R.	Müller R. R.
		Araujo-de Assis	Moreau	Puppo	R. Scaltritti-Cassiniga	Sordelli	Torrazza-Lorenzo	Wylér	Kahn standard	Kahn presumptive	Dussert-Jolland	Müller
596	20/9	+	+	-	-	-	+	++	-	-	-	-
597		-	-	-	-	-	-	++	-	-	-	-
598		#	#	#	#	#	#	#	#	#	#	#
599		-	++	-	-	-	-	-	+	-	++	++
600		-	++	-	-	-	-	-	-	-	++	++
601	21/9	+	+	+	-	-	+	-	-	-	-	-
602		+	#	#	#	#	+	+	#	#	#	#
603		#	#	#	#	#	#	#	#	#	#	#
604		-	-	++	-	-	-	++	+	#	+	#
605		-	-	-	-	++	++	++	+	#	+	#
606		+	#	+	++	++	+	++	+	#	#	#
607		-	-	-	-	-	-	-	+	-	+	-
608		++	+	+	+	+	-	#	+	#	+	#
609		-	+	+	-	-	-	-	+	-	+	-
610		#	#	+	#	#	#	#	#	#	#	#
611		-	-	-	-	-	-	-	-	-	-	-
612		-	-	+	-	-	-	-	-	++	++	++
613		++	-	+	-	-	+	-	-	#	++	++
614		-	-	-	-	-	-	-	-	-	-	-
615		-	-	-	-	-	-	-	-	-	-	-
616	#	#	#	#	#	#	#	#	#	#	#	
617	#	#	#	#	#	#	#	#	#	#	#	
618	-	-	++	++	-	-	-	-	-	-	-	
619	-	#	-	-	-	-	-	-	-	-	-	
620	-	+	-	-	-	-	-	-	-	-	-	
621	+	-	-	-	-	-	-	-	-	-	++	
622	+	-	-	-	-	-	-	-	-	-	++	
623	+	+	+	-	-	-	-	-	-	-	++	
624	-	-	-	-	-	-	-	-	-	-	++	
625	-	-	+	-	-	-	++	-	-	-	++	
626	#	#	#	#	#	#	#	#	#	#	#	
627	#	#	#	+	+	#	#	#	#	++	#	
628	-	-	++	-	-	-	-	-	-	++	-	
629	+	-	+	-	-	-	-	-	-	-	++	
630	+	-	+	+	+	-	-	-	-	-	++	

Table 1.

Diagnosis												No.
Syphilis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
			• ^t									596
			• ^t									597
			• ^t									598
			• ^t									599
			• ^t									600
										Ulcus molle		601
			• ^t									602
		• ^t										603
			• ^t							Vitiligo		604
			• ^t									605
			• ^t									606
			• ^t									607
			• ^t									608
										Sanus	Sine antec.	609
• ^t												610
										Gon.		611
										Ulcus molle		612
•												613
										Ablatio retinae		614
			• ^t									615
					• ^t							616
		• ^t										617
					•							618
			•									619
										Epithelioma		620
										Lingua geograph.		621
										Sanus	Sine antec.	622
										Dement. præcox	Cf. n° 935	623
										Epilepsia		624
										Debil. ment.	Cf. n° 933	625
						•						626
						•						627
										Dement. præcox		628
										Psychosis		629
										Dement. præcox		630

Table 1.

Diagnosis											No.	
Syphills						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae		Observations
		•				•				Dement. præcox		631
												632
												633
						•				Imbecilitas		634
												635
										Debil. ment.	Cf. 924	636
										Dement. præcox	Cf. n° 904	637
			•							Epilepsia		638
										Debil. ment.	Cf. n° 929	639
										Dement. præcox		640
										Dement. præcox		641
										Alcoholismus		642
										Debil. ment.		643
				•						Sinusitis		644
											Sine antec.	645
											Sine antec.	646
		•								Atherosclerosis		647
			•									648
			•									649
			•									650
			•									651
			•									652
			•									653
			•									654
			•									655
			•									656
			•									657
			•									658
			•									659
			•									660
			•									661
			•									662
			•									663
	•											664
				•							Sine antec.	665

Tableau 1.

No.	Date	B.-W. R.						Kahn R.		Meincke K. R.	Müller G. R.
		Araujo-de Assis	Moreau	Puppo	R. Scatritti-Cassiniga	Sordelli	Torrazza-Lorenzo	Wylar	Kahn standard	Kahn presump-tive	Dussert-Jolland	Müller
806	2/9	|	|	|	|	|	|	|	|	|	|
807		++	#	|	|	|	|	++	|	|	|
808		++	|	|	|	|	|	++	|	|	|
809		|	|	++	|	|	|	|	|	|	|
810		|	|	+	|	|	|	|	|	|	|
811		|	|	|	|	|	|	+	|	|	++
812		|	|	|	|	|	|	|	++	|	++
813		++	+	|	|	++	|	+	|	+	++
814		|	|	|	|	++	|	|	#	+	++
815		|	#	|	|	++	|	+	+	#	+
816	|	|	+	|	|	|	|	|	|	|	
817	|	|	|	|	|	|	|	|	|	|	
818	|	|	|	|	|	|	|	|	|	|	
819	++	|	|	|	|	|	|	|	|	|	
820	|	|	|	|	|	|	++	|	|	|	
821	|	|	+	|	|	|	|	|	|	|	
822	#	#	#	#	#	#	#	#	#	#	
823	|	|	|	|	++	|	|	|	|	|	
824	|	#	|	++	+	|	|	#	#	#	
825	|	|	|	|	|	|	|	++	++	++	
826	|	|	|	|	|	|	|	|	|	|	
827	#	#	+	#	#	#	#	#	#	#	
828	|	|	|	|	|	|	|	|	|	|	
829	#	#	#	#	#	#	#	#	#	#	
830	#	#	#	#	#	#	#	#	#	#	
831	#	#	#	#	#	#	#	#	#	#	
832	#	#	#	#	#	#	#	#	#	#	
833	+	a.c.	++	|	|	#	++	|	|	++	
834	|	|	|	|	|	|	|	|	|	|	
835	#	#	#	#	+	#	#	#	#	#	
836	#	#	#	#	#	#	#	#	#	#	
837	#	#	#	++	++	++	#	#	#	#	
838	#	#	|	++	++	++	#	#	++	++	
839	#	#	#	++	++	++	#	#	++	++	
840	#	#	#	++	++	++	#	#	++	++	

Tableau 1.

No.	Date	B.-W. R.							Kahn R.		Meine L. R.	Müller B. R.
		Araujo- de Assis	Moreau	Puppo	R. Scaltritti- Cassiniga	Sordelli	Torrazza- Lorenzo	Wylér	Kahn "standard"	Kahn presump- tive	Dussert- Jolland	Müller
841	24/9	#	#	#	#	#	#	#	#	#	#	#
842		|	|	|	|	++	|	|	++	#	++	++
843		#	#	#	#	#	#	#	#	#	#	#
844		|	|	|	|	|	|	|	|	|	|	|
845		|	|	|	|	|	|	|	+	#	+	+
846		|	|	|	|	|	|	|	|	|	|	|
847		|	a.c.	|	|	|	|	|	|	|	|	|
848		|	|	|	|	|	|	|	|	|	|	|
849		|	|	|	|	|	|	|	|	|	|	|
850		|	|	|	|	|	|	|	|	|	|	|
851		|	#	|	|	|	|	|	|	|	|	|
852		++	#	|	++	+	#	+	#	#	#	#
853		##	##	##	##	##	##	##	##	##	##	##
854		#	#	#	#	#	#	#	#	#	++	#
855		|	|	|	+	|	|	|	|	|	|	|
856		+	#	++	|	+	|	+	#	#	+	#
857		##	##	##	#	##	##	##	##	##	##	##
858		+++	+++	|	++	|	++	++	|	#	++	|
859		#	##	|	++	+	#	++	#	#	##	##
860		|	#	|	++	+	|	|	+	#	+	#
861	|	#	|	|	++	|	|	|	++	++	++	
862	|	#	|	|	|	|	|	|	#	|	|	
863	|	|	|	|	|	|	|	++	#	++	+	
864	|	#	|	+	++	#	#	#	++	+	#	
865	#	#	+	++	+	#	#	#	#	+	#	
866	|	+	|	|	|	|	|	|	|	|	|	
867	|	|	|	|	|	|	|	|	|	|	|	
868	##	##	##	##	##	##	##	##	##	##	##	
869	##	##	##	##	##	##	##	##	##	##	##	
870	#	#	#	#	#	#	#	#	#	++	#	
871	|	#	|	|	+	|	|	+	#	++	#	
872	|	|	|	|	|	|	|	|	|	|	|	
873	|	|	|	|	+	+	|	+	#	#	#	
874	|	#	|	|	|	|	|	|	|	|	|	
875	|	#	|	|	++	#	#	#	#	#	#	

Table 1.

Diagnosis												No.
Syphilis					Mb. alii (non-syphilitic)							
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
		•	•									876
		•	•									877
			•									878
			•									879
			•									880
			•									881
			•	•								882
			•									883
			•									884
			•									885
			•									886
			•								Sine antec.	887
			•									888
			•									889
			•								Sine antec.	890
			•									891
			•									892
			•									893
			•									894
			•									895
			•									896
			•									897
			•									898
			•									899
			•								Sine antec.	900
			•							Debil. ment.	Cf. n° 214	901
			•							Sanus	Cf. n° 230	902
			•							Delirium	Cf. n° 208	903
			•							Dement. præcox	Cf. n° 637	904
			•							Lepra tuberosa		905
			•							Sepsis	Cf. n° 339	906
			•							Sine antec.	Cf. n° 548	907
			•							Dement. præcox	Cf. n° 554	908
			•							Dement. præcox	Cf. Lq. c. sp. n° 76	909
			•							Dement. præcox	Cf. n° 557	910

Tableau 1.

No.	Date	B.-W. R.							Kahn R.		Müller B. R.
		Araujo-de Assis	Moreau	Puppo	R. Scallritti-Cassiniga	Sordelli	Torrazza-Lorenzo	Wylar	Kahn standard	Kahn presump-tive	
911	26/9	|	|	|	|	|	|	|	|	|	|
912		|	|	|	|	|	|	|	|	|	|
913		|	|	|	|	|	|	|	|	|	|
914		#	|	#	#	#	#	#	#	#	#
915		|	|	|	|	|	|	|	|	|	|
916		|	|	|	|	|	|	|	|	|	|
917		|	|	|	aggl.	aggl.	|	a.c.	#	#	#
918		|	|	|	+	+	+	|	+	+	+
919		#	#	|	#	#	#	#	+	#	#
920		#	#	#	#	#	#	#	#	#	#
921		|	|	+	|	|	|	|	|	+	|
922		|	|	|	|	|	|	|	|	|	|
923		|	|	|	|	|	|	|	|	|	|
924		|	|	|	|	|	+	|	|	|	|
925		#	#	#	#	#	#	#	#	#	#
926	|	|	#	#	#	#	#	#	#	#	
927	|	|	|	|	|	|	|	|	|	|	
928	+	+	|	|	|	+	|	|	|	|	
929	#	|	|	+	|	#	+	+	#	|	
930	#	+	|	+	|	#	+	+	#	|	
931	27/9	+	|	|	|	|	#	+	|	|	#
932		|	|	|	|	|	|	|	|	|	|
933		|	|	|	|	|	|	|	|	|	|
934		|	|	|	|	|	+	|	|	|	|
935		|	+	|	|	|	|	|	|	|	|
936		|	|	+	|	|	|	|	|	|	|
937		|	|	+	|	|	|	|	|	|	|
938		|	+	|	|	|	|	|	|	|	|
939		#	#	#	#	#	#	#	#	#	#
940		#	#	#	#	#	#	#	#	#	#
941		+	+	|	|	|	|	|	|	|	|
942		+	#	|	|	|	+	+	+	#	#
943		#	#	|	|	+	#	+	#	#	+
944		|	|	|	|	|	|	|	|	|	|
945		#	|	#	+	#	#	#	#	#	#

Table 1.

Diagnosis												No.
Syphilis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
			•							Dement. præcox	Lq. c. sp. n° 74	911
			•							Idiotia	Cf. n° 555	913
			•							Psychosis	Cf. n° 49-521	914
			•							Psychosis	Cf. n° 5-516	915
•			•							Ulcus molle	Cf. n° 586	916
•			•							Ulcus	Cf. n° 671	917
			•							Chancres Aug. 30	Cf. n° 508	918
			•							Chancres Aug. 30	Cf. n° 506	919
			•							Chancre 1928	Cf. n° 24-522	920
	•		•							Condylom. ac.	Cf. n° 195	921
			•							Epilepsia	Cf. n° 207	922
			•							Psychosis	Cf. n° 233	923
			•							Debil. ment.	Cf. n° 626	924
			•							Debil. ment.	Cf. n° 221	925
			•							Debil. ment.	Cf. n° 206	926
			•							Debil. ment.	Cf. n° 220	927
			•							Epilepsia	Cf. n° 219	928
			•							Epilepsia	Cf. n° 639	929
			•							Epilepsia	Cf. n° 217	930
			•							Debil. ment.	Cf. n° 187	931
			•							Debil. ment.	Cf. n° 215	932
			•							Depressio ment.	Cf. n° 625	933
			•							Delirium	Cf. n° 232	934
			•							Dement. præcox	Cf. n° 623	935
			•							Debil. ment.	Cf. n° 222	936
			•							Dement. senil.	Cf. n° 216	937
			•							Debil. ment.	Cf. n° 220	938
			•							Debil. ment.	Cf. n° 260	939
			•							Debil. ment.	Cf. n° 265	940
			•							Parkinsonism.	Cf. n° 533	941
•			•							Parkinsonism.	Cf. n° 259	942
			•							Lepra mixta		943
			•							Lepra tuberosa		944
			•							Lepra tuberosa		945

Tableau 1.

No.	Date	B.-W. R.						Kahn R.		Müller S. R.	
		Araujo-de Assis	Moreau	Poupp	R. Scaltritti-Casajiniga	Sordelli	Torrazza-Lorenzo	Wylar	Kahn standard		Kahn presump-tive	Dussert-Jolland
946	27/9	#	-	+	-	+	#	+	+	+	+
947		-	-	+	-	-	-	+	-	-	-
948		-	-	-	-	-	-	-	-	-	-
949		#	-	0	+	#	#	+	#	#	#
950		#	#	#	+	#	#	#	#	#	#
951		-	-	-	-	-	-	-	-	-	-
952		#	-	#	#	#	#	#	#	#	#
953		#	-	#	-	#	#	+	#	#	#
954		#	-	#	#	#	#	#	#	#	#
955		#	-	#	-	#	#	#	-	-	+
956		-	-	-	-	-	-	-	-	-	-
957		+	-	-	-	-	-	-	-	-	-
958		#	-	-	-	-	-	+	-	-	-
959		#	#	+	-	-	#	+	-	+	+
960		+	#	-	-	-	+	+	-	-	+
961	+	-	+	-	+	+	+	+	#	+	
962	#	#	#	+	#	#	#	#	#	#	
963	-	+	+	-	-	-	-	-	-	-	
964	-	-	-	-	-	-	+	-	#	+	
965	-	-	-	-	-	-	-	-	-	-	
966	-	-	-	-	-	-	-	-	-	-	
967	-	-	-	-	-	-	-	-	-	-	
968	+	#	-	-	-	+	+	-	#	+	
969	+	-	-	-	-	-	+	-	+	+	

Table 1.

Diagnosis											No.	
Syphillis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Derm. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae		Observations
			•							Lepra tuberosa		946
										Lepra tuberosa	Cf. n° 71-519	947
										Syringomyeli		948
										Lepra tuberosa		949
										Lepra tuberosa		950
										Lepra tuberosa		951
										Lepra mixta		952
										Lepra mixta		953
			•							Lepra mixta		954
										Lepra tuberosa		955
										Lepra lagad.		956
										Lepra tuberosa		957
										Sine antec.	Prostitutio	958
			•								Cf. n° 320	959
										Sine antec.	Cf. n° 536	960
										Sine stigm. luct.	Cf. n° 326	961
			•								Cf. n° 323	962
										Parolitis	Cf. n° 298	963
			•									964
										Sana	Cf. n° 312	965
										Ulcus molle	Cf. n° 113	966
										Sana; Puella publ.	Cf. n° 314	967
										Sine stigm. luct.	Cf. n° 309	968
			•							Puella publ.	Cf. n° 370	969

Tableau 2
RÉSULTATS DÉTAILLÉS OBTENUS PAR LES DIVERSES MÉTHODES
SÉROLOGIQUES. LIQUIDE CÉPHALO-RACHIDIEN.

No.	Date	B.-W. R.						Kahn R.		Müller B. B.
		Araujo-de Assis		R. Scaltritti-Cassiniga		Torrazza-Lorenzo	Wylér	Kahn standard	Kahn presump-tive	
1	15/9	#		#		#	#	#	#	#
2		|		|		|	|	|	|	|
3		#		#		#	#	#	#	#
4		|		|		|	|	|	|	|
5		|		|		|	|	+	+	|
6		|		|		|	|	|	|	|
7		|		|		|	|	|	|	|
8		|		|		|	|	|	|	|
9		|		|		|	|	|	|	|
10		|		|		|	|	|	|	|
11		|		|		|	|	|	|	|
12		|		|		|	|	|	|	|
13		|		|		|	|	|	|	|
14		#		#		#	#	#	#	#
15		|		|		|	|	|	|	|
16	16/9	#		#		#	#	#	#	#
17		|		|		|	|	|	|	|
18		|		|		|	|	|	|	|
19		|		|		|	|	|	|	|
20		|		|		|	|	|	+	|
21		|		|		|	|	|	+	|
22		|		|		|	|	|	|	|
23		|		|		|	|	|	|	|
24		|		|		|	|	|	|	|
25		|		|		|	|	|	|	|
26		#		#		#	#	#	#	#
27		|		|		|	|	|	|	|
28		|		|		|	|	|	|	|
29		|		|		|	|	|	|	|
30		|		|		|	|	|	|	|
31		|		|		|	|	|	|	|
32		#		#		#	#	#	#	#
33		|		|		|	|	|	|	|
34		#		#		#	#	#	#	#
35		#		#		#	#	#	#	#

Table 2.
DETAILED RESULTS OBTAINED BY THE VARIOUS SEROLOGICAL METHODS.
CEREBRO-SPINAL FLUIDS.

Diagnosis												No.
Syphilis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
			•			•				Conf. ment.		1
						•					Cf. n° 186	2
											Malaria ther.	3
										Epilepsia		4
										Confus. ment.		5
										Epilepsia		6
										Debil. ment.		7
										Dement. senil.		8
										Epilepsia		9
										Confus. ment.		10
										Debil. ment.		11
										Alcoholismus		12
										Dement. præcox		13
						•					Malaria ther.	14
										Epilepsia		15
						•					Malaria ther.	16
										Epilepsia		17
			•							Epilepsia		18
										Debil. ment.	Cf. n° 182	19
										Debil. ment.		20
										Debil. ment.		21
										Dement. præcox		22
										Perversitas		23
										Psychosis		24
										Dement. præcox		25
						•						26
										Debil. ment.		27
										Delirium		28
										Delirium		29
										Dement. præcox		30
										Alcoholismus		31
						•						32
										Dement. præcox		33
						•					Malaria ther.	34
						•						35

Tableau 2.

No.	Date	B.-W. R.						Kahn R.		Müller S. R.
		Araujo-de Assis		R. Scatritti-Cassiniga	Torrazza-Lorenzo	Wylar	Kahn standard	Kahn presump-tive	Müller	
36	16/9	|		|	|	|	|	|	|	
37		|		|	|	|	|	|	|	
38		|		|	|	|	|	|	|	
39		|		|	|	|	|	|	|	
40		|		|	|	|	|	|	|	
41	17/9	|		|	|	|	|	|	|	
42		#		#	|	#	+	#	+	
43		|		|	|	|	|	|	|	
44		|		|	|	|	|	o	|	
45		|		|	|	|	|	|	|	
46		|		|	|	|	|	|	|	
47		|		|	|	|	|	|	|	
48		|		|	|	|	|	|	|	
49		|		|	|	|	|	|	|	
50		|		|	|	|	|	|	|	
51	|	#		#	|	#	#	#	#	
52	|	|		|	|	|	|	|	|	
53	|	|		|	|	|	|	|	|	
54	|	|		|	|	|	|	|	|	
55	|	|		|	|	|	|	|	|	
56	|	|		|	|	|	|	|	|	
57	|	|		|	|	|	|	|	|	
58	|	|		|	|	|	|	|	|	
59	|	|		|	|	|	|	|	|	
60	|	|		|	|	|	|	|	|	
61	18/9	|		|	|	|	|	|	|	
62		|		|	|	|	|	o	|	
63		|		|	|	|	|	|	|	
64		#		#	|	#	+	#	+	
65		|		|	|	|	|	|	|	
66		|	+		|	|	|	|	|	
67		|	+		|	|	|	|	|	
68		|	+		|	|	|	o	|	
69		|	|		|	|	|	|	|	
70		|	|		|	|	|	|	|	

Table 2.

Diagnosis												No.
Syphilis						Mb. alii (non-syphilitic)						
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
										Debil. ment.		36
										Debil. ment.		37
										Epilepsia		38
										Dement. præcox		39
										Epilepsia		40
						•				Dement. præcox		41
										Dement. præcox		42
										Dement. præcox		43
										Dement. præcox		44
										Dement. præcox		45
										Hysteria		46
										Dement. præcox		47
										Debil. ment.		48
										Dement. præcox		49
										Dement. præcox		50
						•						51
										Dement. præcox		52
										Dement. senil		53
										Dement. præcox		54
										Dement. præcox		55
										Dement. præcox		56
										Dement. præcox		57
										Dement. præcox		58
										Dement. præcox		59
										Dement. præcox		60
										Dement. præcox		61
										Psychosis		62
										Hysteria		63
						•						64
			•							Dement. senil.		65
										Delirium		66
										Dement. præcox	Cf. n° 197	67
											Malaria ther.	68
						•				Dement. præcox		69
										Debil. ment.		70

Table 2.

Diagnosis												No.
Syphillis							Mb. alii (non-syphilitic)					
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
						•				Dement. traumat.		71
												72
										Dement. præcox		73
										Dement. præcox	Cf. n° 183	74
										Debil. ment.		75
										Dement. præcox	Cf. n° 184-199	76
										Idiotia	Cf. n° 187	77
										Debil. ment.		78
										Psychosis		79
										Debil. ment.		80
										Idiotia		81
										Debil. ment.		82
										Epilepsia		83
										Dement. præcox		84
										Dement. præcox		85
										Dement. præcox		86
										Dement. præcox		87
	•											88
	•											89
		•										90
										Dement. præcox		91
										Epilepsia		92
										Debil. ment.		93
						•						94
										Debil. ment.		95
						•						96
										Dement. præcox		97
										Psychosis		98
										Dement. præcox		99
										Dement. præcox		100
						•				Parkinsonism.		101
						•						102
		•										103
						•				Imbecillitis		104
						•						105

Tableau 2.

No.	Date	B.-W. R.						Kahn R.		Müller R.R.
		Araujo-de Assis		R. Scatritti-Cassiniga		Torrazza-Lorenzo	Wylter	Kahn standard	Kahn presumptive	
141	21/9	|		|		|	|	|	|	|
142		+		#		o	+	|	+	|
143		|		|		|	|	|	|	|
144		#		#		#	#	|	+	+
145		#		#		#	#	+	#	#
146		#		#		#	#	|	#	+
147		#		#		#	#	+	#	+
148		#		#		#	#	#	#	#
149		#		#		#	#	#	o	#
150		#		#		#	#	|	o	+
151	22/9	#		+		#	+	+	+	|
152		#		#		#	+	#	#	#
153		|		|		|	|	|	|	|
154		|		|		|	|	|	|	|
155		|		|		|	|	|	|	|
156		|		|		|	|	|	|	|
157		|		|		|	|	|	|	|
158		#		#		#	+	|	|	|
159		|		|		|	|	|	|	|
160		|		|		|	|	|	|	|
161	|		|		|	|	|	|	|	
162	|		|		|	|	|	|	|	
163	#		|		|	+	|	|	|	
164	|		|		|	|	|	|	|	
165	|		|		|	|	|	|	|	
166	#		#		#	#	+	#	#	
167	|		|		|	|	|	|	|	
168	|		|		|	|	|	|	|	
169	|		|		|	|	|	|	|	
170	|		|		|	|	|	|	|	
171	24/9	|		|		|	|	|	|	|
172		|		|		|	|	|	|	o
173		#		#		#	#	|	#	+
174		#		#		#	#	|	#	+
175		|		|		|	|	|	|	|

Table 2.

Diagnosis													No.
Syphilis							Mb. alii (non-syphilitic)					Observations	
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor var.	Diagn. aliae			
						•						141	
						•						142	
						•						143	
						•						144	
						•						145	
						•						146	
						•						147	
						•						148	
						•						149	
						•						150	
						•						151	
						•						152	
											Sine antec.	153	
										Dement. præcox		154	
										Dement. præcox		155	
										Alcoholismus		156	
										Alcoholismus		157	
						•						158	
										Dement. præcox		159	
										Dement. præcox		160	
										Dement. præcox		161	
										Dement. præcox		162	
			•									163	
											Sine antec.	164	
										Dementia		165	
												166	
						•				Delirium		167	
											Sine antec.	168	
										Dement. præcox		169	
										Debil. ment.		170	
										Delirium		171	
										Dement. præcox		172	
						•						173	
						•						174	
											Sine antec.	175	

Tableau 2.

No.	Date	B.-W. R.						Kahn R.		Müller & R.	
		Araujo-de Assis		R. Scaltritti-Cassiniga		Torrezza-Lorenzo	Wyer	Kahn standard	Kahn presump-tive	Müller	
176	24/9	| | | |		| | | |		+ | | |	+ | | |	| | | |	0	| | | |	
177		| | | |		| | | |		+ | | |	+ | | |	| | | |		| | | |	
178		| | | |		| | | |		+ | | |	+ | | |	| | | |		| | | |	
179		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	
180		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	
181		| # | |		| # | |		| # | |	| | | |	| # | |	#	| # | |	#
182		| | | #		| | | +		| | | +	| | | |	| | | #	+ | | |	| | | #	+ | | |
183		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	
184		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	
185		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	
186		| | | |		| | | +		| | | +	| | | |	| | | |		| | | |	| # | |
*187		| | | |		| | | +		| | | #	| | | |	| | | |		| | | |	| | | #
*188		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	| | | #
189		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	| | | |
190		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	| | | |
191	27/9	| | | |		| | | |		| | | |	| | | |		| | | |	| | | |	
192		| | | |		| | | |		| | | |	| | | |		| | | |	| | | |	
193		| | | |		| | | |		| | | |	| | | |		| | | |	| | | |	
194		| | | +		| | | +		| | | #	| | | #	| | | #	#	| | | #	#
195		| # | |		| # | |		| # | |	| # | |	| # | |	#	| # | |	#
*196		| | | |		| | | #		| | | |	| | | |	| | | |		| | | |	| | | |
197		| | | |		| | | +		| | | +	| | | |	| | | |		| | | |	| | | |
198		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	| | | |
199		| | | |		| | | |		| | | |	| | | |	| | | |		| | | |	| | | |
200		| | | |		| | | |		| | | |	| | | |	| | | 0		| | | |	| | | |

Table 2.

Diagnosis												No.
Syphilis							Mb. alii (non-syphilitic)					
I.	II.	III.	Latens	Cong.	Tabes	Dem. par.	Tbc.	Grav.	Tumor. var.	Diagn. aliae	Observations	
			•								Sine antec.	176
											Sine antec.	177
											Sine antec.	178
											Sine antec.	179
										Dement. præcox		180
						•						181
			•								Cf. n° 19	182
										Dement. præcox	Cf. n° 74	183
										Dement. præcox	Cf. n° 76	184
										Psychosis	Sine antec.	185
			•							Conf. ment.	Cf. n° 2	186
										Idiotia	Cf. n° 77	187
			•							Sine antec.	Cf. n° 198	188
			•									189
											Sine antec.	190
											Sine antec.	191
											Sine antec.	192
											Sine antec.	193
	•											194
					•							195
										Dement. præcox	Cf. n° 118	196
										Dement. præcox	Cf. n° 67	197
											Cf. n° 188	198
										Dement. præcox	Cf. n° 76-184	199
										Dement. præcox	Cf. n° 74	200

Annex 3.

**LIST OF INSTITUTIONS WHICH SUPPLIED
SPECIMENS OF BLOOD AND OF CEREBRO-SPINAL
FLUID TO THE CONFERENCE.**

- ARGENTINE:** *The Faculty of Medicine, Buenos Aires* (Professor Pedro L. Baliña, Professor of Dermatology and Syphilology).
- BRAZIL:** *The Dermatological Clinic of the Faculty of Medicine, Rio de Janeiro* (Professor Edouardo Rabello).
Gaffree and Guinle Foundation, Rio de Janeiro (Dr. Moura Costa).
Prophylaxis Service for Venereal Diseases and Leprosy, Rio de Janeiro (Professor O. da Silva Araujo).
- URUGUAY:** *Central Dispensary* (Director: Dr. Hector del Campo; Assistant: Germán de Salterain).
Dispensary No. 1 (Professor José Brito Foresti; Chief of Clinic: Dr. G. Bocage).
Dispensary No. 2 (Director: Dr. J. J. Canabal; Assistant: Dr. Ricardo Bombet).
Dispensary No. 3 (Director: Dr. Mario Taglioretti).
Dispensary No. 7 (Director: Dr. Pedro Raúl Alonso; Assistant: Dr. Raúl Buenafama).
Dermatological and Syphilitic Polyclinic (Dr. José May).
Vilardebó Hospital (Dr. Walter Martínez).
Mental Colonies (Dr. Walter Martínez).
Pasteur Hospital (Professors Mussio Fournier, J. P. Urioste, R. Silva and Juan C. Pla).
Fermin Ferreira Hospital : Leprosy (Dr. Ernesto Stirling).
Service for the Sanitary Inspection of Prostitutes (Director: Dr. Baldomero Cuenca y Lamas).
German Segura Pavilion (Director: Professor Máximo Halty).

Annex 4.

**DESCRIPTION
OF THE VARIOUS METHODS EMPLOYED¹**

Method employed by A. de Assis.

1. Method employed.

Technique of the Institute "Vital Brazil" (see the *Bulletin of the Institute "Vital Brazil"*, No. 2, December 1927, pages 14-43). Devised by A. DE ASSIS and slightly modified later by him.

2. Principles.

Complement fixation. Heated sera. A cholesterinised extract of ox-heart as antigen. Guinea-pig serum complement and an anti-sheep hæmolytic system. The essential details of the method are given below.

3. Advantages.

Great sensitiveness combined with a high degree of specificity. In addition to these essential advantages, the antigen chosen is stable and easy to prepare and keeps well. The whole reaction is economical in cost.

4. Temperature, and Reading of Results.

Fixation takes place in a water-bath at 37° C. for an hour. Sensitised sheep cells are then added and the tubes are replaced in the water-bath. Negative results may be recorded as soon as hæmolysis is complete in all the respective tubes; positive results should be watched for half an hour and the final reading should not be taken before this time.

5. Number of Tubes required for each Serum.

Three — two for antigen and serum and one for serum control.

6. Number of Pipettes required for each Test.

A 1 cc. pipette graduated in tenths for each serum. For the other reagents the following pipettes are necessary:

- (a) A 10 cc. pipette graduated in tenths for the salt solution;
- (b) A 2 cc. pipette graduated in tenths for the antigen;
- (c) A 5 cc. pipette graduated in tenths for the complement

¹ The following descriptions have been supplied by the participants themselves; any appreciation of the single method must therefore be regarded as the personal opinion of the author concerned.

(a long pipette with well-separated graduations is preferable);

(d) A 5 cc. pipette graduated in tenths for the corpuscles;

(e) Two pipettes for the hæmolysin: one 1 cc. graduated in tenths for the measurement of the quantity required for sensitisation; the other, 0.1 cc., graduated in hundredths and employed in the titration of the hæmolysin. This latter is optional.

7. *Apparatus necessary.*

Two water-baths, one working at 37° C. and the other at 55° C. An electric centrifuge capable of at least 1,800 revolutions per minute. A 15 cc. centrifuge tube graduated in tenths for preparation of the corpuscle suspension. It is strongly recommended that neutral glassware should be used.

8. *Essential Details of the Method.*

(a) *Inactivation of the Patient's Serum.* — The serum used for the test must be heated for fifteen minutes at 55° C. if tested within twenty-four hours of collection of the blood. If there is a longer interval before the serum is tested it must be heated twice for ten minutes at 55° C., the first time shortly after the separation of the serum and the second time immediately before the test. In the meanwhile it must be kept at low temperature. Cerebro-spinal fluids are examined without previous heating.

(b) *Complement.* — A mixture of sera taken from at least three male adult guinea-pigs which have been left to fast for twelve hours before bleeding. The animals are bled on the evening preceding the test-day and the sera are left in contact with the blood clot in the refrigerator during the night. After having been centrifuged for a short time, the clear sera are mixed, and a dilution in physiological saline of 1 in 20 is made. This is titrated each day in the presence of the "test dose" of antigen suspension (0.2 cc.), employing increasing doses of the complement dilution from 0.1 cc. to 0.8 cc., the contents of all the test-tubes being made up to 1 cc. with saline. After an hour's incubation in the water-bath at 37° C., sensitised corpuscles are added and the test-tubes are replaced in the water-bath for half an hour. At the end of this time "the unit of complement" is read — that is to say, the smallest amount of complement which has produced complete hæmolysis. For the test proper, 0.005 guinea-pig serum must be added to this amount (*i.e.*, 0.1 cc. of the 5 per cent. complement dilution). This is termed "the corrected unit".

(c) *Antigen. Cholesterinised Alcoholic Extract of Ox-heart prepared according to a Modification of the Sachs Method.* — The muscular portions of several ox-hearts are minced and rapidly dried in a Faust-Heim apparatus. They are then pulverised and carefully sifted. Preliminary extractions of the powders with absolute alcohol (10 per cent volume) for eight to ten days at 37° C. show if it is

possible to obtain positive Wassermann reactions with sera definitely known to be positive (secondary stage of syphilis) and with cerebro-spinal fluid (untreated G.P.I). Extracts of heart powder which give negative results in these cases are discarded. The samples of ox-heart powder giving clear-cut positive reactions are then pooled, extracted with absolute alcohol (10 per cent volume) and kept at a temperature of 37° C. for at least twenty-five days, being shaken daily for an hour in a shaker. The extract is then filtered and allowed to mature at a low temperature for at least thirty days. During this period a precipitate forms, which is removed periodically by filtration until nothing more comes down.

The amount of cholesterin (Kahlbaum) to be added to the extract is ascertained by means of comparative titration with a standard antigen, to the end that closely comparable results are obtained with a certain number of known positive and negative sera. These preliminary titrations are performed with small quantities of extract to which increasing doses of 1 per cent solution of cholesterin in alcohol have been added. The final addition of cholesterin to the total volume of the extract should be made at once and at room temperature, the exact amount of crystallised cholesterin being calculated from the preliminary titrations.

The antigen, when kept at room temperature and in the dark, preserves its complement-fixing properties for several years.

The dilution of the antigen to be used in the tests should be prepared immediately before use, in the following manner: nineteen parts of physiological saline are placed in a chemically clean Jena or Pyrex test-tube. One part of antigen is now run *very slowly* on to the saline down the side of the tube, and mixed with the saline by *very slowly* rocking the tube from side to side, so that a strongly cloudy opalescent homogeneous suspension is obtained. Two-tenths cc. of this suspension are used as a "test dose", not only for the preliminary titration of the complement (see above), but also in the test proper.

(d) *Hæmolytic System.* — Defibrinated sheep's blood is washed three times in an excess of sterile physiological saline solution, the last washing being performed in a 15 cc. centrifuge tube graduated in tenths. The final centrifugation must be continued for twice as long a time as was found necessary to throw down the corpuscles in the preceding washing. The volume of the packed cells is directly read on the graduations of the centrifuge tube. From this volume a 5 per cent suspension is prepared. Two-tenths cc. of this suspension are used in the tests.

The anti-sheep hæmolysin is titrated with the above dose of corpuscles and 1 cc. of the 5 per cent complement dilution, the contents of all the test-tubes being made up to 1.5 cc. with physiological saline. After half an hour's incubation in a water-bath at 37° C., the smallest quantity of hæmolysin producing total hæmolysis is noted as being "the hæmolytic unity". From five to ten hæmolytic units of hæmolysin are employed to sensitise the dose of corpuscles.

(e) *Saline Solution.* — This is prepared with redistilled water and Merck's *NaCl puriss.* (0.85 per cent). Sterilisation of the solution is carried out in the steamer at 100° C.

(f) *The Test proper.* — Three tubes are required for each specimen. Patient's serum is first delivered as follows: 0.2 cc. (test-tube 1), 0.1 cc. (test-tube 2) and 0.2 cc. (tube 3, the serum control). The "test dose" of antigen (0.2 cc.) is now delivered into tubes 1 and 2 and the mixture at once gently shaken for about five seconds. The racks are now set aside for half an hour at room temperature when the "adjusted unit" of complement is added, and the volume in each tube is brought up to 1 cc. with saline, the tubes being well shaken and placed for an hour in the water-bath at 37° C. Sensitised red cells are then added (final volume in each test-tube: 1.5 cc.), and the racks are replaced in the water-bath for half an hour. The negative results may be read before the expiration of this period, as soon as complete hæmolysis has taken place in all the respective tubes. Positive reactions may be finally read after half an hour, due regard being paid to the progress of the reaction in the controls. The results are recorded as follows:

- ++++ Complete absence of hæmolysis ("strongly positive").
- +++ Very slight hæmolysis.
- ++ Marked hæmolysis.
- + Advanced hæmolysis ("weakly positive").
- ± Very slight inhibition of hæmolysis.
- Complete hæmolysis ("negative").

(g) *Cerebro-spinal Fluid.* — The test of the fluid is made in the same way as with serum, slight modifications being made only in regard to the doses to be employed, which are as follows: 1 cc.; 0.5 cc.; 0.2 cc.; 0.1 cc. Five tubes are employed instead of three as with serum.

Meinicke's Clarification Test, as performed by Eduardo Dussert-Jolland.

1. *Material used.*

Test-tubes 8 cm. by 1 cm., graduated pipettes and test-tube racks.

2. *Reagents used.*

Original Meinicke extract, a 3.5 per cent solution of sodium chloride and a 1 per cent solution of carbonate of soda in 3.5 per cent sodium chloride.

3. *Technique of the Test* (Qualitative Macro-reaction).

0.2, 0.2, 0.2, 0.1 and 0.2 patient's serum is placed in five test-tubes; 0.01, 0.015, 0.02, 0.04 and 0.03 per cent carbonate of soda

solutions are then prepared as follows: 4 cc. of 1 per cent Na_2CO_3 are mixed with 96 cc. of 3.5 per cent saline solution, thus giving a 0.04 per cent solution. If we mix one part of this solution with one part of 3.5 per cent salt solution, we obtain a 0.02 per cent solution. If we mix one part of the latter with one part of the salt solution, we obtain a 0.01 per cent solution. One part of the 0.01 per cent solution mixed with one part of the 0.02 per cent solution gives us a 0.015 per cent solution, and one part of the 0.04 per cent solution mixed with one part of the 0.01 per cent solution gives us a 0.03 per cent solution.

Ten cc. of each of these solutions are now heated in a water-bath to 56°C . One 1 cc. of antigen having been placed in each of five dry test-tubes, these are simultaneously heated to 56°C . in the water-bath and are then mixed with the solutions of sodium carbonate. The freshly prepared antigen suspensions are now replaced for two minutes in the water-bath to mature, and 0.5 cc. of each antigen suspension is delivered into the corresponding tube. Each serum is thus tested with five antigen dilutions. The first is a suspension made with 0.01 per cent of carbonate of soda, the second with 0.015 per cent, the third with 0.02 per cent, the fourth with 0.04 per cent and the fifth with 0.03 per cent. (In order to bring the contents of the fourth tube up to the requisite volume, 0.1 cc. of 0.04 per cent carbonated saline is added.) The fifth tube is for the microscopic reaction. Immediately after the antigen has been mixed with the serum, a drop of the mixture is placed on a slide, which is set aside for an hour in a moist chamber at a temperature of 20°C . The drop is examined under a very low magnification. If the result is negative, the field is uniform; if it is positive, discrete clumps are observed. After the drop has been taken, 0.1 cc. of 1 per 1,000 HCl is added to the tube, and all the results are read microscopically on the following day.¹

It is desirable, but by no means obligatory, to test the solution of carbonate of soda. This is done by placing into each of five test tubes 0.2 cc. of 3.5 per cent saline solution and then adding to each tube 0.5 cc. of one of the various antigen suspensions. The tube containing the antigen with 0.01 per cent soda should clarify in about sixteen to eighteen hours when kept at a temperature of 20°C . The tube with 0.015 per cent clarifies partially but definitely. Only the tube with 0.02 per cent may show slight clarification; neither the tube at 0.04 per cent and 0.03 per cent must show any clarification whatsoever.

The results are read after sixteen to eighteen hours at 20°C . The more clearly positive the test, the more marked is the clarification and sedimentation. Certain very positive sera only clarify in No. 4 tube. Negative reactions remain turbid.

¹ The most important tubes are those containing 0.015 per cent soda and 0.03 per cent sensitised with HCl, and we confined our present work to these tubes because of the special circumstances.

Outline of Technique of Kahn Test.

1. *Method used.*

The Kahn test.

2. *Principles of this Method.*

The Kahn test is a precipitation method for differentiating syphilitic from non-syphilitic serum with the aid of a specially prepared cholesterinised alcoholic extract. The test has been developed in conformity with the following requirements for optimum precipitation:

(a) *Antigen.* — An optimum concentration of lipoids in the antigen is essential for correct sensitiveness of the antigen with syphilitic serum, excessive or deficient concentration preventing precipitation. This quantitative relation between concentration of an antigen and its sensitiveness makes possible the preparation of antigens of uniform sensitiveness for the Kahn reaction, in spite of variations in antigenic lipoids of heart muscle from which the antigens are prepared, the antigens being brought to the desired sensitiveness by merely adjusting their lipoid concentration.

(b) *Antigen Suspension.* — The proper physical state of the antigen suspension of lipoids is necessary for high sensitiveness. The suspension should contain a minimum amount of physiologic salt solution and the lipoid aggregates must be dispersable in serum. This state of the antigen suspension plays an important rôle, not only in the sensitiveness, but also in the rapidity of the Kahn reaction.

(c) *Serum and Antigen Suspension.* — Correct quantitative relation between the serum and antigen suspension is essential for proper sensitiveness. This relation may be summarised as follows: (1) The largest volume of antigen suspension with which a given serum volume will react depends on the potency of the serum. The serum volume must contain a supply of syphilitic units or reagin adequate to react with the antigen suspension. When the latter is in excess, no precipitation reaction takes place. (2) For precipitation reactions with all syphilitic sera, without regard to potency, it is essential that some minimum volume of antigen suspension in relation to the serum volume be employed. There must be a sufficient number of antigen units (lipoid particles) available in the suspension so that the aggregates formed after contact with the *reagin* units will be sufficiently large to come within the range of visibility. This relation between antigen suspension and serum enables the use of a proportion of these reagents which is desirable for proper sensitiveness in the Kahn reaction.

(d) *Shaking.* — Shaking of the mixture of serum and antigen suspension brings the precipitation reaction to rapid completion.

Shaking hastens the collision between the serum-antigen interacting particles and undoubtedly helps to explain why the Kahn reaction is completed in three minutes instead of after hours of incubation.

(e) *Dilution versus Concentration.* — Dilution of the mixture of serum and antigen suspension should be minimum to obtain sensitive reactions. Increasing the volume of mixture with salt solution tends to reduce sensitiveness. Based on this fact, in the Kahn reaction the serum is used in an undiluted state and the antigen suspension contains a minimum amount of salt solution.

3. *Advantages of this Method.*

Technical:

- (a) Practical steps evolved for bringing antigens prepared from different heart muscles to a standard degree of sensitiveness;
- (b) Stability of antigen;
- (c) The use of but three reagents — antigen, salt solution and serum;
- (d) Relative simplicity of technique, minimising thereby the sources of error;
- (e) Rapidity in obtaining results;
- (f) Availability throughout the world — in the tropics, field laboratories, etc.

Clinical:

- (a) High degree of specificity combined with sensitiveness;
- (b) Clear-cut reactions, minimum number of border-line reactions;
- (c) Aside from the regular Kahn test, several processes as an additional aid to clinicians in their diagnosis and treatment of syphilis:
 - (i) Quantitative process with serum as an aid in studying the serological effect of therapy;
 - (ii) Qualitative process with spinal fluid corresponding to regular Kahn test with serum;
 - (iii) Quantitative process with spinal fluid as an aid in studying the serological effect of neuro-syphilitic therapy;
 - (iv) Presumptive processes with serum and spinal fluid more sensitive than the regular processes owing to the employment of an antigen (sensitised) which is more potent than standard antigen;
 - (v) Special processes, including microprocesses with serum and spinal fluid, and process with chancre fluid.

Research. — The Kahn test especially lends itself to the application of research by physical and biological chemists as well as by serologists.

4. *Temperature at which the Reaction is carried out.*
 - (a) The serum is heated for thirty minutes at 56° C.
 - (b) The test is performed at room temperature.
5. *Reading of Results.*

After three minutes' shaking.
6. *Test-tubes used for One Serum.*

Three tubes.
7. *Pipettes used for One Test.*

Three pipettes, two of which may be used for a series of tests.
8. *Other Apparatus required.*

Centrifuge for separating serum from blood-clots.
Water-bath for heating serum at 56° C. for thirty minutes.
Test-tube rack.

In laboratories where large numbers of tests (thirty or more) are made daily, a shaking apparatus is of considerable help.

9. *Other Details of the Method.*

I. APPARATUS.

(1) Test-tubes for performing test (with serum and spinal fluid) are about 7.5 cm. in length and 1 cm. in diameter.

(2) Vials (with straight wall and flat bottom) for preparing antigen suspension are about 5.5 cm. in length and 1.5 cm. in diameter.

(3) Pipettes: 10 cc. graduated to 0.1 cc., 1 cc. graduated to 0.01 cc., and 0.2 cc. graduated to 0.001 cc.

(4) The test-tube rack is made of sheet copper, 3 inches wide, 11½ inches long, 2¾ inches high, and consists of three shelves, the upper and middle ones containing three rows of ten holes, each approximately half an inch in diameter. The centre row of holes are offset half an inch.

(5) Shaking apparatus may be of any construction that will hold the test-tube racks employed. The required speed is 275 oscillations per minute, with a stroke of an inch and a-half.

(6) Water-bath (56° C.); centrifuge and centrifuge tubes may be of any make that will be found convenient in the particular laboratory.

II. REAGENTS.

(1) *Antigen*. — For preparation and standardisation of antigen for Kahn test, see *The Kahn Test* (Williams and Wilkins, Baltimore). An antigen once standardised maintains its titre indefinitely. Antigen should be kept in the dark at room temperature. When subjected to cold, a precipitate may be thrown down, which can be redissolved upon warming in a water-bath. Only chemically clean and dry glass vessels should be used for storing antigen, and the cork stoppers should be covered with thin high-grade tinfoil.

(2) *Serum*. — The blood specimen should be centrifuged to remove clot and cells. The serum must be entirely free from cells or other particles. Previous to its use in the test, the serum is heated in a water-bath at 56° C. for thirty minutes. When serum that has been heated is kept overnight in the ice box, reheating for ten minutes at 56° C. is necessary before using in the test.

(3) *Physiologic Salt Solution*. — A solution is prepared of 0.9 per cent sodium chloride (chemically pure) in distilled water.

III. ROUTINE (DIAGNOSTIC) TEST WITH SERUM.

This is a three-tube test. Each tube contains a different proportion of serum and antigen suspension according to the following outline:

	No. 1	No. 2	No. 3
Antigen suspension, cc.	0.05	0.025	0.0125
Serum, cc.	0.15	0.15	0.15

It is well to have everything arranged before mixing the antigen with salt solution for the test. Have racks set up, tubes numbered, sera heated and pipettes ready for reassembling antigen suspension and serum. For measuring the 0.05 cc. quantities of antigen suspension, mark off these amounts on a 1 cc. (graduated to 0.01 cc.) pipette with a wax pencil. For measuring the 0.025 and 0.0125 cc. quantities, use 0.2 cc. (graduated to 0.001 cc.) pipettes, on which these amounts are also indicated with a wax pencil.

Performance of Test.

(1) *Preparation of Standard Antigen Suspension*. — Mix antigen with salt solution according to required titre. Thus, if the titre is 1 cc. antigen plus 1.1 cc. normal saline, mix the antigen as follows: (a) Measure 1.1 cc. saline into a standard antigen suspension vial; (b) measure 1 cc. antigen into a similar vial; (c) pour the salt solution into the antigen, and as rapidly as possible (without waiting to drain the vial) pour the mixture back and forth six times to ensure thorough mixing; (d) allow the antigen suspension to stand for ten minutes before using. The suspension should not be used after thirty minutes, standing.

One may mix more than 1 cc. of antigen with a proportionally larger amount of salt solution, but not less than 1 cc. This amount, when mixed with saline, will be sufficient for about fifteen tests; 2 cc. of antigen mixed with saline will be sufficient for about thirty-five tests.

(2) *Measuring Antigen Suspension.* — After the antigen suspension has stood for ten minutes, shake it well and measure 0.05, 0.025, and 0.0125 cc. amounts for each serum, delivering the suspension to the bottom of the tubes. When employing the standard rack which contains thirty tubes, measure 0.05 cc. amounts in the tubes of the first row, 0.025 cc. amounts in the tubes of the second row, and 0.0125 cc. amounts in the tubes of the third row.

(3) *Measuring Serum.* — The serum should be added as soon as possible after the antigen suspension has been pipetted, to avoid undue evaporation from the suspension. When examining large numbers of sera, it is well for one worker to measure the antigen suspension and for another to follow with the sera. Add 0.15 cc. serum to the 0.05, 0.025 and 0.0125 cc. amounts of antigen suspension, and shake the rack of tubes vigorously for a few seconds to ensure thorough mixing of the ingredients. The rack can now be set aside until the remaining tests are ready for the regular three-minute shaking period.

(4) *Controls.* — At least one positive and one negative serum control should be included with each series of tests. Every serum giving a positive reaction should be examined to establish that it is free from red cells or foreign particles which might be confused with a specific precipitate. Dilute 0.1 cc. serum with 0.3 cc. saline. Shake well and examine for particles. If particles are present, the serum should be recentrifuged and retested.

(5) *Shaking.* — During the three-minute shaking period, it is important, not merely to agitate the rack of tubes, but to see to it that the fluid within the tubes are vigorously agitated. When shaken by hand, one may shake three one-minute periods with short rest periods. When a shaking machine is employed, its speed should be 275 oscillations per minute, with a stroke of an inch and a-half. Hand shaking should approximate this speed.

(6) *Addition of Saline.* — After the tests have been shaken, add 1 cc. saline to each tube of the first row of the rack (containing the 0.05 cc. amounts of antigen suspension) and 0.5 cc. saline to the remaining tubes. Shake sufficiently to mix ingredients.

(7) *Reading Results.* — The results are read after the addition of the salt solution. Optimum reading conditions in each laboratory

should be determined by trial. The following points will be found helpful: (a) When utilising daylight for reading the tests, it is well to have but one source of light coming from a single window immediately in front of the reader. It will be found satisfactory to shade the upper and lower portions of the window, narrowing the source of light to a section several feet in height. Light from any other windows near the reader should be dimmed by lowering the window shades. (b) When holding the rack in front of the exposed section of the window, the definitely positive and the negative reactions are readily differentiated without lifting the tubes from the rack. (c) In case of weak reactions, examine each tube individually, lifting it several inches above the eye-level and slanting it until the fluid is spread into a thin layer. The precipitate will then become readily visible.

Those preferring magnification will find the microscopic mirror helpful. Place mirror on reading table with concave surface upward. Hold the tube in slanting position two to three inches above the mirror and examine the image in the mirror. Both daylight and artificial light may be employed. One may also utilise an ordinary hand lens for reading the tests. A two- or three-fold magnification will be found satisfactory. Some workers prefer the use of a slit-light arrangement, the source of light being an electric bulb enclosed in a box which is provided with a narrow slit.

As far as possible, workers should limit themselves to one method of reading. The occasional use of magnification by readers who usually do not resort to it will be likely to affect the uniformity of their reading scale. It should be emphasised that certain highly magnifying agglutinoscopes show particles in serum alone, and are thus unfit for use in this test. The magnification must be sufficiently low as to assure opalescent and clear-cut negative reactions, with entire freedom from visible particles.

(8) *Interpretation of Results.* — A definite precipitate suspended in a clear medium is read + + + +. Proportionally weaker reactions are read + + +, + +, + and ± respectively. The final results is the average of the readings of the three tubes, as indicated in Table 1.

TABLE I. OUTLINE OF KAHN TEST AND INTERPRETATION OF RESULTS.

Tube	No. 1	No. 2	No. 3	Completion of test
Serum: Antigen suspension . . .	3:1	6:1	12:1	Tests are shaken three minutes, 1 cc. salt solution is added to first tube and 0.5 cc. to other two tubes and results are read.
Antigen suspension cc.	0.05	0.025	0.0125	
Serum (heated at 56° C. for thirty minutes) cc. . .	0.15	0.15	0.15	

INTERPRETATION OF RESULTS.

Reaction No.				Final result (average of reactions of three tubes)
1	++++	++++	++++ ¹	++++
2	+++	++++	++++	++++
3	++	++++	++++	
4	+	+++	++++	+++
5	—	+++	++++	
6	—	++	++++	++
7	—	±	++++	
8	—	—	+++	+
9	—	±	++	±
10	—	±	+	
11	—	—	+	—
12	—	—	—	

(9) *Recording Results.* — Make a permanent record of findings in all tubes of each test at time of reading. Preferably, the tests should be read independently by two separate workers. When two workers are not available, the original reading should be checked by the same worker after a short interval.

(10) *Procedure with less than Three Tubes.* — If there is insufficient serum for the three-tube test, examine and report as follows:

(a) If enough serum for two tubes, employ the lesser amounts of antigen suspension; report as a two-tube test.

(b) If enough for one tube, employ the least amount of antigen suspension; report as a one-tube test.

¹ Weakly potent sera show most marked precipitation in the third tube because a small amount of reagin reacts best with a small amount of antigen suspension, the relatively larger amounts of suspension in the first two tubes being inhibitory to precipitation.

Strongly potent sera show ++++ precipitation in each tube; but, owing to the different amounts of antigen suspension employed, the precipitates are of unequal bulk, being greatest in the first tube and least in the last tube.

In rare instances, an atypical reaction is obtained in which precipitation is marked in the first tube and weak or negative in the second and third tubes. In such a case, a quantitative test should be made and, if the result is twenty units or more, the qualitative reaction may be considered ++++; if less than twenty units, the results of the qualitative reaction should be averaged.

(c) If less than 0.15 cc. serum is available, a one-tube test (micro test) may be made by employing ten parts of serum to one part of antigen suspension. Thus, if 0.05 cc. of serum is available, it is employed with 0.005 cc. of antigen suspension. Report these as micro tests.

IV. QUALITATIVE SPINAL FLUID PROCESS.

In this process, the greater part of the spinal fluid globulins is precipitated by means of ammonium sulphate and redissolved in an amount of normal saline equivalent to a tenth of the original spinal fluid volume. The concentrated globulin solution thus obtained is then tested with antigen suspension.

(1) *Preparation of Concentrated Globulin Solution.* — Reagents. — The reagents needed for the preparation of concentrated globulin solution are: (1) spinal fluid, (2) physiological salt solution, and (3) a solution of saturated ammonium sulphate. This salt must be of the highest purity (Baker's Analysed or Merck's Reagent).

Procedure. — (a) Centrifuge spinal fluid to render it free from cells and foreign particles. (b) Add 1.5 cc. of the clear fluid to a standard Kahn test-tube (7.5 by 1 cm.). (c) To the same tube add 1.5 cc. of a saturated solution of ammonium sulphate. (d) Mix fluids, covering mouth of tube with thumb (protected with rubber if desired) and shake tube back and forth vigorously. The thorough mixing of the spinal fluid and globulin is of great importance. Place in 56° C. water bath for fifteen minutes to hasten the precipitation of the globulins. (e) Centrifuge at high speed for about ten minutes to completely throw down the precipitated globulins. (f) Remove with capillary pipette the supernatant fluid as completely as possible. This is best accomplished with the aid of a finely drawn capillary pipette. The major amount of supernatant fluid is first withdrawn. The tube is then slanted at an angle of about 45° and the remaining fluid is withdrawn after bringing the opening of the capillary pipette to the point of contact of the globulin precipitate and inner tube wall. It will be found that the last trace of supernatant fluid can be removed by this method. (g) Add 0.15 cc. salt solution to the precipitate and redissolve it by gentle shaking. In adding this salt solution the pipette should be lowered close to the bottom of the tube to avoid washing down the ammonium sulphate. The globulin precipitate will readily dissolve on gentle shaking. This globulin solution is now ready to be tested with antigen suspension.

(2) *Preparation of Antigen Suspension.* — Mix salt solution with antigen in the same manner as for the test with serum, according to the required antigen titre for spinal fluid. The antigen suspension should stand ten minutes before its use in the test and should be used within thirty minutes.

(3) *Measuring of Antigen Suspension.* — With a 0.2 cc. pipette graduated to 0.001 cc., measure 0.01 cc. of antigen suspension to the bottom of a test-tube.

(4) *Measuring of Concentrated Globulin Solution.* — Measure 0.15 cc. of concentrated solution into the antigen suspension tube, using a 0.2 cc. pipette. Shake tests vigorously for a few seconds to mix ingredients.

(5) *Controls.* — Include positive and negative spinal fluid controls; also observe each concentrated globulin solution to establish that it is free from foreign particles.

(6) *Shaking.* — After mixing the concentrated fluid with antigen suspension, shake tube vigorously for three minutes.

(7) *Addition of Salt Solution.* — Add 0.5 cc. normal saline to tube.

(8) *Reading of Results.* — A definite precipitate suspended in a clear medium is read + + + +. Proportionally weaker precipitates are read + + +, + + and + respectively.

(The spinal fluid procedure may be carried out with 1.5 cc. spinal fluid plus 1 cc. saturated ammonium sulphate solution. Dissolve globulin precipitate in 0.15 cc. normal saline (instead of 0.3 cc.) and perform test with 0.01 cc. antigen suspension.)

9. *Highly Potent Spinal Fluid.* — It should be emphasised that highly potent spinal fluids give positive reactions directly without concentrating the globulins by means of ammonium sulphate. It is recommended, therefore, that spinal fluids from clinically diagnosed cases of neuro-syphilis be examined by mixing 0.15 cc. fluid plus 0.01 cc. antigen suspension, using the same antigen titre as for tests with serum. If the spinal fluid is definitely positive (+ + + +, + + + or + +) in the unconcentrated state, the reaction may be interpreted as + + + + in the qualitative procedure. If the reaction is very weak or negative (+, ± or —), the spinal fluid is examined in the usual manner, after concentrating the globulins.

KAHN PRESUMPTIVE TESTS.

The presumptive test had been developed as an auxiliary method to the regular Kahn test, the main difference between the two methods being that the presumptive is more sensitive than the regular test. This increased sensitiveness is due to the fact that, in the presumptive test, "sensitised" antigen¹ is employed which possesses a greater degree of sensitiveness than "standard" antigen. The test was named presumptive because it is believed that, in rare instances, it may give positive reactions in cases apparently free from syphilis, and it seemed best, until the true specificity of the test was established, to consider

¹ See *The Kahn Test*, Williams and Wilkins, Baltimore.

such reactions as presumptive in character. The following are among the more important purposes of the presumptive test:

(1) *As a Technical Check on the Regular Kahn Test.*— Any method carried out by human hands is subject to technical error. By reexamining all sera with the presumptive procedure after they have been examined with the regular test, obviously the number of technical errors would be reduced to a minimum.

(2) *As a Check on Weak Reactions with the Regular Test.*— The fact that the presumptive procedure possesses an especially high degree of sensitiveness renders it a good check on sera giving weak and border-line Kahn reactions; such sera should give definitely positive reactions with the presumptive procedure.

(3) *Positive Reactions — as a Criterion in establishing the Presence of Syphilis in Early Primary, Latent Syphilis, Neurosyphilis, Hereditary Syphilis and Other Instances where in the Regular Kahn Reaction, in Isolated Cases, might be negative.*— While the presumptive procedure may not possess the specificity of the regular Kahn test, our studies indicate that it is highly specific and relatively free from false reactions. Because of this fact, a positive presumptive reaction, when the regular test is negative, should be taken as a strong possibility of syphilitic infection. Such a reaction should stimulate clinicians to search carefully for clinical evidence of the disease, and, if necessary, to administer a therapeutic test.

(4) *Negative Reactions — an Additional Criterion in establishing the Absence of Syphilis.*— We have stated that a negative reaction with the regular Kahn test does not eliminate the possibility of syphilitic infection in a patient. Since the presumptive procedure is more sensitive, a negative presumptive reaction has greater value in eliminating this possibility. Stated differently, the positive reaction of the regular Kahn test has greater diagnostic value than the negative reaction, while the negative reaction of the presumptive procedure has greater diagnostic value than the positive reaction.

It is believed that the serum diagnosis of syphilis is best served by the employment of two methods wherein one method is more sensitive than the other. The recommendation by the Copenhagen Conference, of the use of two methods in the serum diagnosis of syphilis, was based in the belief that, in certain cases of syphilis wherein one method is negative, the other might be positive. When one of the methods is of greater sensitiveness, not only will it serve as a check on the positive reactions given by the other, but, in addition, it will detect cases of syphilis in which the other reaction is negative. The basic requirement is that the more sensitive method be as free from false reactions as possible. The presumptive procedure, according to our experience, conforms to this requirement being non-specific only in rare instances. *Furthermore, the name presumptive should prevent too hasty decision in establishing syphilis on the basis of a*

positive reaction by this method, when the regular Kahn test is negative and when clinical evidence is absent, since such a reaction is only presumptive evidence of syphilis.

PERFORMANCE OF PRESUMPTIVE TEST WITH SERUM.

(1) *Preparation of Antigen Suspension.* — (a) Pipette 1 cc. of sensitised antigen into an antigen suspension vial. (b) Pipette an amount of physiological salt solution, indicated by the titre of the antigen, into a similar vial. (c) Pour the salt solution into the antigen and, as rapidly as possible, pour the mixture back and forth six times. (d) Allow the antigen suspension to stand ten minutes at room temperature before using.

(2) *Measuring Antigen Suspension.* — Measure 0.025 cc. of the thoroughly mixed antigen suspension into a standard tube (7.5 cm. in length, 1 cm. in diameter) with a 0.2 cc. pipette marked in 0.001 cc. amounts, delivering to the bottom of the tube.

(3) *Measuring Serum.* — Add 0.15 cc. serum — after heating for 30 minutes at 56° C. — with a 1 cc. pipette graduated in 0.01 cc., and mix the serum with the antigen suspension by shaking the rack vigorously by hand for about ten seconds.

(4) *Shaking.* — Shake rack in the usual manner for three minutes (oscillation speed 275 to 285 per minute), preferably in a shaking apparatus.

(5) *Adding Salt Solution.* — Add 0.5 cc. physiological salt solution to the tube and examine for presence of precipitates.

(6) *Interpretation of Results.* — The results are interpreted on a qualitative basis. Marked precipitation reactions, such as ++++ or +++, are interpreted as positive; moderate precipitation reactions, such as ++ or +, are interpreted as weakly positive, while very weak reactions, such as ±, are classed with the negative.

(7) *Control System.* — (a) Antigen control. — When pipetting antigen suspension for a series of tests, employ the last tube, containing 0.025 cc. of suspension, with salt solution instead of serum and include with regular test. At final reading this tube should show freedom from a precipitate. (b) Serum control. — Examine each serum for foreign particles which might give the appearance of a specific precipitate. Particularly in the case of each positive reaction, it is essential to determine that the serum used in the test is free from foreign particles. In using the presumptive test as a check on the regular Kahn test, the same serum control is, of course, sufficient for both methods. (c) Positive and negative serum controls. — Include one or more such controls in each series of tests.

PERFORMANCE OF PRESUMPTIVE TEST WITH SPINAL FLUID.

This test is carried out identically as the regular Kahn test with spinal fluid, except that, instead of using "standard" antigen, "sensitised" antigen is employed. Both tests require a total of 3 cc. of spinal fluid — 1.5 cc. for the regular test and 1.5 cc. for the presumptive test.

Method employed by Jules E. Moreau.

The method is characterised by the use of active patient's serum and by the preliminary subjection of the serum to the action of formalised sheep cells, which are then removed by centrifugation.

Incubation takes place in an air incubator at a temperature of 37° C. for an hour.

TECHNIQUE.

Materials.

1. Red sheep cells, washed and kept for twenty-four hours with 10 per cent formol. The formalised red cells are washed four times with physiological saline before use.
2. Guinea-pig serum diluted 1 in 10.
3. Titrated anti-sheep hæmolysin.
4. One cc. non-inactivated patient's serum.
5. Physiological saline solution 0.9 per cent.
6. Bordet-Ruelens antigen.

PREPARATION OF THE FORMOLISED RED CELLS.

Sheep red blood corpuscles are washed three times and brought up to the original volume of the blood. Formolin is added to make a 10 per cent dilution. The vessel is shaken and left to stand for twenty-four hours at laboratory temperature. The cells are then washed four times with physiological saline and are finally diluted with saline to twice their volume. They are then sensitised with five minimal hæmolytic doses of hæmolysin. They are shaken and are then ready for use.

One cc. of unsensitised cell suspension is added to 1 cc. of each serum (uninactivated) to be examined. The mixtures are left in the incubator at 37° C. for an hour. They are then centrifuged, the serum is removed and is then ready for the test.

Complement titration is carried out in the presence of antigen and runs concurrently with the test proper.

DETAILS OF THE METHOD.

(Quantities in cc.)

Tubes	No. 1	No. 2	No. 3	No. 4	No. 5
Antigen solution, 1 in 20	0.5	0.5	—	—	—
Diluted serum, 1 in 2	0.4	0.4	0.4	0.4	0.4
Complement, 1 in 10	0.3	0.6	0.3	0.6	0.6
Physiological saline	0.8	0.5	1.3	1.0	1.0
	Incubation for an hour at 37° C. with occasional shaking.				
Sensitised sheep cells, 5 per cent .	1.0	1.0	1.0	1.0	—
Non-sensitised cells, 5 per cent . .	—	—	—	—	—
	Incubation for half an hour at 37° C. with occasional shaking.				

Müller's Clotting Test (M.B. R. II).

1. Basic Method and Centrifugation Method for the Simplified Clotting Test (M.B. R. II) of Serum and Cerebro-spinal Fluid.

The M.B. R. II. antigen is prepared, as for the original clotting test, with a sufficiently cholesterinated heart extract, subsequently concentrated, which will be referred to as the "clotting reagent".

As all heart specimens are not adapted to this use and the extract has to be very carefully prepared, the clotting reagent is obtained from a central service (Schering-Kahlbaum A.-G., Berlin ¹), numerous samples having been tested by myself.

2. Preparation of the Antigen.

Two cc. of clotting reagent are mixed with 3 cc. of alkalised saline solution (0.03 per cent); this is allowed to mature for twelve minutes. It is then further diluted by the addition of 25 cc. of alkalised saline solution. The antigen is now ready for use.

¹ Detailed instructions for use are included with every consignment.

3. Carrying out the Reaction.

For the centrifugation test, which I chiefly employed at the Conference, 0.45 cc. of sterilised serum is mixed with 0.5 of antigen; the mixture is heated for five minutes (2,500 to 3,000 revolutions). A few minutes later the first reading is possible.

At first reading, in positive cases, precipitates of varying density are found. In the feebly positive cases, slight precipitation only is frequently observed at this stage. After about half an hour the reading of the results is easier, as flocculation is very distinct even in these positive cases.

To determine the result of cases showing an extremely feeble reaction (doubtful), a second reading is carried out after a fresh interval of one hour. By then, the denser precipitates have already formed fairly big clots, which float freely. The precipitates, which to begin with were *light*, now appear as compact flocculations or flocculent formations. Further, certain cases which, after the first half-hour, still produce a negative reaction now present flocculations.

The result of the test is interpreted as follows: the light or dense flocculi which appear immediately after centrifugation and soon afterwards form the above-mentioned clots are regarded as positive ($++$ or $+$). The lighter flocculations which, after half an hour, are not yet visible and only begin to form if the liquid is left standing some time longer, are described as feebly positive or doubtful (\pm). The reaction is negative if the liquid, even after about two hours, presents a uniformly clear colloidal appearance.

The *M.B. R. II basic method* (without centrifugation) differs from the other only by the fact that the mixture is kept a little longer (fifteen minutes) in the water-bath and that the volume of serum should not exceed 0.35 cc. Instead of employing centrifugation, the liquid is left standing, at room temperature, for a maximum of four hours. The formations which present the distinct appearance of clots are regarded as positive, and fairly marked flocculent formations as feebly positive or doubtful. If the mixture continues to exhibit a clear colloidal appearance, the case is negative.

The use of the centrifugation method, compared with the basic method, gives satisfactory results in a somewhat larger number of cases of syphilis, without specificity being diminished. Since, moreover, the reading of the results of the *M.B. R. II* centrifugation method is as easy and the technique of this method is almost as simple, though more rapid, the centrifugation method should be specially recommended.

For examining the *cerebro-spinal* fluid, the same antigen is employed, simply using a different dose; 0.6 cc. of inactivated fluid is mixed with 0.3 cc. of antigen. The mixture is heated for *ten minutes* in the water-bath at 56° C. and left standing at room temperature.

In very markedly positive cases, even during the first hour and at latest during the third hour, very distinct and freely floating clots are formed. In medium cases, flocculation appears only after six or seven

hours, and the clot is only formed the following day. The weaker cases produce a clot or very definite flocculation only on the day after the test. The specificity for cerebro-spinal fluid is so high that even the weaker reactions point to the presence of syphilis, as M.B. R. II gives negative results even for diseases such as multiple sclerosis, tumours, etc., for which the colloidal gold and benjoin tests are positive.

For cerebro-spinal fluid, also, the result of the test can be obtained more rapidly by centrifugation. In definitely or weakly positive cases, a diagnosis can be established in a few minutes. It is only in the very feebly positive cases that definite clotting does not occur until the following day.

Prunell's Sero-Haemo-Flocculation Test.

1. BLOOD SERUM.

Preliminary Test.

	No. 1	Tubes No. 2	No. 3
1. Normal active human serum	0.2 cc.	0.2 cc.	0.2 cc.
2. Bordet antigen (1 in 10)	0.5 „	0.5 „	0.5 „
3. Dispersing agent (1 in 100).	0.5 „	0.5 „	0.5 „

Incubate for fifteen minutes in a water-bath at 32° to 34° C. and then add:

4. Acetic acid solution (1 in 500)	0.1 „	0.2 „	0.3 „
5. 4 per cent suspension of red cells	0.5 „	0.5 „	0.5 „

Replace in the water-bath at 32 to 34° C. and watch the progress of hæmolysis.

Hæmolysis should occur in from five to ten minutes in No. 1 tube and from fifteen to twenty minutes in No. 2; whilst in No. 3 it is absent. The dose of acetic acid employed in the test proper is that which produces hæmolysis in from five to seven minutes. If hæmolysis does not occur within this time, this should prove that either the serum employed is syphilitic or that the reagents have been wrongly prepared.

Final Tests.

	No. 1	Tubes No. 2
1. Patient's serum (active)	0.2 cc.	0.2 cc.
2. Bordet antigen (1 in 10)	0.5 „	—
3. 0.85 per cent physiological saline solution	—	0.5 „
4. Dispersing agent.	0.5 „	0.5 „

Incubate for half an hour in a water-bath at 32° to 34° C. and then add:

5. Acetic acid solution (1 in 500)	0.1 „	0.1 „
6. 4 per cent suspension of red cells.	0.5 „	0.5 „

The racks are shaken and replaced in the water-bath at 32° to 34° C. for from fifteen to twenty minutes. The reading is then taken in the same way as in the Bordet-Wassermann test.

If, in the course of the preliminary test, a serum is selected with which hæmolysis occurs in five minutes, the final readings can be performed with greater accuracy.

2. CEREBRO-SPINAL FLUID.

Preliminary Test.

	Tubes		
	No. 1	No. 2	No. 3
1. Normal cerebro-spinal fluid	1.0 cc.	1.0 cc.	1.0 cc.
2. Normal human serum (dispenser)	0.1 „	0.15 „	0.2 „
3. 0.85 per cent physiological saline solution	0.4 „	0.35 „	0.3 „
4. Bordet antigen (1 in 15)	0.5 „	0.5 „	0.5 „

Incubate for fifteen minutes in a water-bath at 32° to 34° C. and then add:

5. Acetic acid solution (1 in 500)	0.1 „	0.1 „	0.1 „
6. 4 per cent suspension of red cells	0.5 „	0.5 „	0.5 „

The tubes are shaken and replaced in the water-bath at 32° to 34° C. for from twelve to fifteen minutes. Test-tube No. 1 should hæmolysise in from seven to ten minutes.

Final Test.

	Tubes	
	No. 1	No. 2
1. Cerebro-spinal fluid	1.0 cc.	1.0 cc.
2. Bordet antigen (1 in 15)	0.5 „	—
3. 0.85 per cent physiological saline solution	—	0.5 „
4. Normal human serum (1 in 5)	0.5 „	0.5 „

Incubate for thirty minutes in a water-bath at 32° to 34° C. and then add:

5. Acetic acid solution (1 in 500)	0.1 „	0.1 „
6. 4 per cent suspension of red cells	0.5 „	0.5 „

Replace in the water bath for from fifteen to twenty minutes.
 Positive reaction: Inhibition of hæmolysis in tube No. 1.
 Negative reaction: Hæmolysis in tubes Nos. 1 and 2.

Method employed by Dr. Saül Puppo.

Method employed. — Original Wassermann method.

Antigen. — Cholesterinised human heart.

Temperature at which the Test is performed. — 37° C.

Technique of Test. — Human heart extract is cholesterinised on the day of the test.

The cholesterinised extract and the amboceptor serum are previously titrated.

Inactivation of Patient's Serum. — Fifteen minutes in water-bath at 55° to 56° C.

Fixation. — In the water-bath at 37° C.

Reading of Results. — When lysis is complete in the negative control tubes — usually in about eight minutes at 37° C. (water-bath) after addition of sensitised cells.

Other Apparatus necessary for the Tests. — A water-bath at 56° C. and a Vernes rheometer.

Method employed by Dr. R. F. Scaltritti and Dr. Julio Cassiniga.

The method of the sero-diagnosis of syphilis performed at the Serological Conference at Montevideo is based on the complement fixation principle — Bordet-Wassermann reaction.

Method.

Serum heated at 56° C. for half an hour.

Complement of a male guinea-pig weighing approximately 500 grammes, obtained by cardiac puncture on the day of the test. Four minimal doses of hæmolysin are employed. The sheep cells are washed four times with 0.85 per cent saline solution. The sensitised red cells are centrifuged slowly for one minute. The supernatant fluid is removed and the suspension is restored to its original volume with 8.5 per cent saline solution. The antigen used is described by Dr. Alberto SCALTRITTI in the *Annales de l'Institut Pasteur* (December 1928, Volume XVII, page 1608). The antigen, complement and hæmolytic system are delivered into the tubes with a Vernes "aspiro-pipeur" in 0.4 cc. volumes. The sera are distributed with pipettes.

The reaction takes place in a water-bath at 37° C.

The reading is taken as soon as hæmolysis is complete in the control tubes.

Details of the Test.

	No. 1	Tubes No. 2	No. 3
1. Inactivated patient's serum	0.15 cc.	0.10 cc.	0.15 cc.
2. Antigen	0.40 „	0.40 „	—
3. Complement	0.40 „	0.40 „	0.40 „
4. Physiological saline	—	—	0.40 „

Incubation for one hour in a water-bath at 37° C.

5. Hæmolytic system	0.40 „	0.40 „	0.40 „
-------------------------------	--------	--------	--------

Water-bath until hæmolysis has occurred in the control tubes.

Cerebro-Spinal Fluid.

	No. 1	Tubes No. 2	No. 3
1. Cerebro-spinal fluid	0.50 cc.	0.80 cc.	0.80 cc.
2. Antigen.	0.40 „	0.40 „	—
3. Complement.	0.05 „	0.05 „	0.05 „
4. Physiological saline :	0.30 „	—	0.40 „
Water-bath for one hour at 37° C.			
5. Hæmolysin (titrated).	0.10 „	0.10 „	0.10 „
6. Red cells (one-third)	0.05 „	0.05 „	0.05 „

Water-bath until hæmolysis has occurred in the control tubes.

Note. — Cerebro-spinal fluids are ordinarily tested in our laboratory in five amounts of 0.2 cc., 0.3 cc., 0.5 cc., 0.8 cc. and 0.8 cc. At this Conference, however, it was impossible to perform the tests with this series of tubes owing to the limited quantity of fluid available.

Technique employed by A. Sordelli and J. Miravent.

1. *Hæmolytic Serum.*

(a) Washed red sheep cells.

Suspension in physiological saline (0.85 per cent) in such proportions as to give 8 per cent of hæmoglobin (Sahli-Leitz). Dose employed 0.5 cc.

(b) Hæmolytic rabbit serum inactivated for thirty minutes at 56° C.

The titration of the serum is performed once every fifteen to thirty days in the following manner: Increasing doses of hæmolytic serum are made up to a volume of 0.5 cc. To these are added 0.5 cc. of red cells and 1 cc. of guinea-pig complement (1 in 20). Results are read after thirty minutes in the water-bath at 37° C.

A mixture of 0.5 cc. of red cells and 0.5 cc. of hæmolytic serum containing five times the hæmolytic dose previously determined is employed for the test.

2. *Human Serum.*

Inactivated for thirty minutes at 56° C.

Dose 0.1 cc.

3. *Antigen.*

Bordet-Ruelens.

The extract is evaporated to dryness, and is then thoroughly emulsified with distilled water in the proportion of 2 cc. of distilled water for each cc. of antigen employed; 18 cc. of physiological saline solution are now added, giving a dilution of antigen 1 in 20. From a part of this 1 in 20 dilution, a further dilution of 1 in 100 is prepared.

Dose: 0.4 cc. of each dilution.

4. Guinea-pig Complement.

Serum of at least five guinea-pigs diluted 1 in 20. Titration is performed on every test-day. One and one and a-half times the minimal hæmolytic dose is employed in the test.

5. Technique of the Reaction.

(a) *Complement Titration.* — This is performed:

- (1) Alone;
- (2) In presence of 0.4 cc. of antigen 1 in 20;
- (3) In presence of 0.4 cc. of antigen 1 in 100.

The tubes are placed in the water-bath at 37° C. for one hour, when 1 cc. of the mixture of red cells and hæmolytic serum are added and incubation is continued for a further half-hour. The results are then read. Usually, the hæmolytic dose is the same for the three series.

(b) *Test Proper.* — Five tubes are used for each serum; 0.1 cc. of serum is first delivered into each tube and then 0.9 cc. of the mixture of reagents as shown in the following table:

Tube		Antigen Complement	Physiological saline
No. 1 . .	0.4 cc. (1 in 20)	1 hæmolytic dose	Up to 0.9 cc.
No. 2 . .	0.4 cc. (1 in 20)	1½ hæmolytic dose	Up to 0.9 cc.
No. 3 . .	—	1 hæmolytic dose	Up to 0.9 cc.
No. 4 . .	—	1½ hæmolytic dose	Up to 0.9 cc.
No. 5 . .	0.4 cc. (1 in 100)	1 hæmolytic dose	Up to 0.9 cc.

The quantity to be prepared of each of the reagents is of course determined by the number of reactions. After one hour in the water-bath at 37° C., 1 cc. of the mixture of red cell and hæmolytic serum is added. The racks are replaced in the water-bath at 37° C. and the results are read when test-tubes Nos. 3 and 4 are hæmolysed.

Weak reactions are shown by the absence of hæmolysis in the fifth tube, and strong reactions by the absence of hæmolysis in the second.

**Technique of the Bordet-Wassermann Complement Fixation
Reaction employed by M. Juan Torrazza
and M. José Arturo Lorenzo.**

1. *Suspension of red sheep cells, 5 per cent.*
0.5 cc. per tube.
2. *Hæmolytic anti-sheep rabbit serum.*
3. *Complement.*

A mixture of complement of more than three guinea-pigs obtained by cardiac puncture of animals which have been kept fasting for twelve hours.

4. *Antigen.*

Alcoholic extract of horse- or ox-heart cholesterinised at the time of making the antigen suspension.

Preparation. — A fresh heart is minced as finely as possible and dried with absorbent gauze; 10 cc. of absolute alcohol are added to each gramme of heart and the mixture left for ten days in an incubator at 37° C. The mixture must be frequently shaken. It is then left for a further ten days at room temperature, after which it is filtered and placed in the incubator in a Petri dish until it has evaporated to half its original volume. It is then transferred to a stoppered bottle and left for two or three hours in a refrigerator, when it is filtered. The extract should be kept at a temperature of more than 15° C.

A saturated solution of recrystallised cholesterin in absolute methyl alcohol is prepared by dissolving the cholesterin in the alcohol at a temperature of 50° to 60° C. The solution is then cooled to 15° C., being shaken at intervals. It is filtered when precipitation has ceased.

The mixture of alcoholic heart extract with cholesterin solution (1 cc. of heart extract + 1 cc. of cholesterin solution) should take place at the time of making the colloidal suspension. This is prepared as follows: Place 2 cc. physiological saline in a test-tube of 10 to 12 mm. diameter. Float upon it 2 cc. cholesterinised extract. Cork the tube and mix by gently inverting three times. Wait two minutes and pour into a graduated measure containing 40 cc. physiological saline. Make up the total volume with saline to 50 cc. The antigen thus prepared should be less anti-complementary than the antigen plus negative serum. The dose of antigen is 0.5 cc. per tube. The suspension should be prepared the evening before it is required for use and should remain for at least sixteen hours in the ice-chest.

5. *Apparatus.*

The ordinary laboratory equipment, with the addition of the Hohl automatic distributor for delivering the reagents in a uniform volume of 0.5 cc.

6. *Technique of the Reaction.*

I. *Dose of Hæmolysin.* — The minimal hæmolytic dose is determined for 0.5 cc. of 5 per cent sheep's red cells on incubation for twenty minutes in the water-bath at 37° C., together with 0.03 cc. of complement. For use in the complement titration and the test proper four minimal hæmolytic doses are employed.

II. *Dose of Complement.* — Titration is performed as follows:

First row of tubes:

Negative serum inactivated for ten minutes at 55° C. + antigen + complement in increasing doses.

Second row of tubes:

Antigen alone + complement in increasing doses.

Third row of tubes:

Negative serum alone + complement in increasing doses.

Fourth row of tubes:

Complement alone in increasing doses.

The contents of each tube are brought up with physiological saline to 1.5 cc., and the tubes are then placed in the water bath at 37° C. for fifty minutes; 0.5 cc. of 5 per cent sheep cells sensitised with four minimal hæmolytic doses are then delivered into each tube.

The results are read after a further incubation of twenty minutes in the water-bath.

Row No. 1 shows the titre of the complement for calculation of the dose to be employed in the test proper. (This titre should be increased by one-quarter of its value.)

Row No. 2 determines the quality of the extract in regard to what has been explained above.

Row No. 3 gives the titre of the first control of the test proper.

Row No. 4 enables the anti-complementary power of the negative sera to be determined, so that, when necessary, the results of particular tests may be rejected.

In the test proper, at least three antigens, derived from different sources, are used, which should be titrated during this preliminary test.

III. Test Proper. — 0.1 cc. of each serum to be examined is delivered into as many tubes as there are antigens employed plus two control tubes, and inactivated for ten minutes.

The antigen are then added and the mixtures allowed to stand for ten minutes, when the complement is added in dilution determined by the previous titration. The second control tube receives 0.005 cc. over and above the amount delivered to the first.

The tubes are now incubated for fifty minutes at 37° C., when the hæmolytic system is added. The readings are taken after twenty minutes in the water-bath.

Method used by Dr. E. J. Wyler.

1. Method used.

The method is fully described in "Medical Research Council Special Report Series", No. 129, to which reference should be made, as details must be strictly followed to obtain reliable results.

2. Principle.

Complement fixation; the essentials of the technique are set out below.

3. Advantages.

It would appear that the principal advantage of this method consists in a high degree of specificity without undue loss of sensitiveness.

4 and 5. *Temperature and Reading of Results.*

Fixation takes place for thirty minutes at room temperature, followed by thirty minutes in the water-bath at 37° C. The sensitised sheep cells are then added and the racks replaced in the water-bath at 37° C. The results are read as soon as the negative control serum shows complete lysis.

6. *Tubes used for Each Serum.*

Four.

7. *Number of Pipettes used.*

In Donald's "dropping" technique, which was employed at the Conference, graduated pipettes are not needed in the test proper. One dropping pipette is used for the sera and is washed out with saline between each specimen; one dropper is used for saline, complement dilutions, and sensitised cells; and one other dropper is used for antigen suspension.

8. *Apparatus used.*

A burette, to which Donald's droppers are attached, as described in "Medical Research Council Special Report Series", No. 129.

9. *Essentials of the Method.*

Inactivation of Patient's Serum. — Thirty minutes at 55° C.

Complement. — Guinea-pig's serum titrated as follows:

This is done on every test-day, the volume of fluid in each tube being the same as in the test proper. Two rows of tubes containing graded strengths of complement dilution are set up as follows:

- Row 1 contains 2 volumes saline;
1 volume complement dilution;
1 volume sensitised cells.
- Row 2 contains 1 volume saline;
1 volume complement dilution;
1 volume antigen suspension.

Row 1 is incubated for thirty minutes at 37° C., and the titre of the complement is then read.

Row 2 is incubated for thirty minutes at room temperature and then for thirty minutes in the water-bath at 37° C. At the end of this period, a volume of sensitised cells is added to each tube and the rack replaced in the water-bath at 37° C. for thirty minutes. Provided that the result of the final incubation of row 2 shows that the titre as ascertained in row 1 has not been reduced through the presence of antigen by more than one dose, the reading obtained in row 1 is accepted.

Antigen. — Alcoholic human heart extract (three parts); 1 per cent alcoholic solution cholesterol (two parts). These are mixed on the day of the test and the mixture diluted 1 in 15 with normal saline by pouring the saline quickly upon it.

The heart extract is prepared as follows: the fat having been cut away, the muscular portion of the left ventricle is minced and ground for one minute with absolute alcohol (1 gramme of heart muscle to 9 cc. absolute alcohol) in a mortar with powdered glass. The mixture is placed in the incubator at 37° C. for twenty-four hours, being shaken at intervals. At the end of twenty-four hours it is filtered, placed in the ice-chest overnight and again filtered. It is then kept at room temperature for four weeks, when it is titrated. The extract will then remain unchanged at room temperature for many months.

Hæmolytic System. — A standardised suspension of sheep's red blood cells sensitised with six doses of hæmolytic immune body.

Test Proper. — Four tubes are required for each serum.
Each tube contains the same quantity of fluid as follows:

Tube No. 1

(serum control): 1 volume saline;
1 volume patient's serum diluted 1 in 5 with saline;
1 volume complement dilution in saline, containing three minimal hæmolytic doses.

Tube No. 2

(serum control): Same as tube No. 1, but the volume of complement dilution in saline contains two minimal hæmolytic doses.

Tube No. 3:

1 volume patient's serum diluted 1 in 5 with saline;
1 volume complement dilution in saline containing five minimal hæmolytic doses;
1 volume antigen suspension.

Tube No. 4:

Same as tube No. 3, but the volume of complement dilution in saline contains three minimal hæmolytic doses.

The tubes are incubated first at room temperature for thirty minutes and then in the water-bath at 37° C. for thirty minutes, after which one volume of sensitised cells is added to each and the racks replaced in the water-bath at 37° C. The reading is taken as soon as the negative control serum shows complete lysis.

Cerebro-spinal Fluid. — This is tested in the same way as serum (one volume of cerebro-spinal fluid diluted 1 in 5), except that a further three rows of tubes are up, containing two, five and ten times this amount.

Annex 5.

OBSERVATIONS ON THE RESULTS OBTAINED.

NOTES BY A. DE ASSIS.

We propose considering only certain isolated results obtained by means of the technique which is explained below. To gauge its general or comparative value is not possible at the time of writing.

It must be stated at the outset that it was impossible to carry out our technique under all the conditions described by us and in the manner practised at home owing to certain practical difficulties that had to be overcome (heating of sera; the preparation of the suspensions of sheep cells). One point should receive particular attention. In spite of all the care taken in obtaining the complement used at the various meetings, we were not always successful in procuring it in such perfect condition as was desirable. The mixture of sera obtained from guinea-pigs from Rio de Janeiro and Montevideo had a more or less constant hæmolytic power, but its specific fixability with antigen sera or cerebro-spinal fluid antigen was shown to be much more variable than at home. We desire to emphasise this variation of the complement, because it accounts for a certain number of abnormal reactions recorded, particularly on September 18th, and in the cerebro-spinal fluid tests, Nos. 74 and 76, which gave weak non-specific results (+) (No. 67 was not retested).

The tests we have just referred to were repeated on September 24th with the same antigen as used in the first case, but with another complement. Both were clearly negative, which makes it impossible that our cholesterinised antigen was responsible for the non-specific result.

Particular emphasis must, however, be laid on the fact that all our strongly positive reactions (++) with cerebro-spinal fluid retained their specificity without exception and therefore their diagnostic value.

We are unable to make any statement on certain divergent results obtained by us with the sera, as the necessary information is lacking.

A NOTE ON THE RESULTS OBTAINED WITH THE "STANDARD" KAHN TEST AND "PRESUMPTIVE" PROCEDURE WITH SPINAL FLUID AT MONTEVIDEO, BY R. L. KAHN.

For best results with the Kahn spinal fluid tests, it is necessary to employ saturated ammonium sulphate (for precipitating the globulins) of the highest purity obtainable. I was not satisfied with the purity of the ammonium sulphate available during the Monte-

video Conference. Impure ammonium sulphate shows a tendency to give false precipitation reactions. My constant concern as to the possibility of such reactions led me to modify somewhat my standard reading scale of my spinal fluid results. According to the findings in our own laboratory, as well as those reported by many other laboratories, both spinal fluid tests should have shown greater sensitivity and the presumptive test should not have given four false positive reactions in the 200 cases examined.

OBSERVATIONS BY DR. JULES MOREAU.

I wish to point out that, as I had to work with a very small incubator, the reactions developed very slowly and rather irregularly. For this reason I am afraid that certain reactions are non-specific.

OBSERVATIONS BY PROFESSOR MÜLLER.

1. *Non-specific Reactions.*

My method produced non-specific results in two cases, and in one of these (No. 222, *debilitas mentalis*) this fact was probably due to some technical inaccuracy. A second serological test of the same case (No. 936) produced a negative result. The second case (No. 438) concerned the serum of a patient suffering from an *ulcus phagedænicum penis*; it was impossible either to repeat the serological test or to carry out a fresh clinical examination, and this may quite possibly have been a case of phagedænic sclerosis.

2. *Doubtful Results (\pm) among Cases recorded as Non-syphilitic.*

My method produced doubtful results on twenty-three of the non-syphilitic cases; two of these twenty-three cases were prostitutes, one of whom was examined twice, producing a doubtful reaction on both occasions. Setting aside these two cases (three serological tests), twenty-one cases still remain.

Two of these twenty-one cases were examined twice with the same result, so that only nineteen different cases produced doubtful results. Three of these doubtful cases were examined several times, the results now proving negative, and the inaccuracy note at the beginning, which was probably due to some technical fault, may be regarded as having been corrected for all three.

The remaining sixteen cases were acute infectious diseases, in which, as we know, a positive reaction is only transient; so that the results obtained should not be regarded as detracting from the diagnostic value of my method. In the cases, more particularly, which again produced doubtful results on re-examination, latent or congenital syphilis cannot be excluded with any certainty. This view might be confirmed by anamnesis — *e.g.*, *ulcus three weeks ago*, *“alopecia”*, *“idiocy”*, *“epilepsy”*. It was unfortunately impossible to carry out fresh blood tests for these cases.

LETTER BY DR. A. PRUNELL TO THE PRESIDENT OF THE CONFERENCE.

Montevideo, September 20th, 1930.

The Council of the Public Health Service of Montevideo appointed me to carry out serological research work, following my own method, the efficacy of which I was able to record at Hamburg and in more than four thousand cases at Montevideo.

I may add that excellent results have been obtained with my method by M. Banciu and M. Vatamanu of Professor Nicolau's clinic ("An. of Venereal Diseases", October 1927), M. Piotrowski and M. Liengne ("An. of Venereal Diseases", January 1928) and also by M. E. Galita, who confirmed its value in a thesis (Bucharest, No. 3034).

I have had the honour of participating in the work of the Serological Conference over which you preside, and I observed in the course of the very first tests that the results I was obtaining were in agreement neither with those of the other research workers nor with those which I had obtained in my numerous previous tests.

I am led to the conclusion that the errors which occurred were due to the fact that the sera submitted for examination were not sufficiently fresh to allow my test to be carried out properly. Active sera are absolutely essential for this method, and the test should be made within from twenty-four to forty-eight hours after the blood has been taken.

As I consider, greatly to my regret, that it is impossible for these reasons to work with exactitude, I would ask you, Sir, to be good enough to allow me to abandon my investigations as soon as they appear to present no further practical interest to the Congress.

(Signed) Alfredo PRUNELL,
Chief of the Laboratory of the Pasteur
Hospital of Montevideo.

Official No. : **C.H./Malaria/16**

Geneva, June 1931.

LEAGUE OF NATIONS

HEALTH ORGANISATION

HOUSING AND MALARIA

(A Critical Summary of the Literature dealing with this Subject)

by

Lt.-Col. CLAYTON LANE, M.D., I.M.S.

Series of League of Nations Publications

III. HEALTH ✓

1931. III. 6.

CONTENTS.

	Page
Introduction	5
1. The Anopheles associated with Malaria are, in the Main, House-Haunters and Night-Biters	7
2. Malaria Houses and Anopheles Houses	8
3. Arrangement of the House and the Habits of Those who dwell in it	9
4. The Habits of Anopheles in relation to Malaria Infection	15
5. A Hospice-Return Instinct.	17
6. A Stay-at-Hospice Habit	19
7. The Blood Meals of Anopheles	23
8. Influence of Animals and Animal Houses	25
9. Effect of Certain Preventive Measures	26
(a) Effects of the Detection and Destruction of Adult Anopheles in Houses	27
(b) Effects of screening Houses.	29
(c) Effects of the House Site.	33
Conclusions	34
Bibliography	36

INTRODUCTION.

This report follows a request from the Medical Director of the League Secretariat for a "survey of available literature in regard to the question of housing and malaria in the form of a critical summary".

The second general report of the Malaria Commission of the League of Nations (document C.H./Malaria/73 ; Geneva, 1927) describes as indispensable two "primary measures" directed against malaria, the first being the treatment of the infected. The report states that the other primary measure which was recommended was described in the former report as follows :

"The instruction of the inhabitants . . . as to how malaria is spread from member to member of the same family by the agency of particular mosquitoes which find the house a safe resting-place . . . In Europe, the majority of infected mosquitoes are found inside houses . . . The Commission strongly recommends that . . . an active and energetic endeavour should be made, wherever possible, to induce householders, especially housewives to make the killing of adult mosquitoes found within the house a part of the daily cleaning task. The Commission is convinced that that measure, if it could be effectively carried out, would have very remarkable results."

That conclusion clearly implies the steadfast conviction that malaria infection is essentially obtained in the house in Europe. In effect, the present survey of literature has resolved itself into the collecting and weighing of the evidence bearing on a possible connection between malaria and the house in all parts of the world.

For material from 1912 onwards, the procedure employed has been to read all abstracts dealing directly or indirectly with malaria in the *Tropical Diseases Bulletin* (instituted in 1912) in its *Sanitary Supplements* and in the *Bulletin of Hygiene*. Every paper whose abstract suggested that it might possibly contain appropriate matter has been read in the original. The majority proved useless for the purpose. In addition, earlier references compiled by Sir Andrew BALFOUR, Director of the London School of Hygiene and Tropical Medicine, have most generously been placed at my disposal and consulted in original. Moreover, others collected by Colonel S. P. JAMES, I.M.S., of the Ministry of Health, have with equal generosity been laid open to me, as well as translations of German and Dutch works written at the beginning of the century and recently. Finally, references have been met with in the papers consulted, and these have been followed up in the originals whenever they seemed likely to prove of value.

It early became apparent that the amount of published works containing direct evidence of the rôle of the house in the transmission of malaria was relatively small, and it became equally clear that this was the case because there was assumption, often apparently unconscious, that the connection was real and essential. Thus the

fact that nearly all collections of anopheles reported in connection with malaria have been made in houses or outhouses ; that in malarious countries the screening of houses is habitually advocated, or their removal to a distance from anopheline breeding-places or sources of malarial infection, while the place of the day's work is unaltered—all these procedures at bottom assume that it is in the house that malarial infection is acquired. In face, then, of this assumption, the amount of evidence is not great, but such as exists seems to me to be strikingly strong. It is considered below from a number of aspects.

I am indebted to Colonel James for the following historical items not incorporated in the body of this note or in its list of references.

1897. — On May 7th, Ronald Ross caught in a rest-house in the Sigurghat the first "dappled-winged mosquito" that he had ever seen (Ross's "Memoirs", page 208).

1898. — In September, GRASSI and BIGNAMI collected all the mosquitoes they could find in houses of malarious patients at Maccarese. They included many specimens of *Culex vexans* and *C. penicillaris* and about ten specimens of anopheles. The culicines were liberated on September 26th, 1898, in a room in which a healthy person slept, and the anopheles on October 20th. The person fell ill with an attack of æstivo-autumnal malaria on November 1st (GRASSI, "Studi di uno Zoologo sulla Malaria", 1901 edition, page 142).

On November 13th, 1898, BIGNAMI and BASTIANELLI repeated this experiment, using only spotted-winged mosquitoes (*Anopheles claviger*). They collected about a hundred of these mosquitoes from houses occupied by persons suffering from malaria in Maccarese and liberated them on November 13th in a room in which a healthy person slept from that date until December 2nd. This person developed an attack of malarial fever "of double tertian type" in the beginning of December (GRASSI, *Ibid.*, page 144).

In December 1898, GRASSI and his collaborators also began to practise Ross's plan of catching mosquitoes in houses containing persons suffering from malaria and examining them for developmental forms of the parasite. They found that at that period of the year 75 per cent of *A. claviger* caught in certain rooms occupied by persons who were all suffering from malaria contained developmental forms of the parasite (BASTIANELLI and BIGNAMI in "Annali d'Igiene Sperimentale", Nuova Serie, Vol. IV, No. 3, 1899, page 272).

1899. — In August, the malaria expedition to West Africa, despatched by the Liverpool School of Tropical Medicine, ascertained, by dissecting mosquitoes caught in dwellings, that at Lagos two species of anopheles (*costalis* and *funestus*) were acting as hosts and transmitters of all three species of the malaria parasite (Report of the Liverpool School Expedition to West Africa.)

1899-1900. — STEPHENS and CHRISTOPHERS, working in West Africa, gave some striking examples of "fever houses" in which infection persisted for weeks or months (Reports to the Malaria Committee of the Royal Society, Series 1-8, 1900 to 1903).

1. THE ANOPHELES ASSOCIATED WITH MALARIA ARE, IN THE MAIN,
HOUSE-HAUNTERS AND NIGHT-BITERS.

The anopheles associated by experience with malaria are, in the main, house-haunters and night-biters, and at night their victim mainly spends his time in a house.

The general principle is implicit in a report by STEPHENS (1921) on malaria on a Venezuelan oilfield, chosen here at random as being typical of the advice regularly tendered in such cases :

“ We have here, then, an example of the conditions frequently found in the tropics—namely, native villages and a source of anopheles in close proximity to a white population.”

Since the two populations white and coloured meet during the day at their work, it must be the homes to which they separately go at night that are held to be the site where they acquire their infection. The principle is treated by SYMES (1926) thus in speaking of Africans in Kenya :

“ It has been suggested that the native becomes infected with malaria in the open. The few observations we have made suggest that a native is bitten most frequently in his hut. Normally, he spends very little time outside during the evening.”

CARTER (1927), by implication, accepts the house as the important site of infection in Ceylon in writing that *A. fuliginosus*, which has shown natural and artificial malarial infection, occurs frequently in local houses and cattle-sheds, and so must be regarded as potentially dangerous ; and, of *A. culicifacies* :

“ This species is highly susceptible to malaria infection, and, owing to this fact and its domestic habits, is, in India, regarded as one of the most important carriers of the disease.”

Again, MACGREGOR (1927) writes of Mauritius that *A. mauritianus* will attack ferociously in the open during the day, and will enter houses and feed by day, but never, if free, at night, to his knowledge, and is not a carrier in Mauritius ; that *A. costalis*, which enters houses readily and which, although it will feed by day, feeds chiefly at night, is the main vector ; that *A. funestus*, of which there is no record of day-feeding when not in captivity, is the vector of second importance. GARNHAM (1929, writes :

“ It is essential to know whether a mosquito is domestic in its habits, for, in the latter case, measures for its destruction are unnecessary, malaria as a rule being a household disease.”

In this case, the principle is fully accepted. SWELLENGREBEL, SCHÜFFNER and SWELLENGREBEL DE GRAAF (1919) point out that, given the capability of acting as efficient host to plasmodia, the potential danger of an anopheles species depends on its commonness, its liking for human blood, and on whether or not it is a house-haunter.

2. MALARIA HOUSES AND ANOPHELES HOUSES.

That, where malaria prevails, certain houses may be particularly associated with this infection is an observation constantly made, of which the following are some published examples.

MÜHLENS (1902) quotes a number of instances of such house epidemics, from which the following are selected.

In Berensch, malaria appeared in two only of its twenty houses. In one, a 5-year-old boy fell ill at the end of March 1901, having tertian parasites in his blood; his sister of 2 years, who slept with him, followed in May, as also a man in the second house, 150 metres from the first, both showing the parasites.

Groden had over 200 houses and malaria appeared in two only. In one, the wife had untreated fever in 1901. In 1902, her child of 6½ years fell ill in March, and in May her husband, both having tertian malaria microscopically established. In the other house, two girls fell ill in April 1902, the infection being later microscopically established in one.

In Ellens, there were eight cases of confirmed malaria in 1902, occurring in four of its twenty-three houses. Four occurred in one house as follows: The wife had been ill in 1901. In 1902, there fell ill (a) her husband in the beginning of May, (b) the wife again fourteen days later, (c) their child of 15 months about the same time as (b), and (d) a servant nine days after (b).

FROSC (1903) noted that R. KOCH showed in Fasana and Sigano, Istria, that malaria was a house infection, and reproduces a plan of the former, in which the malarious houses and the number of cases they contained is clearly marked. It illustrates the house character of the infection in a striking manner.

SCHOO (1905, page 219) had 218 patients in a town in North Holland, distributed as follows, in 1901:

In 81 houses	1 case
" 38 "	2 cases
" 13 "	3 "
" 4 "	4 "
" 1 "	5 "

In another part of his practice, Schoo had houses with six, seven and eight malaria cases. He gives, on a plan, the distribution of these "malaria houses", and adds that he can confidently call them such, for experience teaches that it is just in these houses where every year cases occur.

ALCOCK (1925) wrote :

“ There is the significant fact in certain Indian cantonments—and these not notoriously malarious—there may be (or once was to be) found some particularly malarious house having the opprobrious name of ‘ Fever Hall ’.”

FALCONI (1913) noted that, in all regions where malaria prevails, its incidence in particular houses or streets of a town can be demonstrated. MÜHLENS and SVARČIĆ (1925) wrote of one such “ Malaria-Häuschen ”, comprising a single room 4 metres by 4 metres, in which a family of five lived and in which over fifty fed mosquitoes were found. The finding of malaria houses is still common. Thus, KLIGLER (1925) said of Palestine : “ In almost any village at all there are such things as ‘ malaria houses ’ and such things as ‘ mosquito houses ’ ” ; while, in discussion on this paper, Bruce MAYNE said, “ It seems to be a general experience among field workers to encounter ‘ malarious houses ’ ”. Presumably, the well-known instances of “ blackwater houses ” are further examples of this condition of affairs. That there are constantly found houses particularly associated with malaria is evident from the literature published between 1902 and 1930. One reference not generally accessible may be added. Brigadier-General TESTI (1919) stated of the Piave region that there were found there what were termed by Lieutenant-Colonel MARIOTTI-BRANCHI and himself “ family epidemics ”, in which all or nearly all members of a family were infected with malaria parasites, and anopheles captured in the houses concerned were infected to the extent of 25 per cent. The instances cited are merely a few of many.

3. ARRANGEMENT OF THE HOUSE AND THE HABITS OF THOSE WHO DWELL IN IT.

Seeing, then, that these extracts show clearly the existence of “ malaria houses ”, any particular character which they possess next requires elucidation. They do possess certain characters, and they are those which appeal to the instincts of at least certain malaria-carrying anopheles. For examples, *Anopheles maculipennis* shows by its habits that its preferences are for dark places without draught and with a comparatively equable temperature close to a food supply ; cobwebs add to the attractiveness. Of the condition of “ malaria houses ” in the regions where *A. maculipennis* is mainly concerned in the spread of this infection, the following are examples :

S. P. JAMES (1919(a)) investigated an epidemic of thirty-two cases of tertian malaria which occurred in 1917-18 at Queenborough, Kent, England, in fifteen houses lying in four streets. In one house, there occurred five cases at intervals through the epidemic, and, finally, the landlady was found to be an apparently healthy carrier. In other houses there occurred 3, 2, 2, and 2 cases, so that sixteen of the cases occurred in six houses and these (JAMES, 1920(b)) became commonly spoken of as

“malarious houses”. A. J. GROVE, in discussion on the above paper, reported that he had examined a number of these houses and that nearly all were built on one plan :

“The entrance hall gave place to a staircase which led to a central landing from which the bedrooms at either end and along one side opened. The ceiling of this landing supplied . . . absence of draught, stability of temperature, and, when the bedroom doors were closed, diminished lighting—in fact, almost complete darkness. *A. maculipennis* was found in many of the houses especially on the ceiling of the landing.”

CAZENEUVE (1920) writes thus of autochthonous malaria in Kerhono, a suburb of Lorient on the west coast of France :

“La distribution de ce paludisme indigène affecte un groupement conditionné par la proximité d’un marais, l’altitude, l’exposition au vent, la disposition des maisons. Il existe ainsi dans Kerhono un quartier paludéen, des maisons à malaria, à familles paludéennes . . . Des maisons sont essaimées par petits groupes en bordure de la prairie récente et du marais. Elles sont basses, au ras du sol, sans étage, selon le type primitif de la maison bretonne. Leur intérieur est souvent disposé en une seule pièce, sans grande ventilation ni lumière. Les murs sont tapissés de meubles et de rideaux, offrant de nombreux refuges aux moustiques. . . Dans ce quartier paludéen, toutes les maisons ne sont pas atteintes. Plusieurs, à un étage, claires et bien aérées, dont le rez-de-chaussée n’est habité que le jour, sont restées sans paludéens. Des maisons voisines, basses et sans étage, à l’intérieur encombré, sont, au contraire, devenues des maisons à malaria, dans lesquelles vivent des familles de paludéens.”

JAMES (1919(b)) made the following observations in England :

“A country lane leading to the edge of Arbrook Common in Surrey has on one side a row of modern two-storey houses and on the other a few primitive cottages. Anopheles bred abundantly in ponds on the edge of the common, and the adult insects were always to be found in great numbers in cowsheds and stables in the neighbourhood. During 1917, I lived in one of the houses in the lane and made observations on the anophelens in relation to that house and to one of the cottages facing it.”

James found that every evening throughout the summer about the same number of anopheles appeared to fly into both habitations. In the house, even when unmolested, they seldom remained more than a few minutes, and only once during the whole summer was a specimen found there in the morning, having apparently remained there all night. Of those which entered the cottage, “several quickly settled in dark corners and on the smoke-grimed rafters of the living-room and made no attempt to fly out” ; and some could always be caught at any time in the cottage.

Shelter of the kind which, as has been noted, anopheles prefer is, in Europe nowadays, mostly found in stables. But this is not always so. PEJU and CORDIER (1919) while noting that *A. maculipennis* seems almost domesticated, seeking out dark shelters in living-houses in which to dwell by day, yet report that the percentage of this anopheles in the total mosquito catch was the same in occupied dwelling-houses and in barracks deserted for six months—namely, 75 per cent—so that their conclusion that the insects which harboured in the latter were not there by food attraction seems incontestable. It is worth mentioning that, in rainy weather, the percentage of *A. maculipennis* in their house catches was only 10 or 12.

One potent mosquito-preventing habit of the primitive house-dweller requires special mention—that of the chimneyless hearth within the house. Thus MÜHLENS and SFARČIĆ (1925) noted that anopheles liked dark, dirty, damp dwellings, unless there was an open smoking fire. HAIGH (1925) wrote of Albania :

“ On June 28th, in examining the villages of Aliku and Chausi (he mentions finding a spleen rate of 85 in twenty-six Aliku schoolboys), standing on a raised sandstone knoll overlooking the Vivari plain and forest in Southern Albania, I found that houses, cattle and goatsheds were swarming with mosquitoes. A goatshed made of basket work, and therefore with little protection from the wind, contained hundreds on the walls, roof, on cobwebs, etc. A cow and horse shed, the lower storey of a good house, built of stone and beams, with no light except from the door, contained similar numbers. The house above was constructed with two verandahs and doors which gave a through draught across the living and cooking room. In this room, which had an open rafter roof, blackened and shiny from the deposit of wood tar from the open fire on the cooking range, no mosquitoes were to be found. The inner sleeping-room, with ceiling and plaster, lighted by three windows, had numerous mosquitoes on walls, roof, bedding rolls, ornaments, etc., just like flies, and, if disturbed, these formed a cloud in the same way. The mosquitoes consisted of *maculipennis* and *superpictus*, more of the former, the bulk females, and generally gorged with blood . . . In houses, I have rarely found a mosquito resting on a smoked roof beam, but generally in the sleeping compartment, whether it possessed a roof or not.”

SYMES (1926) wrote of Kenya : “ As one would expect, fires constitute a fairly efficient though not absolute protection against mosquitoes ”, a conclusion based on “ a considerable number of hut collections ”. He adds :

“ In native villages it is in the huts set apart for the unmarried members of the community that the majority of anopheles is found. In these huts, no cooking goes on and no fires are lighted.”

Similarly, GARNHAM (1929), writing of Kenya ; states :

“ In selecting huts for adult (mosquito) counts it soon became apparent that those with fires within them were unsuitable, as they contained few or no anopheles. A sudden diminution of anopheline density was shown to be due on numerous occasions to the inhabitants making a fire and cooking inside their huts.”

The findings of HAIGH, SYKES and GARNHAM lead naturally to remarks by L. L. WILLIAMS, Jr., made in discussing the paper read by KLIGLER (1925):

“ In considering the *quadrimaculatus* rate (in North America) and its bearings on malaria, I would be most interested in the ‘bedroom rate’ rather than on the regional rate . . . I have observed a farming community of thirty houses in Isle of Wight County, all close to prolific *quadrimaculatus* breeding areas and with one or more cases of malaria in every home except one. This is the only screened house, and a well-screened house. In this group, the bedroom rate is quite high, it being quite usual to take twenty to sixty *quadrimaculatus* from a bedroom.”¹

The same factors seem to underlie findings by FRY (1922):

“ The day-time resting-place of anophelines in Bengal is in the cowshed, and the low mosquito infection rate which we found in Bengal may be explained by the fact that most of the mosquitoes which were dissected by us were not caught in the sleeping-rooms, where it was always difficult to find specimens. Cowsheds are packed with animals at night, and the number of anophelines found in them increases in direct proportion to warmth and darkness. The sleeping apartments of houses in Bengal are generally very clean and well kept. Though the cowhouses in the same compound may swarm with anophelines, it is exceptional to find a single specimen in a cookhouse or sleeping apartment.”

The importance of the structure of the dwelling as a place attractive or distasteful to anopheles is emphasised by ALCOCK (1925). After noting the importance of drainage, he adds:

“ But the equal importance of dry, light, airy houses seems to have been realised only by C. W. Daniels, Colonel S.P. James and a few others. And yet there are facts of common observation that suggests the influence of the house.”

After the lines quoted under “malarious houses” and a reference to James’s observations in Kent, he continues:

“ There are places, not a few in the residential area, round London where anopheles larvæ are to be found, and adult anopheles in any cowshed or stable, though search for an anopheles in the excellent modern residence close by would be in vain.”

In the same sense, MACARTHUR (1929) writes of Hung Jao, five miles west of Shanghai:

“ The selective habit of *A. hyrcanus* was much in evidence here. The men of the Coldstream Guards were accommodated in tents, and the officers messed in a house nearby. For a period of eight weeks the medical officer, Captain O. R.

¹ The interesting sequel is noted under “screening”.

ORAM, M.C., kept records of the number of anopheles in the house and tents respectively. During this time, only two single specimens were seen in the former, whereas on no occasion was any tent found free from them, and, if not disturbed by the occupants, forty or fifty anopheles per tent was a common morning sight." About one hundred of the men shortly developed malaria.

What is now a matter of observation was inferred by LESLIE in 1909 :

" Much, I believe, could be effected by improving the design of living-rooms and dormitories. It seems obvious that a well-ventilated, white-washed room will afford less shelter during the day to mosquitoes than a dark, dingy room."

It seems not inadmissible to suggest that the factors now seen to be active were those which, at least partly, determined the incidence of malaria in Europe in the past.

ADDY (1898) describes ancient English cottages. The length of the " house-part " was, as usual, the rod, pole or perch—that of the single plough team with the four oxen standing side by side. Off it were other chambers. Windows were tiny and the fireplace without a chimney. He writes (page 52) :

" The house part of these cottages [fig. 1] corresponds to the *megaron* of a primitive Greek house, the *megaron* being the kitchen and men's room of the family. It also corresponds to the *atrium*, or ' house place ', of the Romans, that

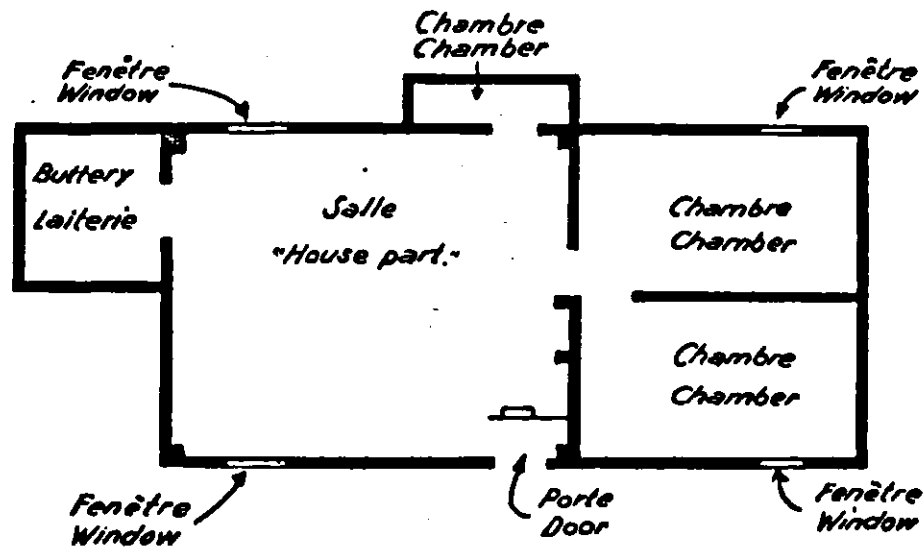


FIGURE 1.

Plan of Cottage at Westward — North Meols — England.

word being derived by some authorities from *aler* (black), on account of the blackened roof. In Chaucer's time the ' house part ' with its open hearth must have been black enough, as in the tale told by the " Nonne prest " :

" Full sooty was hir bowr and eke hir halle. "

For dwellings of those of higher social position in the olden days, Addy instanced those still existing at Saterlander, in Oldenburg, said to be of the sixteenth century

or a little earlier, and having the dwelling-place, cattle-stalls and store-rooms under the same unbroken roof, and most meagre lighting, and adds :

“ The whole domestic life of the Saterlander is spent on the spacious ‘ floor ’ (the central part of the house round which stand the farm animals in their stalls). In the background, about 6½ feet from the black wall, burns the open fire, the centre of domestic intercourse . . . The older dwellings have no chimneys. The smoke of the turf fire spreads through the whole building. This has the advantage that it scares away vermin.”

Yet higher in the social scale are the ruins of an ancient manor house at Padley Hale, near Hathersage, Derbyshire, England, and of this Addy writes :

“ The house at Padley was not expressly built to keep out sunshine, but it would have served well for that purpose.”

Finally, for the house of the noble, Addy writes of Peak Castle, mentioned in “ Domesday Book ” :

“ In such a place life would hardly be bearable in the winter without a fire, but there is no trace of either chimney or flue in any part of the building . . . Unless such a flue existed, we are driven to the conclusion that a fire was burnt in an open brazier, thereby filling the room with smoke.”

His general comment is :

“ It may be taken almost as an axiom that the smaller the windows the older the house.”

There seems clearly at work in all these ancient buildings an antagonism between the pro-malarial effect of darkness and the anti-malarial effect of smoke. With the evolution of the chimney, the anti-malarial factor disappeared ; but in the existing houses, at least, the windows presumably were not enlarged. It can hardly be doubted that, in malarious parts, this particular advance in civilisation meant an increase in malaria.

The remarks above have all applied to the structure of the house relative to adult anopheles, infected or not. As a breeding-place of anopheline larvæ, water-holding recesses and receptacles outside the roof, walls or plinth of the house, and in wells, cisterns and domestic utensils, as intanced by *A. stephensi* in Bombay, are so well recognised as to need no detailed study here.

Regarding the interior of the house, M. D. MACKENZIE (1923) wrote of South-East Russia :

“ At the time of the famine in the Volga Valley, thousands of refugees travelled 1,500 or 2,000 miles to Turkestan, where wheat was obtainable (November 1921 to March 1922). On the return of these peasants after the

harvest of 1922, malaria broke out in pandemic form throughout South-East Russia. The epidemic spread steadily throughout the winter, with the thermometer varying from 20° C. to 30° C. below zero from November to March. The spread of the disease during the extreme cold appeared to be due to the fact that the drinking-water-butt, combined with the almost tropical heat of the log-houses of the peasants, offered an ideal breeding-place for the anopheles remaining in the huts from the summer. During the intense cold of the winter, both larvæ (in the water-butts) and adult anopheles (in dark corners) could readily be found in a large proportion of the peasants' houses."

No dissections of anopheles for malarial infection were made.

IOFF (1926) writes in comment :

" This observation can relate to but a single case, as no one of many Russian investigators for the south-east has ever seen larvæ of anopheles in the water-butts within the houses. The females of anopheles domesticating in our dwellings have been found exceedingly seldom, and can by no means account for the numerous cases of malaria observed under our conditions *en masse* in winter and early spring months."

CHRISTIE (1924) caught mosquitoes in Russian houses during the winter, identified by Alcock as *A. maculipennis*, and reports that several cases of undoubted first infections of malaria have been noted during the winter months. Leaving aside the question of breeding in butts within houses during winter, it must be noted as strange that the same mosquito should hibernate in dwellings in, say, Holland, but not in Russia. The question of latency in first infections is dealt with below.

I may be mistaken in concluding that the recommendation of HECKENROTH (1923) implies his belief that, in Dakar, anopheles breed in cisterns within houses. He notes that an insufficient water supply leads to storage both outside and within houses, and, in a paper entitled "*Mesures capables d'enrayer le paludisme à Dakar*", urges the need of powers to inspect cisterns *inside* houses.

4. THE HABITS OF ANOPHELES IN RELATION TO MALARIAL INFECTION.

Of the "malarious house", JAMES writes (1920 (a) page 68) :

" The explanation seems to be that a mosquito (*maculipennis*) which has lived long enough to become infected has also acquired the habit of remaining for weeks and months in that house, *or of returning to it after every flight*".

And, again (1920(b)), regarding the Queenborough results :

“ The findings could only be explained on the assumption that the particular mosquito which had bitten the malaria-carrier remained in that house day after day and week after week, or that, if it made a flight outside, it succeeded in returning to the same house, which it instinctively knew to be the resting and feeding place which it had originally selected.”

SCHÜFFNER, SWELLENGREBEL, SWELLENGREBEL DE GRAAF and Achmed MOCHTAR (1919) offer evidence on like lines :

“ We do not know whether [*Anopheles*] *ludlowi* leaves the house it has once entered before the maturity of its eggs does compel it to do so, and whether, on return from its breeding-place, it does visit the same house or another one. We have only been able to make one single observation in Mandailing, which points to the fact that its sojourn in the same house may last longer than one night or one day. At Panjaboegan, we searched the house of a European who had just contracted malaria and who had developed into a gamete carrier of the third degree (more crescents than 1 to 19 leucocytes). Ten specimens of *ludlowi* were caught. Seven were found to be infected with coarsely-pigmented cysts, of which six had cysts of the size proportional to three or four days and in one the cysts were older.”

The index of infection was 3 per cent round Mandailing, and 8 per cent further afield, as against 70 per cent in this house. The mosquitoes had stayed in the house or had returned to it.

In like manner the finding of infected or actually infective mosquitoes in the houses of those from whom they must have obtained infection is noted by HEYDON (1923), who caught 101 *Anopheles punctulatus*, mostly at night when attempting to bite, sixty-three coming from the White Hospital, Namanula, Rabaul, and thirty-eight from his own bungalow. None showed infection ; while, of 136 caught in native quarters or huts, mostly when resting by day, eight showed sporozoits and eight oocysts. Again, WALCH and WALCH-SORGDRAGER (1921) found mosquitoes with oocysts as follows :

	<i>A. ludlowi</i>	<i>A. sinensis</i>	<i>A. kochi</i>	<i>A. aconitus</i>
In dwellings :	17.2% of 58	1.5% of 7.038	12.5% of 72	2.5% of 40
In buffalo-stalls:	No mosquitoes found	0.9% of 225	0% of 7	0% of 3

Further, JAMES (1929 (a)) writes of a farm in Kenya :

“ The farmhouse was a thatched ‘ banda ’ divided into rooms by wattle and daub walls not reaching to the roof. It had an earth floor and no ceiling. We found that the farmer was up and about, but that he was only just recovering from an attack of malaria. His son was in bed with a similar attack. His daughter,

the only other member of the family at home during the visit, was about the house, but we found malarial parasites in her blood. Four houseboys, who occupied a hut a few yards from the door of the farmhouse, had enlarged spleens and parasites in their blood, and this was also the finding in twenty-four out of twenty-five native labourers on the farm. Then we searched for anopheles mosquitoes in the house and huts . . . and dissected thirty-eight of these. We found that the salivary glands of five (13.2 per cent) were heavily charged with sporozoits."

Observations associating malaria in the inhabitants of a dwelling with malarial infection of the mosquitoes caught in the dwelling itself are, then, forthcoming from widely separated areas. It remains to offer evidence regarding the alternatives laid down by James. Have anopheles, at least in certain circumstances, either a hospice-return instinct—one which brings them back to the place where they have already enjoyed food and shelter—or a stay-at-hospice habit ?

5. A HOSPICE-RETURN INSTINCT.

Accounts of three experiments on the question of a hospice-return instinct in anopheles have been collected from the literature. The usual procedure has been to catch adult anopheles in habitations in one place, stain them by spraying them with an aniline dye solution, release them at a distance from the place of capture, make fresh catches of mosquitoes in various places including the original site of capture, and determine whether any among the new captures are stained. A slight amount of staining may be overlooked by mere inspection, but may be made evident as a flash of colour when a mosquito is dropped into alcohol, chloroform and glycerine.

LE PRINCE and GRIFFITHS (1917) captured in houses and barns in South Carolina, U.S.A., 272 *A. quadrimaculatus* and three *A. punctipennis* and stained them with eosin. After release, three only were recaptured, all of which in a negro shack from which a large percentage of the original captures had come, the distance in a straight line from the place of release being 3,090 feet and including a river 800 feet wide. They enquire whether this implies a homing instinct and add : "It would be easy enough to test by using different stains for the batches caught in different houses". Such a test never seems to have been carried out.

GEIGER, PURDY and TARBETT (1919), in Arkansas, U.S.A., caught and stained about 4,000 *A. quadrimaculatus* and released them at the point shown in Figure 2 ☒. The subsequent catching stations are shown thus □. Ten stained mosquitoes were recaptured at the points shown thus ● which were within the township of Lonoke. Of these mosquitoes, four-fifths had been caught originally at the stations indicated thus ◆ and one-fifth at the two marked thus ☐. At the time of re-catch, such air currents as existed were from the south-west. Perhaps observations by LE PRINCE and ORENSTEIN (1916) in Panama provide another explanation for these results than a

back-to-the-hospice instinct. These writers describe strong flights of anopheles in a direct route practically at right angles to a strong breeze from the breeding-grounds to a human settlement—to food, that is. As they put it: "The numerous observations showed that the anopheles knew where they desired to go". In the experiments of GEIGER, PURDY and TARBETT, it may be that it was the aggregation of human beings in the township which attracted them; they sensed plentiful food and made for it.

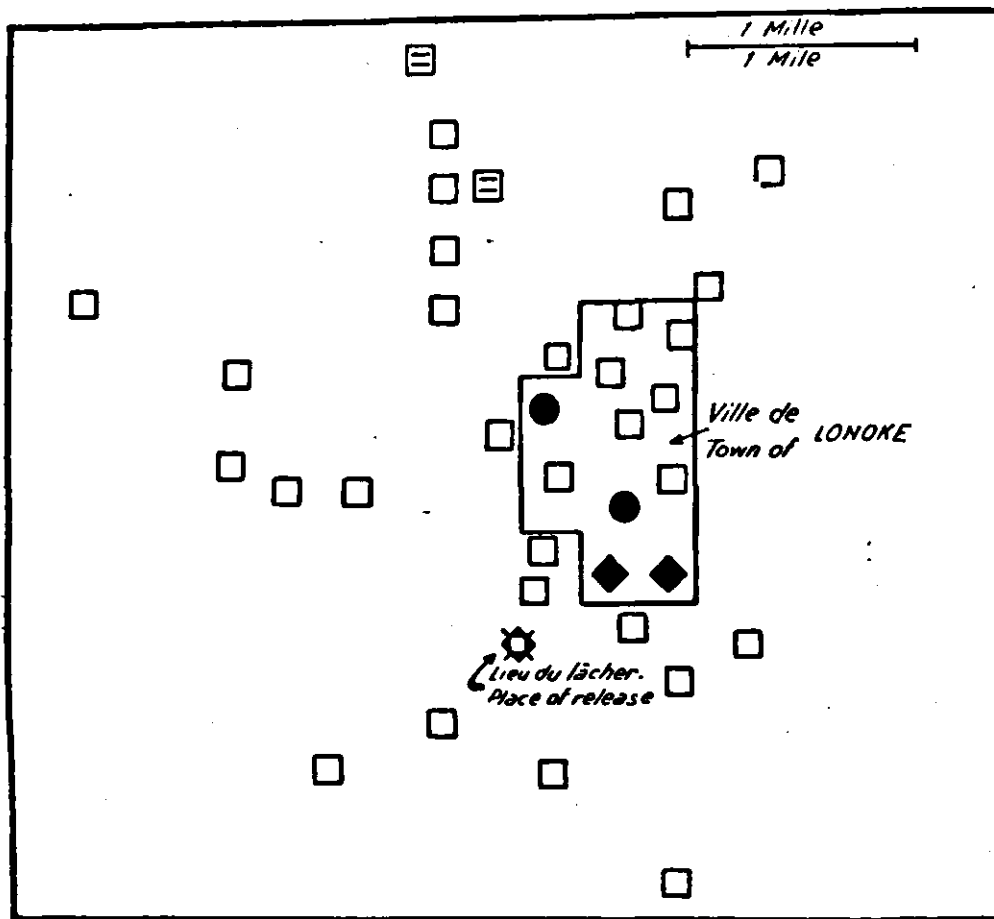


FIGURE 2.

GARNHAM (1929) collected 688 adult anopheles, mostly *A. funestus*, from native huts just outside a township in Kenya Colony and sprayed them with methylene blue and released them in four of a group of fifteen huts in another part of the town. "No coloured mosquitoes were obtained from anywhere outside the treated boma"; presumably, the group of fifteen huts is meant. There were recovered eleven between the second and fourth days from eight of the untreated huts; but not from the other three, which lay to windward of the places of release. These last were searched for the first time on the fifth day and no stained mosquitoes were found.

It cannot then be said that experiments so far carried out lead to the clear conclusion that anopheles have an instinct to return to their "hospice" after leaving it to oviposit. They appear, however, to have a tropism towards any ample food reservoir,

such as a large collection of human beings, and this may explain instances of apparent "back-to-the-hospice instinct". It appears to follow that, if a convenient breeding-place lies close to a convenient "hospice", a tropism towards food will bring anopheles back to this "hospice" after oviposition, and a "malarious house" may thus be established.

6. A STAY-AT-HOSPICE HABIT.

Such a habit is clearly not invariable among anopheles. BLACKLOCK and CARTER (1920) write :

"That *A. plumbeus* has not been recorded more frequently in houses is, in our opinion, due chiefly to the fact, noted by CHRISTOPHERS (1916), that the females retire to the shelter of their breeding-places (rot-holes in trees) shortly after their feeding. Unlike *A. maculipennis*, they will remain but a short time in the house, and the chances of seeing them except in the mornings and evenings will be small."

While this quotation implies the belief that these anopheles feed and so infect or become infected in houses, it shows that a failure to surprise anopheles within the house is no evidence that feeding does not habitually occur within the house. The same is emphasised by J. G. THOMSON (1929) for Southern Africa :

"At night, in badly lit houses, anopheles can be detected with difficulty . . . They are silent during flight. The inhabitants of unscreened blackwater fever houses, as often as not, will state that they seldom see mosquitoes and are not bitten by them—this at the height of the malaria season, when the houses are nightly infested with anophelines, as the following incident demonstrates. Larvæ of *Anopheles costalis* were found in abundance in a spruit about 100 yards away. A hunt in the house for adult anophelines proved of little use ; none were found. The occupants declared they seldom saw mosquitoes."

Before sundown a window was closed with mosquito netting. Immediately the sun set, the netting became covered with mosquitoes trying to get *out of* the house.

"On many occasions by adopting this procedure thirty, forty, fifty or more female anophelines (*A. costalis*) could be captured on the netting in a short time, and these were only a few of those actually present."

In the Philippines, MANALANG (1928) reports a like experience with *A. minimus* :

"The adult mosquitoes are typically wild in that they are but seldom found in the ordinary nipa house at night, much less in the day-time. The only occasions on which they have been caught during the day-time were when they were imprisoned inside wire screens. During the period of heavy catches, they have shown preferential harbourage in two houses and incidentally where most of the new malaria cases were registered." ("Significantly" seems a better adverb.)

ESSED (1925) deals with *A. maculatus* in Tandjong, Sumatra. On analogy with Malaya, he concludes that this mosquito is the essential local host, because splenic and parasite indices are highest near its breeding-places, because it is the prevalent mosquito with the most extensive breeding-grounds, because it attacks man at night, and because it has been found locally infected. Further, from the nature of the catches in and out of doors, he concludes that *A. maculatus* feeds exclusively at night, and then immediately leaves the house.

FRICKS (1920) and LE PRINCE (1926) deal with a somewhat similar condition in America. The latter writes of *A. quadrimaculatus*, the chief conveyer of malaria in the United States :

“ When it bites us in our homes, in most instances it rests on the walls of the room where it took its blood meal and remains there quietly all day. Occasionally, some of them go into an adjoining room.”

He adds that, after feeding, this mosquito is sluggish and readily killed, and that children can easily be trained to kill every anopheles in a room. The former adds : “ When in a condition to fly, they are most apt to leave the house just before dusk or soon after dawn”. There is with this American anopheles a period after feeding during which it remains in the house ; but, at least in general, this interval is not long enough for it to become infective if the feed was infected.

The urge to leave a house, where the female anopheles has fed, is impelled by the necessity for oviposition, to which the blood feed is the biological preliminary. In true hibernation, there is no oviposition and, therefore, no need to leave such a house ; but neither does the insect feed, so that there is no possibility of an infective anopheles transmitting malaria. This condition SWELLENGREBEL (1929) calls gonotropic association. But, as he has shown, there is in Holland for *A. maculipennis* an intermediate condition in which, while oviposition is in abeyance, feeding is not (he calls it gonotropic dissociation) ; while, at the same time, there is an autumn settling down of anopheles, the anopheline population ceasing to move from one “ hospice ” to another. Thus, when all the anopheles in any shelter were captured during the summer, the numbers were made up again within one to nine days. When the operation was repeated in September (the production of eggs ceases almost entirely from the beginning of the month in Holland), this was the case to a very slight degree, and was due to the hatching of some late larvæ which still survived. When capture was repeated in October, the room remained empty, although neighbouring shelters were still full of anopheles. During the summer, oocysts were found in the initial stage only ; this Swellengrebel attributes to the fact that, after a feed, anopheles leave the house. At that season, their proportion is one per house and 200 per stable, so that, when infected insects leave a house, they become so swamped by numbers as to escape detection. It is, at all events, clear that there is no evidence that *A. maculipennis* in Holland has in summer any tendency to return to the hospice. With the autumn settlement, oocysts gradually reach maturity during September to December, in spite of the less

favourable temperature (Figure 3, after SWELLENGREBEL, 1925), while the need for food in these anopheles with gonotropic dissociation ensures the entrance of sporozoites into man. It requires a large dose of these sporozoites to produce an immediate outbreak of malaria; but that they are viable was shown by JAMES (1927, 1929 (b)) and confirmed by SWELLENGREBEL, the malarial attack coming on six to nine months

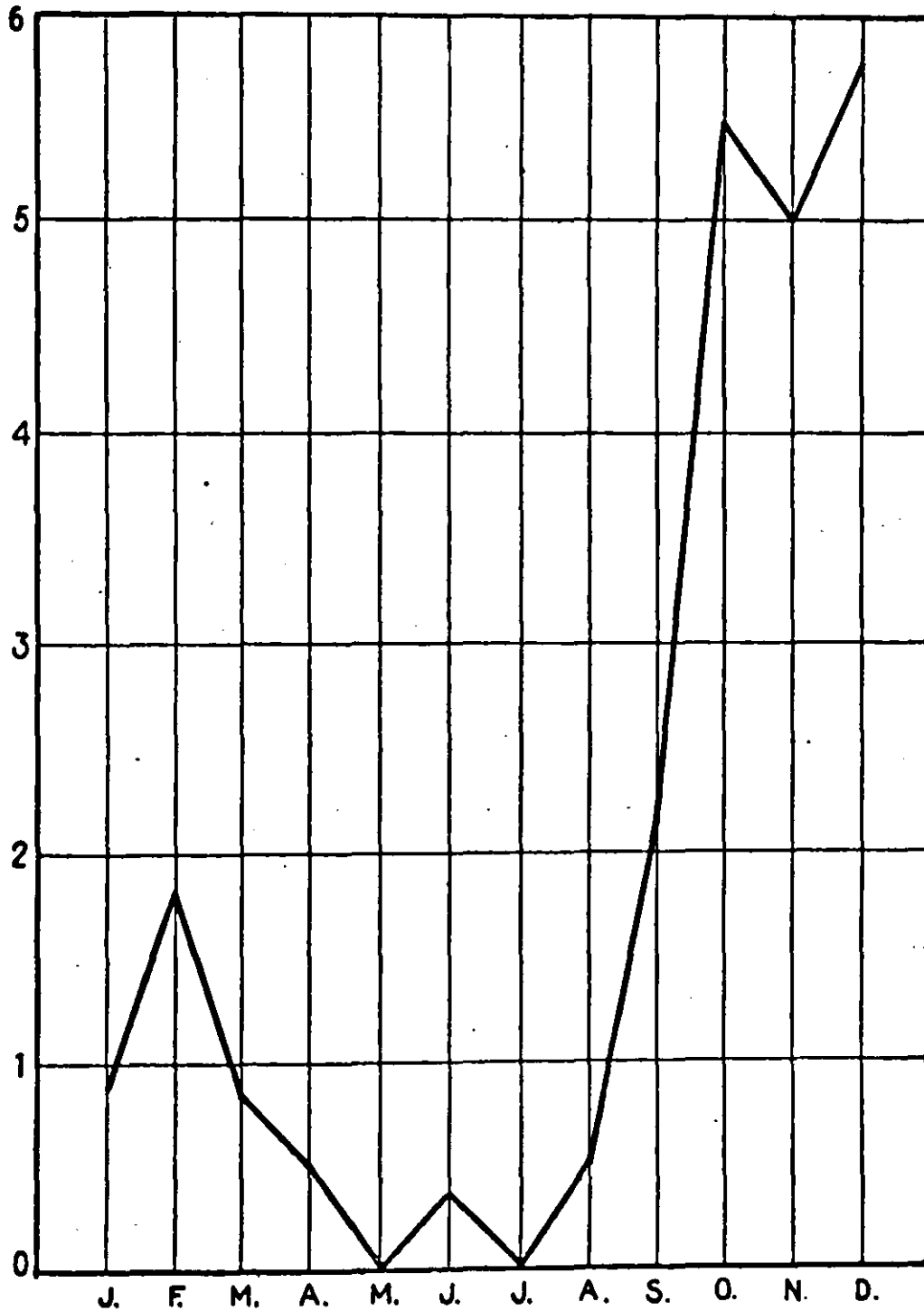


FIGURE. 3.
Average monthly percentage of infection of anopheles caught
in malarious houses in the Netherlands.

later ; a circumstance which explains how the vernal epidemic appears in Holland before the new anopheline brood is reared, and that, nevertheless, the infection might be acquired in the house. Moreover, in Holland, there are areas where only gonotrophic dissociation is found ; these are areas with endemic malarious centres, the presence or absence of this infection seeming to depend on anopheline density. There are areas where only gonotrophic association is present ; these are free from malaria, even though the number of anopheles is high. There are areas with a mixed population in which, in early autumn, anopheles with gonotrophic association settle down in lofts, threshing floors and other uninhabited places, whereas those with gonotrophic dissociation settle down in inhabited dwellings. These biological types, it may be added, Swellengrebel associates, at least on the average, with certain anatomical differences.

The winter behaviour of *A. punctipennis*, *A. quadrimaculatus* and *A. crucians* in North Carolina, U.S.A., is reported on by BOYD and WEATHERSBEE (1929). In very cold weather these anopheles might show hibernation, nearly always in unoccupied places with no feeding and no oviposition ; the condition was designated as hibernation because intense smoke might leave them undisturbed. In less cold weather there was evidently gonotrophic dissociation, for the number of anopheles in occupied places increased and recently fed individuals were in evidence ; the first two species showing, as they do in summer, a particular tendency to linger where they feed. The gonotrophic dissociation held up to January, as judged by the way in which the percentage of gravid females lessened after that date. SWELLENGREBEL points out too that, as regards hot climates, nothing is known as to whether gonotrophic dissociation, the requisite for a "stay-at-hospice" habit, is associated with aestivation or with any other special biological state.

CHAGAS (1925) states, however, that observations in Brazil, particularly by GODOY, show that certain individual anopheles remain in houses continuously for as long as twenty days, even after they have been fertilised and have fed on blood. These mosquitoes, it is pointed out, have completely developed ovaries associated with inhibition of oviposition, and are too heavy for ready flight. Among their normal fellows oviposition is followed rapidly by death ; but, when this function is suspended, life is prolonged to an extent which allows of the formation of sporozoites, so that there is brought into being an infective individual which is without any instinct urging it to leave the house. Chagas characterises this as a fact of capital biological importance, and sufficient in itself to establish the doctrine of the house infection of malaria. Whether or not it is related to the condition next considered does not seem clear, though Chagas states that, while he had never detected infection in mosquitoes caught outside houses, it is always easy in houses inhabited by gametocyte carriers to find anopheles with oocysts and sporozoites. With this he correlates the observation that children, even those in cradles who never leave the house, have a higher spleen index than adults.

There is some evidence that a stay-at-hospice habit may sometimes be due to malarial illness in the mosquito. SCHOO (1905, page 225) quotes PLEHN¹ as believing that, from the pathological changes in the stomach induced by the malarial oocysts, the mosquito falls sick and is unable to leave the house. JAMES (1926) urges that the habits of the *A. maculipennis*, which becomes infective, are quite different from those of normal insects :

“ Instead of making flights in the open, they pass almost the whole of their time in the house in which they first settled. At their first feed in this house they become overloaded with blood and almost too heavy and sluggish to make a satisfactory flight. They find a sheltered dark corner or hole within a few feet of the beds of the occupants of the house, and, night after night, make a short passage between their hiding-place and the sleeper in the bed in order to gorge themselves with blood. Their eggs ripen only very slowly, and, even when they are ripe, the insect is very loth to make the flight necessary to lay them. Often she drops them carelessly after a short flight, and returns to the hole she has made her home. Life in the household with the nightly feed of blood has become a habit to which everything else is subordinated.”

All this reads like the description of a sick insect, analogous to the illness reported by BAHR (1912) in filariated *Stegomyia pseudoscutellaris*.

There is, then, considerable evidence that certain healthy anopheles at certain times have a stay-at-hospice habit, and that some anopheles show it because they are too sick to fly away. When there is no such habit, the almost uniform conclusion on the facts, formed by those who report its absence, has nevertheless been that the anopheles concerned feed in the house but leave it before ordinary methods of capture have secured them. If their feed gave them malaria, it was in the house that they acquired it, and, if they feed again on man after they have become infective, it will be in some house that that feed will take place.

7. THE BLOOD MEALS OF ANOPHELES.

The species of animals which furnished the blood meal of anopheles has been tested by workers. Results which have been collected for the present analysis are as follows :

¹ The citation of the article has not permitted of its being traced.

Country :	DAVIS and SHANNON (1928)	KING and BULL (1923)	KLIGLER and LIEBMAN (1928)	BOYD and ARRIS (1929)	
	United States of America	United States of America	Palestine	Jamaica	
Species of mosquito :	<i>A. pseudo-punctipennis</i>	<i>A. quadri-maculatus</i>	<i>A. elutus</i> <i>A. superpictus</i> <i>A. sergenti</i>	<i>A. vesti-tipennis</i>	<i>A. albi-manus</i>
Site of collection :		In houses	In stables	In houses	
Numbers collected	650	1,455	145	85	26 48
Percentage containing blood from :					
Man	50.0	38.4	40.7	—	42.3 50.0
Equines	8.9	20.1	5.5	All	15.2 8.3
Cow	5.5	18.6	16.0	were	15.2 20.8
Dog	21.8	10.0	—	from	15.2 6.3
Pig	2.5	7.7	—	ani-	3.8 8.3
Chicken	3.2	2.6	—	mals	— 2.1
Cat	1.8	2.6	—		— 2.1
Sheep and goat	6.2	—	—		7.6 2.1

WALCH and SADJITO (1928), in the Dutch East Indies, reported these actual figures from catches in houses :

Mosquito	Number containing human blood	Number containing buffalo blood
<i>A. ludlowi</i>	10	2
<i>A. rossii</i>	5	38
<i>A. vagus</i>	0	6
<i>A. aconita</i>	3	36
<i>A. tessalata</i>	0	3
<i>A. punctulatus</i>	7	0

From buffalo stables near houses, *A. ludlowi* contained human blood three times and buffalo blood twenty-three times, the corresponding figures for *A. rossii* being 0 and 2.

Except for *A. rossii* and *A. aconita* the blood meals of anopheles caught in houses had predominantly been taken from man, and those caught in animal houses predominantly from animals, or solely so in the Palestine figures. The experiments do not suggest that, in the ordinary way, anopheles which have entered houses and fed on man continue to do so afterwards.

8. INFLUENCE OF ANIMALS AND ANIMAL HOUSES.

ROUBAUD (1919) enunciated the protection from malaria which he held domestic animals to confer on man in these words :

“ L'homme est protégé par les animaux. Cette protection est d'autant plus complète que la population anophélienne trouve plus aisément à satisfaire ses besoins de sang sur le bétail. C'est là ce qui règle la présence ou non des anophèles dans les maisons.”

Whether anopheles fed on man or not was here regarded merely as a question of the amount of food available. Accordingly, the use was advised of animal houses surrounding and thus protecting human habitations. Later ROUBAUD and LEGER (1921) modified this unqualified statement. Any kind of animal house would not protect man ; it must be of a certain type—low, dark and without draughts, and animals must be stalled in it at night. In other words, the main stress is removed from the animal as food to the kind of house in which it is stalled. The requirements of the stable attractive for anopheles, indeed, complies in all respects with what has been seen to be those of the similarly attractive human dwelling. No definite attempt seems ever to have been made to determine whether, if men and cattle are housed in new buildings of exactly similar construction, there is in *A. maculipennis* a preference for cattle.

SERGEANT and SERGEANT (1921) believe that they found in Vendée, in 1903, that the pig was more attractive than man, but the relative housing conditions were not stated ; at least, they reported that, though the inhabitants of Algeria surround their houses with animal houses to keep off robbers, they suffer from malaria. The same criticism seems to apply to the statement of SCHÜFFNER and HYLKEMA (1922) that a single buffalo can divert most *A. ludlowi* from the lodgings of one hundred persons. Sergeant *et al.* (1924) later report no protection for man by animal houses, *A. maculipennis* enjoying the hospitality of the W.C. as much as that of the adjacent animal houses.

Regarding Albania, HAIGH (1925) reports :

“ One woman with whom I conversed at Velivishti near Berat [25 per cent of Berat scholars were absentees in autumn as the result of malaria], who had three children suffering from malaria, informed me that mosquitoes had been present in the house ; but there were none there now, as the cow had been sold three weeks ago. No anopheles could be found in the empty cowshed, but the season was advanced (September 22nd) and breeding had almost ceased in the neighbouring river . . . The presence of animals seems to be a factor of great importance in attracting mosquitoes to the houses, and in some areas may be the *chief cause* of their presence.”

ALCOCK (1925) wrote thus :

“ There is no general concord of evidence that the insect (*A. maculipennis*) prefers the blood of cattle to that of horses or pigs or rabbits or man, though there would perhaps be more general agreement that it prefers a cattle-shed or a stable even when empty to a well-constructed house, even when it is habited.”

WESENBERG-LUND (1920-21) assumes that, formerly, in Denmark, *A. maculipennis* bit in the open by day. He attributes the disappearance of malaria in Denmark during the last hundred years to the fact that animals are now housed and man's working time in the fields is much lessened by mechanisation ; and *A. maculipennis* has followed the animals into their stables. It should, however, equally have followed man to his house, if that were the complete explanation. There is no mention made of what, on the evidence given above, is clearly of great importance—the general improvement in light and airiness of Northern European habitations during the last hundred years, a change in which Denmark has certainly participated. It is, perhaps, not going much too far to suggest that the type of cottage used in these latitudes by man a hundred years ago was not far different in these respects from the type of animal house now in use ; and it would seem, then, that the change in anopheline habitat in Denmark is more reasonably attributable to better housing of man than the housing at all of animals. That animals are more attractive to *A. maculipennis* than is man is, then, a position which was practically receded from by ROUBAUD when he insisted that, to be so, they must be stabled in a particular way. The practical question which results seems to be this : As a malaria preventive, is it not better to house man well than to house animals badly ?

It must, however, be noted that MISSIROLI and HACKETT (1930) conclude, as the result of their investigations in Italy, as follows :

“ We believe, therefore, that, in Southern Europe at least, it is not any combination of attractive physical circumstances, such as darkness, warmth, dampness and freedom from draughts, which impels *maculipennis* to enter dwellings ; but, instead, the presence of a certain kind of food-supply to which by instinct it is drawn.”

9. EFFECT OF CERTAIN PREVENTIVE MEASURES.

It is clear that, if the house is the place where infection is ordinarily obtained—the place, that is, where man is ordinarily bitten by infected anopheles—then certain measures which effectively prevent infective anopheles from biting man in the house will lessen or prevent malarial infection. Conversely, if malaria lessens or disappears after such measures have been applied, this fact will be good evidence that the house is a place, or the place, where infection is obtained. The effects of three such measures will now be considered : (a) effects of detection and destruction of adult anopheles in houses, (b) effects of screening houses, and (c) effects of house site.

(a) EFFECTS OF THE DETECTION AND DESTRUCTION OF ADULT ANOPHELES IN HOUSES.

ROSS (1911) reports that Sir William MacGregor employed a boy to kill mosquitoes by a net in his house in Lagos, West Africa, in 1901; but it does not seem clear whether this was an anti-malarial measure or merely designed to increase comfort.

STRACHAN (1904) writes :

“ In Lagos, we have tried the experiment of employing a ‘mosquito catcher’ in certain large institutions; but I am not able to say conscientiously that the results have been very valuable. The reduction of the number of mosquitoes of various kinds cannot have been greatly aided by this means, as a constant influx of new individuals replaces the few destroyed daily, though possibly the comfort of residents may be a trifle increased.”

The reasoning is convincing so far as it goes, but if malaria is contracted in the house and if infected anopheles remain, or having left it return to its shelter and then remain, in the house long enough to become infective, the daily destruction of fed anopheles will prevent the transmission of malaria; and, conversely, the fact that malaria had been controlled by this means would be evidence that malaria was contracted in the house.

In Cocoli, Panama Canal Zone, a temporary camp was installed in April 1908. It was surrounded by anophelene breeding-places too considerable to be got rid of with available funds, though oiling reduced the number of adult insects. A man was detailed to kill all mosquitoes found in tents. He worked daily up till 5 p.m. from April 10th to August 24th. In that time there were 17 cases of malaria, corresponding to a figure of just over one per cent of the force sick with malaria every week.

“ This was a lower sick rate than had occurred at other camps where anti-malarial work had been carried out for quite some time, but at Cocoli we were killing adult mosquitoes and the other places were not.” (LE PRINCE in ROSS, 1911, page 360.) Again, in June 1908, several hundred United States marines were stationed at Camp Diablo on the top of a hill, with a big marsh at its foot. Their malaria sick rate was 14 per cent per week. From the beginning of May 1909 to the end of November 1909, a string of railroad cars, which provided sleeping accommodation for labourers, was stationed between the swamp and the camp formerly occupied by the marines. Each morning the cars were examined and all mosquitoes found were killed in chloroform tubes, and during that period of thirty weeks only four cases of malaria occurred in the 40 labourers, although they were more freely exposed to the anopheles than the marines had been.” (LE PRINCE in ROSS, 1911, page 361.)

In referring to this, GORGAS (1915, page 199) wrote :

“ This method of killing infected mosquitoes was developed by Mr. Le Prince and his sanitary inspectors into one of our most effective antimalarial measures.”

On one occasion some 500 anopheles caught alive were sent to Darling for examination. DARLING (1910) wrote :

“ It is noteworthy and speaks well for the practice of these daily killings that but one infected anophelene was found.”

There are other references in the literature to this work in Panama which need not be detailed.

While, then, on the one hand *A. maculipennis* and *A. quadrimaculatus* are readily detected and killed in the house, it is, on the other hand, clear from the reports already noted by BLACKLOCK and CARTER, by THOMSON, and by MANALANG that this is not the case for *A. plumbeus*, *A. costalis* and *A. minimus*. But their work shows also that the failure of easy detection, in the house, of these species is no evidence that malarial infection is not transmitted by them in the house, for their presence there becomes unequivocally manifest when these mosquitoes are intercepted, practically trapped during flight into or out of the house. It is evident that the use of a mosquito trap may be an essential part of any scheme which is based on the detection and destruction of certain species of adult anopheles as an antimalarial measure. The earliest use of traps which I have been able to trace is recorded by KÜLZ (1909). He describes mosquito traps used by BLIM in Kotonou, Dahomey, West Africa. The latter noticed that mosquitoes were numerous in crab holes, used these as traps and burnt out the mosquitoes in them; and then set up mosquito traps in houses, apparently with considerable success. These methods refer to the destruction of non-hibernating mosquitoes. Regarding hibernating mosquitoes, BERTARELLI (1914) pointed out the importance of destroying these; and SCHAPIRO (see HERON, 1926) described their destruction in dwellings and stables by filling these with smoke, when the sluggish insects fly to a single spot of light deliberately produced and are killed by hand, or trapped on oiled glass. These two writers appear to have in mind the lessening of next summer's brood which such winter destruction will effect, each surviving female producing 7,500,000 descendants (EUGLING, 1921). WENYON (1921), however, wrote regarding Macedonia :

“ I call attention to the carriage of malaria by hibernating mosquitoes because of its importance in antimalarial work, for it emphasises again the advisability of destroying the hibernating female during the winter.”

He points out that for hibernating *A. maculipennis* the conditions are not such as were found by PEJU and CORDIER for this mosquito in its active state :

“ As regards the hibernation of anopheles a very striking feature was their almost complete absence from uninhabited villages, though exactly similar conditions existed, apart from the presence of a population both animal and human. Even in an inhabited village the mosquitoes were more numerous in the occupied houses and barns.”

(b) EFFECTS OF SCREENING HOUSES.

The efficacy of house-screening in preventing malaria was investigated as long ago as the summer and autumn of 1899 in two experiments carried out in the intensely malarious Roman Campagna, mainly with a view to the testing of the mosquito transmission of plasmodium recently discovered by Ronald Ross. CELLI (1900) reported on railway servants living in screened houses, the men on night duty being provided with bee-keepers' veils and leather gloves; he did not neglect, he added, the blood disinfection of relapses and the killing of anopheles which gained access to the houses. From the point of view of the present survey the experiment was not, then, one in which the prevention of biting by anopheles in the house was the only factor concerned in preventing malaria.¹ In screened houses in Cervara-Salone, four of twenty-four persons fell ill with malaria; they had been on night duty and were judged to have carelessly disobeyed instructions; the families remained entirely free of it. In this same area twenty-four of thirty-one persons living in unscreened houses fell ill with malaria.

In the simultaneous experiment initiated and devised by MANSON (1900) screening of the house, and, as an extra precaution, of the beds within it, was the only antimalarial measure used, and the question of possible relapse was eliminated, since none of those concerned had had malaria. Manson describes the experiment thus :

“ A wooden hut, constructed in England, was shipped to Italy and erected in the Roman Campagna at a spot ascertained by Dr. L. SAMBON, after careful enquiry, to be intensely malarial, where the permanent inhabitants all suffer from malarial cachexia, and where the field labourers who come from healthy parts of Italy to reap the harvest, after a short time all contract fever . . . The only protection against mosquito bite and fever employed by the experimenters who occupied this hut was mosquito-netting, wire screens on doors and windows, and, by way of extra precaution, mosquito-nets around their beds. Not a grain of quinine was taken. Dr. SAMBON and Dr. LOW, Signor TERZI and their two Italian servants entered on residence in the hut early in July. They go about the country quite freely—always of course with an eye on *Anopheles*—during the day, but are careful to be indoors from sunset to sunrise.”

That they entirely escaped malaria is a matter of history. As stated in the *British Medical Journal* for December 8th, 1900 :

“ Dr. Sambon and Dr. Low returned to England in robust health, having demonstrated in the most practical manner that, by adopting suitable precautions, it is possible to live through the malaria season in one of the worst haunts of that scourge without contracting the disease.”

¹ For the same reason, the striking effects of Italian “bonification” are not evidential here.

Their precaution consisted in the prevention of mosquito bites while in the house, and the success of these precautions is direct and emphatic evidence of the importance of the house as the essential site where infection is acquired from at least the European anopheles.

In more recent years further light has been thrown on the effects of screening. MAXCY and ZIEGLER, BOYD, and perhaps COOGLE investigated the effects of screens of a mesh small enough merely to keep out flies.

MAXCY and ZIEGLER (1923) write of South-East Missouri, U.S.A. :

“ In Table II is shown the attack rate in households with various degrees of screening, from no screening at all to a reasonably well-screened or ‘ fly-proof ’ house.”

“ Table II. — Malaria attack rate (based on histories) in houses well screened as compared with houses with poor or no screening.

Screening	Number of households	Number of persons exposed	Persons per household	Number of persons attacked	Percentage of attacks
Good	112	513	4.6	45	8.8
Fair or Poor . . .	147	714	4.9	111	15.6
None	144	698	4.8	127	18.2

“ Table III. — Malaria attack rate of houses of light construction as compared with houses of open frame or log construction, holding the screening factor constant.

Screening	Malaria attack rate per thousand persons exposed	
	In houses of light construction	In houses of open frame or log construction
Good	8.6	13.6
Fair or Poor	15.3	16.4
None	21.6	16.7 ”

The writers add that conclusions must take into account that “ in openly constructed houses one is more likely to find the family low in the economic scale, large families living in a single room, inadequately treated when sick, poorly clothed and poorly fed—all factors tending to cause increased malarial incidence ”.

The same mental reservation is desirable in weighing facts observed in Honduras and reported by DEEKS (1926).

“ In Dr. CLARK’s surveys of 2,607 of the native population living in unscreened quarters, 29.1 per cent were positive ; while of 135 non-immune foreigners living in screened quarters only 6.6 per cent were positive.”

These people were performing their ordinary work, and the screens were presumably mosquito-proof and not merely fly-proof, as in the last-quoted case.

BOYD (1926) reports from South East Missouri, U.S.A., on 583 occupied rural dwellings with coarse screening of 12 to 14 meshes to the inch intended merely to keep out flies. The question of malaria was based on histories.

Screening	Number of houses	Population	Total cases	Cases per house	Rates per 100 residents
Tight Houses :					
Good	174	846	43	5.1	0.24
Poor.....	146	812	95	11.7	0.65
None	43	246	47	19.1	0.92
Open Houses :					
Screened	88	408	52	12.7	0.59
No Screens.....	53	258	61	23.5	1.12

Boyd adds, "These data show that [the statement that] 'no screening is better than poor screening' is not true, but that anything which puts difficulties in the way of an anopheles is good".

COOGLE (1927) reports from Leflore County, Miss., U.S.A., that bi-monthly inspections of 104 screened and 104 unscreened houses showed an average of 2.2 *A. quadrimaculatus* per screened and one of 16.5 per unscreened house, while malaria cases in the two sets of houses were 24 and 84 respectively. In the paper in which he spoke of the "bedroom rate of anopheles", WILLIAMS (1925) adds of the single well-screened house already mentioned :

"The following year the owner of the screened home and two of his children came down with malaria. He stated that he had lost faith in us and our theory of malaria transmission. We searched his house immediately and found that his wife had removed the stoves from the bedrooms and had neglected to put the covers on the stove-pipe openings. We found 18 *A. quadrimaculatus* roosting in the first bedroom."

ALDERSHOFF and KORTEWEG (1927) reported on an area under observation in Holland with this result :

Year	Screened Rooms		Unscreened Rooms	
	Number sleeping	Number getting malaria	Number sleeping	Number getting malaria
1924.....	2-3	3	1-3	14
1925.....	3-5	13	2-5	18
1926.....	217	4	120	16

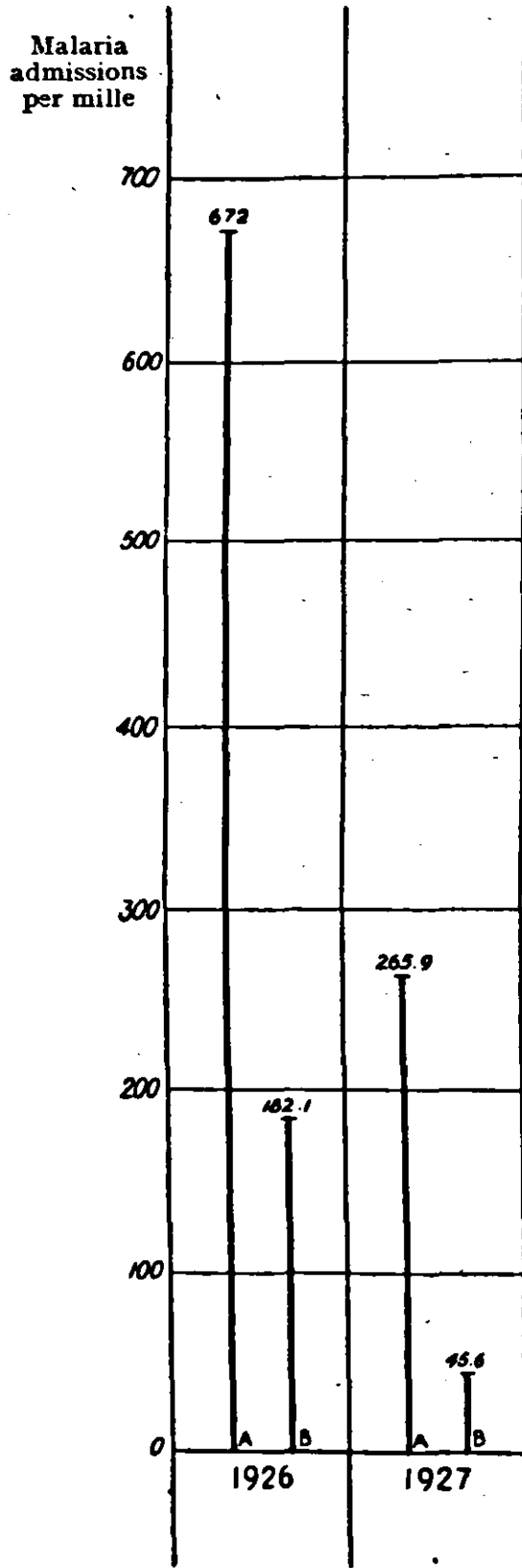


Figure 4.

A. — Unscreened Barracks.
B. — Screened Barracks.

Experiments in which two bodies of men lived in exactly similar conditions in the notorious Mian Mir (now called Lahore Cantonment), India, except that the barracks of one were "completely mosquito-proofed" in July 1926 and the adjoining barracks were not, were reported by RUTHERFORD (1928) in a preliminary note and HANAFIN (1928). Figure 4 shows that in the first complete calendar year after proofing the percentage of those who fell ill in protected barracks was about a sixth of those in unprotected ones.

There is no question in the last case and little reasonable question in most of the others that the daily work of the two groups of persons was the same; they differed mainly, and in the last experiment only, in that the one group was protected from mosquito bites in the house, while the other group was not. In Williams's case conditions were altered in the single particular that anopheles gained access to a house which formerly they could not enter.

All these observations afford direct evidence that the place where those concerned acquired malaria was the house or barrack where they slept, and where they lived generally when not working; and that they at least largely escaped malaria if anopheles were prevented from biting them in the house.

(c) EFFECTS OF THE HOUSE SITE.

As noted in the introductory remarks, the removal of houses from near anophelene breeding-places and from the dwellings of those who are hygienically careless is the stock in trade of the hygienist reporting on the best means of preventing malaria in the more valuable and hygienically careful members of a mixed community.

It is so much a commonplace that the effects are rarely reported or are only incidentally noted. The persistent French work in Algeria, and that of the Dutch in their East Indian possessions occur at once to the mind. With unbecoming prejudice I select the following examples. CHALAM (1923) made a two-years investigation under McCOMBIE of the anophelene distribution and of anophelene malarial infection on a sugar estate in Assam, India. The only anopheles found infected was *A. listoni*, and in one part of the locality 3.8 per cent were so. It bred in a swamp and in the entering streams, and the spleen rate was 82. The average collection of *A. listoni* in houses near the swamp and stream was 6.8, in those comparatively close 4.9, and in those three-eighths of a mile to one mile away 1.6.

CHRISTOPHERS (1912) investigated villages and in the Andamans, Bay of Bengal. *A. ludlowi* breeding in saline swamps on the sea-coast was implicated as vector. The spleen rate in these villages averaged 32. He advised their removal to healthier sites inland, particularly Port Mouat, which had a spleen rate of 58. COVELL (1926) reported: "As a result of Major Christopher's recommendations the villages of Port Mouat, Ogra Baraij and Bindraban were moved to healthier situations. The three villages are now healthy."

Malcolm WATSON (1921, page 50) reports on an estate in which clearing of the virgin forest was being undertaken. As it proceeded, much of the work of the coolies was one to two miles from their lines. Accordingly, four new sets of lines were built, three about a quarter of a mile from the forest, and the other about 100 yards. The result was disastrous. The coolies were overwhelmed with malaria and soon had to be removed. They were again re-housed, this time about half-a-mile from the edge of the jungle and the fever rate became "very small and of little consequence". In this case the coolies were doing the same work in the same place throughout the time under report. Only their houses were altered in site. The fact that alteration of the site of the houses, the rest of the daily life being unaltered, determined whether the inmates suffered disastrously from or were relatively free from malaria, shows how vital is the house in the transmission of malaria.

CONCLUSIONS.

The matter may be summed up thus :

The anopheles associated by experience in the transmission of malaria are in the main house-haunters and night-biters, circumstances which make it likely that the house is important in the transmission of malaria. This likelihood is increased by the consideration that throughout that part of the world where malaria can be transmitted there are "malarious houses", houses where inhabitant after inhabitant acquires malaria. These houses have certain characteristics, at least in Europe; they possess dark, dirty and often damp portions. In parts of Europe and in indigenous dwellings in the tropics, a chimneyless fire is efficient in driving away anopheles from places which would otherwise suit them, and it is suggested that this condition in the past must widely have influenced the incidence of malaria in Europe; with the invention of the chimney it needed the further institution of ample lighting before houses again became distasteful to anopheles. There is slight, though disputed, evidence that *A. maculipennis* may actually breed inside houses; it appears established that *A. stephensi* will do so in Bombay. It is the case that infected anopheles may be particularly associated with certain houses, and the question has been considered as to whether these mosquitoes have an instinct to return to a pleasant hospice after they have left it to oviposit. Such evidence as exists for an instinct of this kind is questionable; the facts are perhaps explicable as showing a tropism towards food, and, if so, they emphasise the importance of abolishing breeding-places near houses, so that no house shall become established as a malarious one by virtue of being near enough to a breeding-place to exercise a food taxis on an infected ovipositing anopheles looking for her next meal. Certain species of anopheles leave the house where they have fed immediately after feeding, others remain in it for some hours. There is, however, at least in Europe, Northern America and Brazil, a condition of gonotropic dissociation, when the need to oviposit ceases, while the need to feed does not. Mosquitoes in this condition remain in the house where they have fed, and they are capable of becoming malarious and of transmitting malaria. There is some evidence too that anopheles may become sick of malaria, an added reason for their failure to leave the house where they became infected. The effects of æstivation in this direction are unknown. The kind of blood meal which has been consumed by anopheles caught in houses shows that they are not tied to any particular feeding-place, and an anopheles caught in a house has often had her previous meal from some animal outside it; as to the converse, there appears to be little evidence, though that is the point which would here be important. There is no

satisfactory evidence that malaria-carrying anopheles prefer the blood of animals to that of man, or that airless animal houses near human habitations necessarily protect man from the bites of anopheles and so from malaria. It is suggested by inference that to house man well is likely to prove a better anti-malarial measure than to house animals badly. There appears a tendency to forget that in the early days of the construction of the Panama Canal, the destruction of replete anopheles in houses was held with good reason by those concerned, from Surgeon-General GORGAS downwards, to have proved a most effective antimalarial measure ; for hibernating mosquitoes this measure has been as emphatically advised ; the success attending the application of these measures stresses the connection between the house and malaria. The value of the screening of houses was established once and for all by the experiment designed by Sir Patrick MANSON in the Roman Campagna to test his mosquito-malaria theory in 1900. Its success showed that, if anopheles were prevented from entering houses, malaria could be avoided ; the work of others has since shown that even imperfect screening is of value in this direction. These experiments are all evidence that it is in the house that malarial infection is essentially obtained. The relationship of house sites be anopheles breeding-places, the manner in which malarial infection can be fostered or hindered by housing men near to or far from such breeding-places is again evidence in the same direction.

These various lines of investigation press with cumulative force the conclusion that the house is a factor of primary importance in the acquisition and spread of malaria.

REFERENCES

TO LITERATURE QUOTED IN "HOUSING AND MALARIA"

(A Critical Summary of Literature)

by Lt.-Col. CLAYTON-LANE, M.D., I.M.S.

-
- ADDY, Sydney, O.
1898. Evolution of the English House.
Swan, Sonnenschein & Co., London.
- ALCOCK, A.
1925. The Anopheles Mosquito in England.
Lancet II, 34, 4 July.
- ALDERSHOFF, H.
KORTEWEG, P. C.
1927. Malaria commissie voor Noord-Holland.
Jaarverslag der Wetenschappelijke Malaria-
Commissie voor Noord-Holland voor 1926.
- BAHR, P. H.
1912. Filariasis and Elephantiasis in Fiji.
Supplement No 1, *Jl. London School
Trop. Med.*
- BERTARELLI, E.
1914. Wenig erörterte Fragen aus dem Gebiete des
Malariaschutzes und der Lehre von der Malaria.
Centralb. f. Bakt. 1 Abt. Referate 60, 289.
- BLACKLOCK, B., and
CARTER, Henry F.
1920. Observations on *Anopheles (Cæloclia) plumbeus*
Stephens, with Special Reference to its Breeding-
places, occurrence in the Liverpool District, and
Possible Connection with the Spread of Malaria.
Ann. Trop. Med. Parasit. 13, 421.
- BOYD, Mark, F.
1926. The Influence of Obstacles unconsciously erected
against Anophelines (Housing and Screening) upon the
Incidence of Malaria.
Amer. Jl. Trop. Med. 6, 157.
- BOYD, Mark F., and ARIS, F. W.
1929. A Malaria Survey of the Island of Jamaica,
B.W.I.
Amer. Jl. Trop. Med. 9, 309.

- BOYD, Mark F., and
WEATHERSBEE, Albert, A.
1929. Studies on the Bionomics of North-American
Anophelines. V. — Winter Activities of Anopheline
imagines in Coastal North Carolina (36° N. Lat.)
Amer. Jl. Hyg., 9, 682.
- CARTER, Henry F.
1927. Report on Malaria and Anopheline Mosquitoes in
Ceylon.
Ceylon, Sessional Paper VII; March,
Colombo.
- CAZENEUVE, H. V.
1920. Le paludisme indigène de Lanester près de Lorient.
Bull. Soc. Path. Exot. 13, 461.
- CELLI, A.
1900. Die neue Prophylaxis der Malaria im Latium.
Cent. f. Bakt. Abt. I. 28, 696.
- CHAGAS, C.
1926. Quelques aspects de l'épidémiologie de la malaria.
Nouvelles indications prophylactiques.
League of Nations, C. H. Malaria 42,
March 16th.
- CHALAM, B. S.
1923. Some Notes on a Malaria Investigation on a Sugar
Estate in Kamrup, Assam.
Indian Med. Gaz. 58, 476.
- CHRISTIE, Ethel M.
1924. An Account of the Malaria Work done in Buzuluk
Ooyezd by the Society of Friends.
Jl. Trop. Med. Hyg. 27, 107.
- CHRISTOPHERS, S. R.
1912. Malaria in the Andamans.
Sci. Mem. Off. Med. San. Dept., Govt.
of India.
Sript. Govt. Printing, India ; Calcutta.
- GOOGLE, C. P.
1927. Preliminary Report of Screening Studies in Leflore
County, Miss.
Public Health Rep. 42, 1101.
- COVELL, G.
1927. Report of an Enquiry into Malarial Conditions
in the Andamans.
Govt. of India Press, Delhi.
- DARLING, S. I.
1910. Factors in the Transmission and Prevention of
Malaria in the Panama Canal Zone.
Ann. Trop. Med. Parasit. 4, 218.
- DAVIS, Nelson C., and
SHANNON, Raymond, C.
1928. The Blood-feeding Habits of *Anopheles pseudo-*
punctipennis in Northern Argentina.
Amer. Jl. Trop. Med. 8, 443.

- DEEKS, William E.
1926. Some Aspects of Malaria Control.
Jl. Trop. Med. Hyg. 29, 185.
- ESSED, W. F. R.
1925. Malaria at Tandjong Pinang.
*Meded. Dienst. d. Volksgezondheis in
Nederl. Indie.* Pt. 3, p. 301.
- EUGLING, Max
1921. Ueber Malaria Bekämpfung : Beobachtungen
und Untersuchungen aus dem albanischen Malaria-
Gebiet.
Arch. f. Schiffs- u. Trop. Hyg. 25 bei
H. 1, 5.
- FALCONI, Domenico
1913. Sulla localizzazione della malaria alle abitazioni.
Policl. Sez. pract. 20, 1119.
- FRICKS, L. D.
1920. Emergency Measure and Foresight in Malaria
Control.
Military Surg. 47, 224.
- FROSCH, P.
1903. Die Malaria Bekämpfung in Brioni (Istrien).
Zeitschr. Hyg. Infectionskr. 43, 37.
- FRY, A. B.
1922. The Rôle of Cattle in the Epidemiology of Malaria.
Indian Med. Gaz. 57, 1.
- GARNHAM, P. C. C.
1929. Malaria in Kisumu, Kenya Colony.
Jl. Trop. Med. Hyg. 32, 207 and 221.
- GEIGER, J. G., PURDY, W. C.,
and TARBETT, R. E.
1919. Control in a Ricefield District.
Jl. Amer. Med. Ass. 72, 844.
- GORGAS, William Crawford
1915. Sanitation in Panama.
D. Appleton & Co., New York and
London.
- HAIGH, W. E.
1925. Malaria in Albania.
League of Nations. Health Organisation
C. H. 272.
- HANAFIN, J. B.
1928. Further Results in Mosquito-proofing Barracks.
Jl. Roy Army Med. Corps. 51, 127.
- HECKENROTH, F.
1923. Mesures capables d'enrayer le paludisme à Dakar.
Bull. Soc. Path. Exot. 15, 1024.

- HERON, G. W.
1926. Proceedings of the Twelfth Meeting of the Anti-malarial Advisory Commission, Jerusalem, May 27th, 1926.
Manuscript abstracted in *Trop. Dis. Bull.* 23, 832.
- HEYDON, G. A. M.
1923. Malaria at Rabaul.
Med. Jl. Australia, Year 10, Vol. 2, p. 625.
- IOFF, I. G.
1926. Comment in *Tropical Dis. Bull.* 23, 138.
- JAMES, S. P.
1919 a. Malaria contracted in England:
Trans. Soc. Trop. Med. Hyg. 12, 37.
- JAMES, S. P.
1919 b. Risks of the Spread of Malaria in relation to Demobilisation.
Reports to the Local Government Board on Public Health and Medical Subjects. (New series No 123) *Reports and papers on malaria contracted in England in 1918.*
- JAMES, S. P.
1920 a. Malaria at Home and Abroad.
London.
- JAMES, S. P.
1920 b. The Risk of the Spread of Malaria in England and the measures necessary to prevent it.
Proceedings Clin. and Scient. Meeting British Medical Association, p. 254.
- JAMES, S. P.
1926. Epidemiological Results of a Laboratory Study of Malaria in England.
Trans. Roy. Soc. Trop. Med. and Hygiene, 20, 143.
- JAMES, S. P.
1927. Communication presented at the October Session of the Malaria Commission of the Health Section of the League of Nations.
- JAMES, S. P.
1929 a. Remarks on Malaria in Kenya.
Kenya and E. Afr. Med. Jl. 6, 92.
- JAMES, S. P.
1929 b. The Disappearance of Malaria from England.
Proc. E. Soc. Med. 23, 71, (Sect. Epidem. and State Med. p. 1); Novemb.

- KING, W. V., and BULL,
Cartoll G.
1923. The Blood-feeding Habits of Malaria-carrying Mosquitoes.
Amer. Jl. Hyg. 3, 497.
- KLIGLER, I. J.
1925. Trans. Fifth Conference of Malaria Field Workers.
Public Health Bull. No 156.
- KLIGLER, I. J.
LIEBMAN, E.
1928. Studies on Malaria in an Uncontrolled Hyperendemic Area (Hule, Palestine). II. Changes in the Resting-places of Anopheles with Special Reference to Infected Mosquitoes.
Jl. Prev. Med. 2, 433.
- KÜLZ, D.
1909. Moskitobekämpfung der Franzosen in West-Afrika durch die Methode der «trous-pièges».
Arch. f. Schiffs- u. Trop. Hyg. 13, 645.
- LE PRINCE, J. A.
1926. Destroying engorged Anopheles as a Malaria Control Measure.
Public Health Rep. 41, 1220.
- LE PRINCE, J. A., and
GRIFFITHS, I. H. D.
1917. Flight of Mosquitoes. Studies on the Distance of Flight of *Anopheles quadrimaculatus*.
Public Health Rep. 32, 856.
- LE PRINCE, J. A., and
ORENSTEIN, A. J.
1916. Mosquito Control in Panama.
G. P. Putnam's Sons ; New York & London.
- LESLIE, J. T. W.
1909. Malaria in India.
Lancet, vol. II, p. 1484.
- MACARTHUR, W. P.
1929. The Adult Mosquitoes of Shanghai.
Jl. Roy. Army Med. Corps. 52, 241.
- MACGREGOR, Malcolm E.
1927. Mosquito Surveys. A Handbook for Anti-malarial and Anti-mosquito Field Workers.
Baillièrè Tindale & Co. London.
- MACKENZIE, Melville D.
1923. Notes on the Epidemiology of Malaria in Russia.
Lancet II. 1227. 8th Dec.
- MANALANG, C.
1928. Notes on Malaria Transmission.
Philippine Jl. Sci. 37. 123.

- MANSON, Patrick.
1900. Experimental Proof of the Mosquito-malaria Theory.
Lancet, II, 923. and *Brit. Med. Jl.* II. 949.
- MAXCY, K. F., and
ZIEGLER, M. V.
1923. The malaria problem in South-East Missouri.
Public Health Rep. 38, 233.
- MISSIROLI, A. M., and
HACKETT, L. W.
1930. Field Studies on the Cause of the Natural disappearance of Malaria in Certain Regions of Europe.
Second International Malaria Congress, Algiers.
- MÜHLENS, P.
1902. Beiträge zur Frage der gegenwärtigen Verbreitung der Malaria in Nordwestdeutschland.
Deut. Med. Woche, 28, 589.
- MÜHLENS, P., und SFARCIC, A.
1925. Bericht über Malariaarbeiten in Dalmatien.
Cent. f. Bakt. u. Abt. Orig. 94, 326.
- PEJU, G., et CORDIER, E.
1919. Epidémie palustre et conditions de l'anophélisme en Argonne.
C. R. Société Biol. 81. 1039.
- ROSS, Ronald
1911. The Prevention of Malaria.
John Murray, London.
- ROUBAUD, E.
1919. Antagonisme du bétail et de l'homme dans la nutrition sanguine de l'*Anopheles maculipennis*. Le rôle antipaludique du bétail domestique.
C. R. Acad. Sci. 169. 483.
- ROUBAUD, E. et LÉGER, M.
1921. Observations sur le paludisme en Corse (mars-avril 1921).
Bull. Soc. Path. Exot. 14, 340.
- RUTHERFORD, N. J. C.
1928. Mosquito-proofing of Barracks of British Troops in India.
Jl. Roy. Army Med. Corps. 50, 316.
- SCHOO, J. H. M.
1905. Malaria in Noord-Holland.
Bohn, Haarlem.
- SCHÜFFNER, W., and
HYLKEMA, B.
1922. Malaria in Belawan during the Construction of the Ocean-harbour.
Meded. Burgerlijk Geneesk. Dienst in Nederl. Indie (Foreign Edition) Pt. 1, P. 47.

- SCHÜFFNER, W.,
SWELLENGREBEL, N. H.,
SWELLENGREBEL DE GRAAF,
J. M. H., and MOCHTAR, A.
1919. On the Biology of *M. L ludlowi* in Sumatra.
*Meded. Burgerlijk. Geneesk. Dienst in
Nederl. Indie*, No 3, p. 65.
- SERGENT, Ed. et SERGENT, Et.
1921. Etudes épidémiologiques et prophylactiques du
paludisme (dix-septième, dix-huitième et dix-neu-
vième campagnes en Algérie, en 1918, 1919 et 1920).
Ann. Inst. Pasteur, 35, 801.
- SERGENT, Ed.
SERGENT, Et., PARROT, L.,
FOLEY, H., SENEVET, G.
et CATANEI, A.
1924. Etudes épidémiologiques et prophylactiques du
paludisme (vingtième, vingt et unième et vingt-
deuxième campagnes en Algérie en 1921, 1922 et
1923).
Ann. Inst. Pasteur, 38, 775.
- STEPHENS, J. W. W.
1921. Malaria on a Venezuelan Oilfield.
Ann. Trop. Med. Parasit. 15, 435.
- STRACHAN, Henry
1904. Discussion on the Prophylaxis of Malaria.
Brit. Med. Jl. II. 637, 17th Sept.
- SWELLENGREBEL, N. H.
1925. Le paludisme aux Pays-Bas.
- SWELLENGREBEL, N. H.
1929. La dissociation des fonctions sexuelles et nutritives
(dissociation gono-tropique) d'*Anopheles maculi-
pennis*, comme cause du paludisme dans les Pays-Bas,
et ses rapports avec l'« infection domiciliaire ».
Ann. Inst. Pasteur 43, 1370.
- SWELLENGREBEL, N. H.,
SCHÜFFNER, W., and
SWELLENGREBEL DE GRAAF,
J. M. H.
1919. The Susceptibility of Anophelines to Malarial
Infection in Netherlands India.
*Meded. Burgerlijk. Geneesk. to Nederl.
Indie*, No 3, p. 1.
- SYMES, C. B.
1926. The Mosquito Problem in Kenya.
Kenya Med. Jl. 3, 93.
- TESTI.
1919. Malaria: Risk of Development of Indigenous
Foci. Discussion at the fifth meeting of the
Fourth Plenary Session of the Sanitary Conference
of the Allied Powers held in Paris.

LEAGUE OF NATIONS

Health Organisation

EUROPEAN CONFERENCE ON RURAL HYGIENE

REPORT OF THE PREPARATORY COMMITTEE

on the

Principles governing
the Organisation of Medical Assistance,
the Public Health Services and Sanitation
in Rural Districts

Series
of League of Nations Publications

III. HEALTH ✓
1931. III. 7.

CONTENTS.

	Page
Foreword	5
<i>Chapter I.</i> — Résumé of the Proposals of the Preparatory Committee	7
<i>Chapter II.</i> — Report of the Experts on the First Item on the Agenda.	10
<i>Chapter III.</i> — Report of the Experts on the Second Item on the Agenda	18
Declaration of the Representatives of Social Insurance Institutions	34
<i>Chapter IV.</i> — Report of the Experts on the Third Item on the Agenda	35
<i>Chapter V.</i> — Report by the International Labour Office on:	
(a) Sickness Insurance as a Factor in Rural Hygiene	50
(b) Agricultural Workers' Housing.	60

FOREWORD.

In September 1930, the Spanish Government proposed to the Council that the League of Nations should convene at Geneva a Conference of representatives of European States for the purpose of a technical international study of rural hygiene, considered as one of the most important factors in the organisation of agricultural areas in Europe.

The Council accepted the proposal, and referred it to the Health Committee for technical study and report.

The Health Committee proposed that the provisional agenda of the Conference should be:

1. Guiding Principles and Suitable Methods for ensuring Effective Medical Assistance in Rural Districts.
2. The Most Effective Methods of organising the Health Services in Rural Districts.
3. The Sanitation of Rural Districts: the Most Effective and Economical Methods.

It also suggested that a Committee be set up to prepare for the Conference, and proposed the members of this Committee.¹

These suggestions received the approval of the Council and the Preparatory Committee met in October and December 1930 and in May 1931.

On its proposal, the Council decided that the Conference should meet at Geneva on June 29th, 1931, and that Professor Gustavo Pittaluga, member of the Health Committee, and Director of the National School of Hygiene at Madrid should be its President.

The Council also decided to invite the Governments of non-European States which had a special interest in rural problems to send observers to attend the conference and hear the discussions.

On the proposal of the Preparatory Committee the Council decided that its members should be at the disposal of the delegates during the Conference.

¹ The members of this Committee are:

Professor G. PITTALUGA (*Chairman*), Director of the School of Hygiene, Madrid;

Dr. H. CARRIÈRE, Director of the Federal Public Health Service, Berne;

Dr. A. LUTRARIO, former Director-General of Public Health, Rome;

Professor S. PARISOT, Director of the Institute of Hygiene, Nancy;

Dr. A. STAMPAR, Inspector-General of Health, Belgrade;

Dr. CHODZKO, Director of the School of Hygiene, Warsaw;

Professor Th. MADSEN, Director of the State Serum Institute, Copenhagen;

Mr. M. HESELTINE, Assistant Secretary, Ministry of Health, London;

Dr. C. HAMEL, President of the Reichsgesundheitsamt, Berlin;

Professor J. G. FITZGERALD, Director of the School of Hygiene and Connaught Laboratories, Toronto;

Professor V. PUNTONI (representing the International Institute of Agriculture);

M. A. TIXIER, Chief of the Section of Social Insurance, International Labour Office.

CHAPTER I. — RÉSUMÉ OF THE PROPOSALS OF THE PREPARATORY COMMITTEE.¹

I. RECOMMENDATIONS AS TO THE COMPOSITION OF DELEGATIONS AND PROCEDURE AT THE CONFERENCE.

The Committee recommended that the members of the various delegations to the Conference should be experienced in social questions, and representative of all the interests involved in rural hygiene — sanitary, agricultural, economic and social; including those of the agricultural employer and labourer. Each delegation will have one vote.

It was decided to appoint a number of rapporteurs to report to the Conference on the recommendations adopted by the groups of experts convened to prepare reports on the different items of the provisional agenda.

During the Conference, the detailed discussion on these items will be referred to at least three sub-committees.

The Bureau of the Conference will be constituted by the President, the Vice-Presidents (at least three) and the Chairmen of the different committees.

The rules of procedure of the Assembly will be applied in general during the Conference, with the exception of certain provisions indicated by the Preparatory Committee (document C.H.1037). The President will make a statement in regard to these at the opening session.

The Bureau of the Conference may admit to the meetings of the sub-committees representatives of private international associations interested in the organisation of rural hygiene which have presented a request for admission. These representatives, on their request may be heard in the commissions, with the approval of the Chairmen.

2. RECOMMENDATIONS ON THE TECHNICAL WORK OF THE CONFERENCE.

The Committee referred to three groups of experts² the preparation of reports on the principles which should govern the provision of medical assistance, the organisation of the health services and the sanitation of rural districts. The views of these experts together with explanations taken from their discussions and material from the individual reports they submitted will be found in the second chapter of this report.

The Committee also defined the term "rural" for the purposes of the Conference as follows:

"The term "rural" refers to an area or a district where agriculture is the chief or even the sole industry, and where all other industries are of small importance and, in the main, dependent on agriculture."

¹ The full text of the Committee's proposals may be found in the documents: C.L.301.1930 (Annex); C.H.952 and C.H.1037.

² The names of these experts are given in footnotes at the beginning of the respective reports.

It was proposed to recommend for consideration by the Conference only the most important questions included in the three items on the agenda.

The Committee felt that purely veterinary questions should be omitted and that the Conference should restrict itself to those aspects of the milk supply which concern rural districts alone.

The following subdivision of the items on the agenda was recommended to the Conference:

First Item.

Guiding Principles and Appropriate Methods for ensuring Effective Medical Assistance in Rural Districts.

A. *Personnel:*

1. The Doctor:

- (a) The number and distribution of doctors in rural districts;
- (b) Methods for ensuring an adequate number of doctors in rural districts:
 - (1) The law of supply and demand — no State or public regulation;
 - (2) Public medicine — every doctor a public official;
 - (3) Inducements offered to doctors to settle in rural districts;
 - (4) Organisation of social groups for medical treatment — sickness insurance, co-operatives, etc.;
- (c) Economic and financial, transport and social conditions as they affect the distribution of physicians.

2. The Nurse.

3. Other Auxiliary Medical Personnel.

B. *Medical Institutions:*

Number, distribution and capacity of hospitals, dispensaries, etc., in rural districts.

Second Item.

The Most Effective Methods of organising the Public Health Services in Rural Districts:

A. *Form of Organisation:*

- 1. A complete State health service.
- 2. Local autonomy in health services.

B. *Method of Organisation:*

- 1. Older form (ordinary administrative form).
 - Part-time health officers in all political subdivisions with restricted legal powers and duties.

2. The "modern" form.
Full-time health officers in large districts with full responsibility for all health work.
The health centre and county health unit plans.
- C. *Subjects to be considered under the Item:*
1. The most important health problem in the rural area (malaria, infectious diseases, etc.).
 2. Infant and maternal welfare.
 3. Welfare of the child of pre-school age.
 4. School hygiene; welfare of the child of school age.
 5. The campaign against tuberculosis.
 6. The campaign against venereal disease.
 7. Sanitation.
 8. Popular education in hygiene.
 9. Provision of medical treatment, including first-aid in urgent cases and supervision of transport of sick and accident cases.
- D. *The Milk Supply:* Limited strictly to considerations which affect rural districts.

Third Item.

The Sanitation of Rural Districts: the Most Effective and Economical Methods.

- A. *Water Supplies:*
1. Collective water systems for two or more villages.
 2. Water supply systems for individual villages.
 3. Individual water supplies: wells, springs, cisterns.
- B. *Sewage and Refuse Disposal:*
1. Systems of sewerage and drains.
 2. Night soil — the latrine, cesspool, sewers, sewer effluents.
 3. Manure — pits.
 4. Garbage and other refuse.
- C. *Housing, including living-in conditions of agricultural labourers:*
1. Public buildings, schools, sanitary institutions (hospitals, etc.).
 2. Private houses.
 3. Settlements — model villages.
 4. Administration; financial and economic aspects — loans, legislation, etc.
- D. *Land Improvements (Bonifications):*
Minor and major sanitary improvements. — Drainage.
-

CHAPTER II. — REPORT OF THE EXPERTS ON THE FIRST ITEM ON THE AGENDA.¹

“Guiding Principles and Suitable Methods for ensuring Effective Medical Assistance in Rural Communities.”

1. The following definition of effective medical assistance was adopted:²

“In the largest sense, effective medical assistance may be considered as indicating a medical service organised in such a way as to place at the disposal of the population all the facilities of modern medicine in order to promote health and to detect and treat illnesses from their incipiency.”

Medical assistance must be concerned with the promotion of health as well as with the treatment and cure of disease. The importance of both aspects was emphasised by the experts, who agreed that prophylaxis of disease was destined to receive more and more consideration.

2. In order to furnish effective medical assistance to the rural population, the experts are unanimous in the belief that 2,000 is the maximum number of persons who can be given proper medical attention by a duly qualified medical practitioner, on the understanding that in proportion to the growth of the health services and the needs of the people, this number may be reduced to one thousand.

The experts recognised that the number of persons and the area which a physician might serve would vary considerably in accordance with local conditions, such as the distribution of the population, means of communication and transport, etc. As far as the number of persons was concerned, they were guided by information furnished regarding

¹ The following experts prepared this report at Geneva, May 9th to 11th, 1931:

Professor KONRICH (*Chairman*), from the Reichsgesundheitsamt, Berlin;

Dr. Alfredo CANAL-COMAS, Physician at Granollers, Catalonia; Representing the Medical Officers of Rural Districts in the National Medical Association of Spain;

M. BOIS-CORJON, Director of the Central Office of Agricultural Mutual Benefit Societies, Paris;

Dr. E. H. F. DECOURT, Representative of the French Medical Syndicates, Member of the Council of the Confederation; Secretary-General of the International Professional Association of Physicians, and Principal Editor of the official bulletin;

Dr. Dino RIO, Chief of the Section on Medical Assistance of the General Health Administration, Ministry of the Interior, Rome;

Dr. Frederic MESTRE PEÓN, Professor of Sanitary Administration at the School of Hygiene, Madrid;

Dr. Walther MIEMIETZ, Vice-President of the Medical Association for the Province of Brandenburg, Wriezen;

M. M. SARRAZ-BOURNET, Associate Inspector-General of the Administrative Services, Ministry of the Interior, Member of the Superior Council of Public Welfare of France, Paris;

M. Karl UNGER, Director of the National Union of Rural Health Insurance Institutions of Germany, at Perleberg (Potsdam).

² The conclusions formerly adopted by the experts are in italics. The explanations which follow in each case are summarised from the reports submitted by the experts and from the Minutes of the meeting.

European countries. In Germany, for example, there is, on the average, one physician to 2,317 persons in rural districts, while in cities the proportion is one physician to 786 persons. In Italy, there was in 1930 one *medico condotto* to 3,603 inhabitants (not exclusively rural). In Spain, the *medico titular* cannot assume charge of more than 300 families (indigent). In extending the German system of health insurance to rural districts in 1914, insurance institutions and physicians agreed that one physician might suffice for the needs of 1,000 members.

In spite of the motor and the telephone, the average area served by a physician in rural districts in Germany declined from nearly 40 square kilometres in 1876 to about 10 in 1929.

Local conditions play such an important part in determining the area which a physician is able to cover, and this varies so considerably, even in a single country, that the experts did not consider it feasible to make any general recommendation on this subject.

In making this recommendation, the experts took into consideration only physicians duly licensed to practice medicine according to the laws of the State.

The need for the physician practising in rural districts to keep pace with the progress of modern medicine was emphasised, and various methods of making this possible were discussed. In one German State, a number of young doctors are employed to act as *locum tenens* for the rural practitioner who desires to take a post-graduate course. Lectures for physicians are also broadcast by wireless. Rural doctors who have access to hospitals are enabled to keep in touch with the progress of medical science by this means. The training of doctors in hygiene is insured in Yugoslavia by compulsory lectures and work at the Institutes of Hygiene before graduation.

The recommendation as to the number of persons who could be cared for by a rural doctor was made on the assumption that the district was adequately provided with suitable medical and health institutions and that the morbidity was normal. The absence of medical and sanitary personnel, and facilities would, of course, reduce the potentialities of the doctor, while an abnormal sickness rate would necessitate a larger number of physicians.

The effective work of a properly organised public health service would increase the demand for the doctor's services, and so reduce the maximum number of persons to whom he could give proper attention. This would result from the increased popularity of measures of personal prophylaxis (vaccination against various diseases, for example) as well as the reference to doctors of persons discovered by the Health Services to require treatment for incipient disease and defects.

3. Such medical assistance also requires a technically qualified auxiliary personnel comprising one or more nurses, or, provisionally, in the absence of qualified nurses, other persons possessing the minimum necessary technical training.

This recommendation refers to public health nurses (health visitors), visiting nurses, graduate nurses, midwives, etc.

Public health and visiting nurses are becoming increasingly numerous in nearly all countries. In 1930, there were 2,403 public health nurses in France, of whom 894 were tuberculosis nurses, 1,053 child welfare nurses, and 456 "generalised" nurses. Nurses employed by industries are not included in these figures.

In Germany, there are public health nurses (*Fürsorgeschwestern*) in the rural districts (*Kreis*) and visiting nurses in even the smallest rural communes (*Gemeindeschwestern*). The latter assist the former in their health work, but their principal task is to nurse the sick. The visiting nurse is employed by the commune and voluntary associations, but health insurance institutions contribute largely to their support.

In England, nurses are employed by the local authorities at such institutions as infectious disease hospitals, hospitals and dispensaries for tuberculosis, treatment centres for venereal diseases, maternity hospitals and consultation centres for infant welfare, and at general hospitals when provision is not made by voluntary bodies. They are also employed for school medical work, nursing service is provided as part of the maternity and child welfare scheme, and home nursing is arranged for certain infectious diseases in young children. Nursing service for members is also one of the additional benefits which approved insurance societies may provide out of surplus funds. In sparsely settled rural districts the duties of district nurse and midwife have been combined.

The recommendation that there should be one or more nurses refers to the number of persons attended by one physician in rural districts.

Midwives. — In 1930, there were 1,376 midwives of the first class and 10,026 of the second class in France. This is nearly half the number of practising physicians. Only in a few of the most remote rural districts in France are trained midwives lacking.

The annual report of the (English) Ministry of Health for 1929-30 states: "Eighty-two per cent of the rural population of England is now provided with the services of trained midwives, as compared with 68 per cent in 1921".

In Spain, every municipality is obliged to employ a midwife for the care of indigent pregnant women. In Italy, the midwife *condotta*, duly qualified, is employed by the commune, which is required by law to provide obstetrical care to women on the list of indigents. In Germany, private practice is almost the general rule but the commune frequently guarantees the midwife a minimum salary. The heavy decrease in the birth-rate in Germany, even in rural districts, has led to a decrease in the number of midwives from more than 33,000 in 1876 to 27,484 in 1929, or from 7.72 to 4.29 per ten thousand inhabitants. There is a larger proportion of midwives in Germany in rural districts than in cities: 2.92 in cities, 5.93 in rural districts per 10,000 inhabitants.

All midwives referred to above are duly qualified and licensed according to the law of the State in which they practise. In many European countries, the midwife is an employee of the commune. In view of the recommendation of the Budapest Conference¹ concerning the aid which midwives may render to the public health nurses in certain specified nursing activities (the new-born) the practise in England of combining the duties of nurse and of midwife is of interest.

The last phrase of the recommendation, in regard to less qualified personnel, refers to temporary conditions in remote rural districts and less well-developed countries. In nearly all European countries, untrained midwives have disappeared or are disappearing.

4. *It is recommended that, in the smallest rural settlement, the patient should be able to find a person capable of rendering first-aid and of carrying out the doctor's orders.*

Doctors and nurses are not stationed in remote and inaccessible rural settlements (mountain villages, etc.) and frequently these settlements have high accident rates on

¹ The Budapest Conference prepared the report on rural health centres which follows on page 18.

account of the occupations of the inhabitants. The first-aid required can be furnished by persons with some slight training, such as former stretcher-bearers (Germany), students of Red Cross classes, etc. The experts considered that such a service should be organised systematically in every rural settlement in such a way that it could be made available immediately the need arose.

5. *The rural population and rural doctors should be in a position to utilise the services of centres of diagnosis and, if necessary, of specialised treatment; such centres should be suitably equipped and provided with a qualified staff; anti-tuberculosis and anti-venereal dispensaries, etc.*¹

These services should maintain liaison with the patient's physician, who should be informed of the results of the examinations, or, if necessary, kept in touch with the treatment and its results.

These centres exist in nearly all European countries, for various purposes, maternal and infant welfare, tuberculosis, venereal diseases, cancer, school hygiene, etc. They are organised by the health authorities as a rule, but sometimes by private agencies. They are equipped with X-ray and other special apparatus and staffed by specialists. The Budapest Conference considered that these and other rural health activities should be combined and co-ordinated in the interests of economy and efficiency.

There was no divergence of opinion among the experts concerning the value of the services rendered by these services, but the discussion revealed fundamental differences in the different countries concerning the part they should play in giving treatment. In Germany, for example, they give no treatment whatever, in France, anti-venereal treatment alone, while, in some countries, all necessary specialised treatment is furnished.

The representatives of health insurance institutions laid special stress on the necessity for the staff of these centres to keep in touch with the patient's physician, and to inform him of the results of the examinations and treatment, so that when the patient came under his care again he would be in a position to continue the treatment properly.

6. *Rural medical assistance also implies facilities for hospitalisation in appropriate suitably-equipped institutions.*

It is recommended that there should be such a hospital for a population of from twenty to thirty thousand people, a rational organisation requiring about two beds per thousand of the population.

However, each such institution should have not less than some fifty beds.

Permanent means of communication (telegraph, telephone, etc.) and constantly available means of transport should be at the disposal of patients and doctors to permit of rapid hospitalisation in urgent cases.

In the view of the experts, suitable equipment for hospitals should include X-rays, a small laboratory, sterilisation apparatus, isolation dressing and operating rooms and instruments. These hospitals should have outdoor departments to which doctors could

¹ Doctor Miemietz, the representative of the rural medical profession in Germany, requested that the following statement should be inserted in the experts' report:

"I understand that the terms 'centres of diagnosis and specialised treatment' refer to organisations intended primarily for diagnostic and consultation purposes, which give no individual treatment unless exceptional circumstances (conditions peculiar to a given country, existing organisations, etc.) demand it."

refer their patients for special examination and treatment. The question of small hospitals was thoroughly debated. There was agreement on the need for one hospital bed for every four or five hundred inhabitants, but it was the opinion of all that hospitals with less than approximately fifty beds are too small to function properly and the overhead cost is too great.

Obviously, the restriction of hospitals to institutions with not less than fifty beds would make difficult the provision of hospitals facilities in certain remote rural districts. This difficulty is overcome in certain countries (Yugoslavia) by having a few beds at the health centre in districts where hospitals are not available, a practice which received general approval.

Methods of communication in the rural districts of European countries have progressed rapidly in recent years. Special arrangements are made in France for the use of the telephone in case of sickness or accident at night or on days when the exchange in remote rural villages is closed. In Germany, a public telephone is almost always available.

The experts stressed the importance of having suitable means of transport instantly available, not only for purposes of hospitalisation but also to bring the patient to the physician's office in case of accident or sudden illness.

*7. Rural medical assistance should utilise the services of laboratories.
Simple examinations and analyses may be carried out in the hospital laboratories.
More complicated examinations and analyses (bacteriological, pathological, serological, etc.) should be carried out in large, specially-equipped laboratories.*

Examples of the simple examinations and analyses referred to are: Examination of sputum for tubercle bacilli; analysis of urine for albumen and sugar, blood counts, etc. In France, Italy and one or two other countries, these are frequently carried out by qualified pharmacists. The experts agreed with the recommendation of the Conference at Budapest that instead of attempting to provide for the carrying out of more complicated laboratory work in rural districts it would be better to concentrate such work in large, properly-equipped, suitably-staffed laboratories at a few centres. Specimen containers should be available to doctors throughout the rural districts and rapid means of transporting these to the laboratories should be provided. Such containers should be placed where they would be most accessible to doctors — for example, in health centres and pharmacies. The cost of laboratory examinations should be as low as possible, so that their use may be encouraged, and, in the case of examinations of public interest, the health authorities should bear the cost.

The experts emphasised the importance of living tissue (biopsy) and post-mortem (autopsy) examinations in the interests of better diagnosis (cancer, for example) and the education of physicians.

Large, well-equipped laboratories are established in one group of countries by the public authorities (Germany, for example) and in another group (France, the United States of America) also by private initiative. Experts from the first group considered that the public authorities alone should be responsible for important laboratory examinations, while experts from the second group pointed out that some of the best-equipped laboratories were purely private.

In Spain, there are institutes of hygiene in each province, which are equipped and staffed in such a way as to make laboratory diagnoses available in rural districts. These institutes have also a number of branches.

In Italy, in communes with populations exceeding 20,000, there are hospitals with well-equipped laboratories; these number ninety-nine.

8. *Rural medical assistance should also be able to utilise medical specialists.*

The specialists should keep in touch with the patient's doctor, informing him of the results of the examination and of the treatment and its results.

The difficulty of providing specialist medical service to rural populations was appreciated by the experts. Specialists cannot be expected to settle in sparsely-populated rural districts. Special measures must be applied to provide for such services.

This is done by the health authorities in the case of certain diseases — tuberculosis, venereal diseases, diseases of infancy and maternity, cancer, etc. The provision of specialist service in hospitals serving rural districts is another method, calculated to complete the services provided by the health authorities, by the provision of surgeons, gynæcologists, oculists, aurists, etc. Specialists in these diseases may come from large cities to the hospitals at fixed periods.

In view of the fact that such specialists come to rural districts only occasionally, it is essential that the general practitioner should be informed of the results of specialist examinations and treatment.

9. *Means of Realisation.*

A. Principles of Collaboration. — *The realisation of effective medical assistance in rural districts demands the collaboration of the public authorities — health and welfare (assistance) — of the medical profession, of health insurance institutions, of private agencies, etc.*

B. The Public Authorities. — *The public authorities should ensure that the entire population benefits from an effective medical assistance. By means of a rational organisation of the health services, adequately staffed with specialists, they should attempt to develop the preventive tendencies of rural medical assistance.*

In the interest of effective medical assistance, it would also be desirable for the public authorities to seek to organise a rational and co-ordinated health programme on a territorial basis, taking account of local conditions.

The public authorities should stimulate, assist and co-ordinate the efforts of agencies and groups which attempt to realise effective medical assistance. They should seek to fill the gaps and avoid the duplications which may occur in the organisation of this assistance.

C. Health Insurance. — *The experts consider that when health insurance applies to the entire body of agricultural labourers, it permits the realisation of effective medical assistance in rural districts under the best conditions.*

D. Public Assistance. — *Nevertheless, where health insurance has not yet been established, rationally-organised free medical assistance may intervene usefully in completing a system which partially satisfies the needs of rural populations.*

Economy and efficiency require that the work of the agencies concerned in the provision of medical assistance should be co-ordinated.

The public authorities have the general responsibility for the provision of effective medical assistance, and it is their duty to organise the health services. The experts did not wish to infringe on the competence of the commission which would have to recommend

methods of sanitary organisation, but considered it necessary to define the part played by the public authorities and the health services in organising medical assistance.

Health Insurance. — The important rôle played by health insurance institutions in providing effective medical assistance in rural districts was emphasised. In countries where such a system applies to all agricultural labourers:

(1) A sufficient number of qualified physicians is attracted to rural districts and they are assured of a sufficient compensation; the insurance institutions employ only qualified doctors.

(2) As the insurance institutions pay all hospital expenses and their members occupy 80 per cent of the beds, the financial support of hospitals is assured.

(3) Reserve funds of insurance institutions are used to enlarge hospitals when necessary, and are loaned to build new hospitals when public funds do not suffice.

(4) These institutions also pay the expense of the necessary laboratory examinations, thus aiding in the support of laboratories.

(5) The cost of transporting the assured to the hospital is borne by the insurance funds.

These advantages refer specifically to German rural health insurance, but they also apply in general to other countries with similar systems.

(6) Health insurance institutions give the mass of the population an interest in medical assistance and prophylaxis which makes of them admirable agencies for popular education in hygiene.

Public Assistance. — In almost all European countries, there are systems of public assistance providing medical attention gratuitously to the indigent. In France, the system, which is on a communal basis, permits free choice of physician, transport and laboratory expenses, treatment in the home or in the hospital, specialised treatment, etc. In 1928, more than three hundred million French francs were spent for such assistance by communes, departments and the State.

When rationally organised, and in the absence of health insurance, this system is useful in providing medical assistance to a part of the rural population.

Methods of Ensuring Effective Medical Assistance to the Entire Rural Population. — In some countries, this is done by means of health insurance — Germany (60 per cent of the population), England, France, etc. Public assistance in all three cases applies to non-insured indigents. In other countries, reliance is placed on public assistance alone.

In Italy, the system of *medici condotti* is employed.

These are physicians appointed by the authorities to treat the indigent, of which lists are established. Of a total of 20,000 doctors in Italy, 9,521 are *medici condotti*.

In Spain, there is the *médecin titulaire*. Spain is predominantly agricultural, but only half (10,000) of the whole number of doctors are in rural districts — there are doctors in only 5,672 of the 12,000 communes. There are also assistant practitioners of medicine

and surgery; these are given two-year courses, and must work under the direction of qualified doctors.

Methods of attracting physicians to rural districts in various European countries are:

- (1) Employment by health insurance institutions;
- (2) Employment by public assistance to treat the poor;
- (3) Employment by the health authorities for vaccinations and other preventive work — maternal and infant welfare work, school inspections, etc.;
- (4) Employment by the authorities to treat the people in remote rural districts (highlands and islands of Scotland);
- (5) Provision of minimum salary — lodging, transportation, payment of mileage, payment of medical school fees on condition that the recipient will undertake rural practice for a given period;
- (6) Employment by private agencies.

Some of these methods are also used to ensure sufficient nurses and midwives in rural districts.

The distribution of physicians in nearly all European countries is also affected by the law of supply and demand.

The experts considered that the rôle of the central health authorities in respect of the provision of effective medical assistance must vary with the development of the country — the less developed the country the greater the need for intervention.

The public authorities should have the principal responsibility for establishing hospitals and laboratories where none exist; if prices for laboratory examinations are too high, the authorities should intervene by means of subventions, etc. The greater the number of doctors, the less need will there be for auxiliary medical personnel apart from nurses and midwives.

CHAPTER III. — REPORT OF THE EXPERTS ON THE SECOND ITEM ON THE AGENDA.¹

"The Most Effective Methods of Organising Health Services in Rural Districts."

I. General Considerations. — *There are two principal forms of rural health organisation: the form in which the State administers the local services, and the form in which the State has only supervisory functions, the local authorities being responsible for the local health administration.*

Both may give good results, and the form best suited to the rural districts of a given country depends on the manner in which the general administration of that country is organised.

When it is necessary to organise the rural health service there is need for a State organisation which will assume control over local health work. As the country develops, its local administrative organisation becoming sufficiently strong to carry out public health work, and the education of its people in hygiene being sufficient to cause them to support the local health service, there may be a gradual decentralisation in health matters until the responsibility can be assumed safely by the local authorities.

Even when such a decentralisation has taken place, the State should preserve its right to frame the health policy which it is the duty of the local authorities to carry out, as well as its right to supervise the work and remedy the deficiencies of the local health service.

¹ These reports were prepared by the Commission on Rural Health Centres which met at Budapest in October 1930 and at Geneva on April 28th to 30th, 1931. The following experts participated:

At Budapest and Geneva:

- Dr. W. CHODZKO, Director of the School of Hygiene at Warsaw (*Chairman*);
- Dr. Béla JOHAN, Director of the State Institute of Hygiene, Budapest;
- Dr. M. KACPRZAK, Chief of the Statistical Department, State Institute of Hygiene, Warsaw;
- Dr. A. METZ, Medical Officer of Health of the County and District of Holbaek, Denmark;
- Dr. J. PARISOT, Professor of Hygiene and Preventive Medicine, Nancy;
- Dr. Hynek PELC, Chief of the Department of Social Hygiene, State Institute of Hygiene, Prague;
- M. M. PETRIK, Chief of the Division of Sanitary Engineering Institute of Hygiene, Zagreb;
- Dr. G. SEIFFERT, Counsellor to the Bavarian Ministry of the Interior, Munich;
- Dr. A. STAMPAR, Inspector-General of Health, Ministry of Health, Belgrade;
- Dr. J. H. TUNTLE, Inspector, Child Welfare, Tuberculosis and Venereal Diseases Service, Netherlands Ministry of Labour, Commerce and Industry, Groningen.

At Geneva alone:

- M. Antoine LABRANCA, Chief of Division in the General Public Health Direction, Ministry of the Interior, Rome;
- Dr. J. THURNHER, Representing the Austrian Union of Sickness Insurance Funds, Vienna;
- M. VIMEUX, Director-General of the National Union of Agricultural Mutual Benefit Societies, Paris.

At Budapest alone:

- Dr. F. RUIZ MOROTE, Public Health Inspector at Caceres, Spain;
- Dr. Mil. RANKOV, Director of the Tropical Diseases Institute at Skopje, Yugoslavia;
- Dr. Kornél SCHOLTZ, Secretary of State, Ministry of Labour and Social Welfare, Budapest;
- Mlle. M. STELLER, Chief of the Public Health Nursing Service, State Institute of Hygiene, Budapest.

Sometimes the health officers are appointed and paid by the State while funds for the work are drawn from local sources. In other cases, the health officers are appointed by the State and paid by the local authorities, while, in still others, part of the salary is paid by the State, part by local authorities.

The advantages of a complete State Health Service are: Uniformity of programme throughout the country, stability of the service, continuity of policy and security of tenure for the staff.

The advantages of a decentralised health service are that the members of the staff are welcomed and aided in their work by the people, the local health problems are apt to receive more intelligent consideration, and as health work is brought closer to the people they take more interest in its competent performance. In view of the greater interest taken in health work when administered locally, funds in support of the programme may be raised more readily.

In Hungary, it is proposed to substitute a State for the present local system, while in Yugoslavia, which had a purely State system in the beginning, the tendency is towards decentralisation.

The above recommendation does not apply necessarily to the method of financing the health services. There was general agreement that in this respect the local units, communes and provinces, for example, should participate, otherwise the financial burden would be too great for the State.

2. The public health officer fully responsible for the promotion of the health work in a rural district should give his whole time to his official duties; the practice of medicine¹ in particular is incompatible with the work of such an official. He should be a doctor trained in hygiene and preventive medicine according to the recommendations of the Conferences of Directors of Schools of Hygiene at Paris and Dresden (document C.H.888). His compensation should be sufficient to assure him a comfortable living. He should enjoy security of tenure in office, subject to the proper discharge of his duties, and have the right to a pension when age or the completion of a fixed number of years of service make it necessary for him to retire.

The experts were unanimous in recommending that the health officer should devote his whole time to his duties. An experience of four years in certain Hungarian districts demonstrated the great superiority of the full-time over the part-time health officer, particularly in respect of school hygiene work. The Danish participant stated that it was hoped to transform the present part-time system in Denmark to a full-time system, by increasing the size of the rural health district.

The tendency to require full-time service of responsible health officers is growing fast in European countries, and whole-time officers are found in England, France, Germany, Hungary, Yugoslavia, etc. In some countries, the law provides for whole-time service but the compensation is not sufficient and the health officer is forced to undertake private practice.

The requirement of whole-time service does not necessarily apply to other doctors in the health services, such as specialists in tuberculosis, infant welfare, etc.

¹ This recommendation refers to the *private* practice of medicine. In some countries where medical assistance is a responsibility of the public health service, work in the field of medical practice may be a duty of the public health officer.

3. *The optimum size of a rural district¹ for which one full-time health officer may be responsible will vary with the density of the population, the means of communication, the prevailing diseases, and other local conditions. Subject to these variables a population of from twenty thousand to one hundred thousand, or an average of fifty thousand, may be fixed, it being understood that one or more full-time assistant health officers will be needed for populations in excess of fifty thousand.*

The rural health district must always correspond with the administrative district in view of the difficulties which would otherwise result. As, in European countries, such administrative districts almost always have populations in excess of fifty thousand, they may be suitably staffed by the appointment of one full-time health officer with the proper number of assistants.

The principle of a sufficiently large district combined with full-time service provides for efficiency and economy in administration.

In certain countries, the Netherlands, for example, the health officer or medical inspector is specialised and his work being restricted to certain subjects he can serve a larger territory.

In Italy, there is no sub-division corresponding to the rural health district defined above, and the health services are organised on a different basis.

The experts did not consider it possible to adopt a recommendation as to the area of the rural health district in view of the varying conditions in the different countries. In Denmark, the plan is to have districts of from 700 to 800 square kilometres.

4. *The experts consider that the health authorities of the rural districts described above should be responsible for the protection and promotion of the public health in all its aspects. The district health officer, as executive officer of the health organisation, should be entrusted with the realisation of the entire programme in order to ensure the economy and efficiency resulting from unity of direction.*

5. *The minimum staff for such a rural health district should consist, in addition to the health officer, of one or more public health nurses, a sanitary inspector, and a clerk.*

The nurse should have a diploma in generalised public health nursing from a recognised school of health nursing or its equivalent. The experts consider that the programme of such nursing schools should be studied by the competent commission of the League's Health Organisation.

The sanitary inspector should have received suitable training at a school or institute of hygiene. Under the direction of the health officer, he should be able to inspect foods, investigate and abate nuisances and carry out the work of rural sanitation planned by the sanitary engineer.

The fact that the public health nurse should do generalised work in rural districts was also emphasised at the Budapest Conference. Such work is more suited to rural conditions for reasons of economy in addition to other advantages.

The qualifications of the sanitary inspector vary widely in different countries. In England, he may be a qualified engineer, while, in other countries, he may have received

¹ In some countries the law requires every commune to employ a doctor. This recommendation deals only with the *district*. The Budapest Conference (see page 24) decided that village doctors might be employed in primary health centres. There is no implication in this report that the practising physician should do no health work. Indeed, the experts considered that the services of the practising physician should be utilised wherever possible.

little or no technical training. Courses for such inspectors are now given in many schools of hygiene, and the required qualifications are being raised considerably.

6. *Although in many European countries, the rural district as defined above cannot alone afford to employ a sanitary engineer, the services of such an engineer should be available in all rural districts. Such engineers may be employed by the Central Health Organisation, the State or the Province. Their work should be that described by the Conference at Budapest.*

It is important that the programme and methods of training these engineers in all countries should be perfectly adapted to the work they are required to do. The experts believe that the study of this subject should be undertaken by the Health Organisation of the League of Nations.

7. *The programme of the health services in such a rural district.*

A. *Notifiable Diseases and Vital Statistics. — The effective work of rural health services depends on the completeness of their information on the prevalence of infectious diseases and on the accuracy with which causes of death are certified.*

All doctors practising in rural health districts should be required by law to notify the health authorities immediately of every case of an infectious disease¹ which they have examined. In the absence of doctors, heads of families, teachers and local officials should be required to notify suspected cases to the health authorities.

The attending physician should be required by law to fill in a standard certificate of the cause of death and to transmit that certificate to the local health authorities without delay.

The health officer should utilise every means to keep in touch with the prevalence of infectious diseases in his district—routine epidemiological investigations of cases and contacts, charts and graphs, a diagnostic (consultation) service. The returns of causes of deaths should be studied regularly to the end that the general health programme may be suitably adapted to local needs.

B. *Statistics on Social and Economic Conditions. — In addition to vital statistics, which permit the health authorities to appraise the results obtained and to adapt their programme to local needs, statistics relating to social and economic conditions (composition of the population, housing, hospitals and other medical institutions, etc.) collected by various agencies, in particular by health insurance institutions, should be utilised by such authorities.*

The representatives of rural health insurance institutions at the meeting emphasised the importance and scope of the statistics collected by such institutions.

C. *Branches of Work. — The programme of the rural health services should include measures for dealing with all the health problems which a survey of the district has revealed to be of real importance; in particular it should relate to:*

- (1) *Infectious disease control;*
- (2) *The campaign against the so called social diseases;*
- (3) *Maternal and infant welfare and school hygiene;*
- (4) *Sanitation;*
- (5) *Hygiene of milk and foods;*
- (6) *Education in hygiene.*

¹ Diseases required by law to be notified.

Provision should also be made for first-aid and for the transportation of the sick in urgent cases.

Laboratory facilities should be available in accordance with the recommendations of the Budapest Conference.

The social diseases referred to include tuberculosis, the venereal diseases and all others which constitute important health problems in the district. Attention was directed to the fact that, in certain districts of some countries (the Netherlands, for example), non-tuberculous pulmonary diseases assume greater importance than tuberculosis.

8. *In order to ensure the interest and enlist the support of the public, the experts consider it advisable for the health officer to set up advisory councils or consultative committees, composed of leaders in the community or of representatives of agencies¹ which carry on health work.*

In the latter case, the Committee should co-ordinate the work of the agencies concerned, and for this reason is worthy of special recommendation.

The experts considered that the *Zweckverband* system, utilised in Bavaria, was particularly useful. It is a union of the various agencies concerned, and the expenses are divided among them in proportion to the membership of each. This system permits the co-ordination of the work of these agencies and provides larger credits for health work.

9. *In view of the wide variations in health programmes in the different countries and the considerable differences in local conditions, it is not possible at present to recommend a model budget for a rural health district, or to state what should be the per capita expenditure for health purposes. It is also impossible to decide on the percentages of the budgets of States, provinces, districts and communes which should be allocated to the health services.*

The experts consider it advisable to secure further information on the cost of rural health services and, to this end, recommend that studies on a uniform plan should be carried out in rural districts under the auspices of the Health Organisation of the League of Nations.

The purpose of these studies should be to determine which effective form of rural health organisation is most economical and, in particular, the cost of the method described by the Budapest Conference in comparison with other methods in use.

10. *Official funds for health work in rural districts are derived in varying proportions from the State, the province, the county, the district and the commune. While the State may have to provide the largest proportion when the rural health services are being organised, or in the case of poor districts, it is essential that the proportion contributed by the local authorities should gradually increase.*

This recommendation embodies the experience of European States which have developed effective rural health services.

11. *In order to avoid deficiencies and prevent duplications in the promotion of the health of the rural population, it is desirable that collaboration should be established between the public health services and social insurance institutions.*

¹ This recommendation does not apply to health insurance institutions which are treated in paragraph 11.

This collaboration might relate particularly to the following work :

- Joint study of plans for the provision of sanitary equipment in rural districts ;*
- Establishment of vital statistics ;*
- Campaign against tuberculosis, venereal diseases, cancer, mental diseases, etc. ;*
- Maternal and infant welfare ;*
- Child welfare ;*
- Education in hygiene of the rural population.*

The collaboration might be realised by means of "Committees of Co-operation" composed of representatives of the public health service and insurance institutions.

The term "sanitary equipment" is not used in its narrow sense, but is meant to include the facilities necessary for the effective performance of health work.

12. *Collaboration between the health authorities and private health agencies is highly important in the interests of economy and efficiency. The work of private agencies is of great value in view of the interest they arouse in hygiene, and their contribution to the available health resources and equipment.*

Useful collaboration between the health authorities and private health agencies presupposes :

(1) *The existence of an effective rural health service and a health programme adapted to local needs.*

(2) *That the work of private health agencies should be set out in the programme adopted by the responsible local health authorities. In this way, the health officer will play an important rôle in the technical direction of the work of these and other similar agencies, as he is responsible for all public health work in his district.*

(3) *That, in each rural district, it would be preferable to have a single private health agency concerned with all the health work with which such agencies usually deal.*

In making the last recommendation (3) the experts referred particularly to districts in which private health agencies were to be organised. The economy and efficiency of a single private health agency were emphasised.

13. *Co-operation between the public health authorities and the agricultural associations of all kinds is also highly desirable. Inspired by the desire to raise the standard of life in rural districts, these associations offer a valuable means of securing the co-operation of the rural population. The results of their work are reflected in health as well as in economic and social conditions, and they are concerned with housing and sanitation as well as with other hygienic measures.*

14. *The experts desire to draw attention to the higher health standard in rural districts which is obtained by the improvement of general education by such means as the folk high schools in Denmark. Raising the general level of education by such means results in a greatly increased appreciation of hygiene and provides a fertile soil in which to implant ideas of health and sanitation.*

B. Rural Health Centres.

1. *It is necessary at the outset to specify that rural health centres, considered as agencies particularly adapted to the promotion of public health in rural districts, constitute an integral part of the general health organisation. They are, in consequence, closely related to and dependent on all the elements which form that organisation—in particular, the State or Provincial Institutes of Hygiene, which, in several countries, constitute the most fully developed centre on which all others may depend for technical guidance.*

It became evident that the two main types of health centres, designated hereafter as primary (village, communal) and secondary (district, *arrondissement*) must vary greatly in size, personnel, equipment and scope of work in the different countries and in the different parts of the same country.

2. *It is to be understood that the considerations which follow relate to average centres, and that, in addition to these, there may be a large number of different types, the development of any particular centre being necessarily conditioned by local exigencies.*

In view of the confusion in the classification of the two main types of health centres, the Conference decided to adopt the following nomenclature:

3. *There are two methods of classifying rural health centres; they may be designated as small or primary centres and as larger or secondary centres, according to their varying organisation and development; or they may be divided into village or communal, corresponding to primary, and district (*arrondissement*) corresponding to secondary, centres, according to the administrative subdivisions in which they work.*

The Conference expressed its preference for the first of these classifications, that is, their sub-division into primary and secondary health centres.

During its second meeting the Commission decided to recommend that there should also be branch health centres of the most simple type to enable the work of such centres to be carried into the smaller villages.

4. *Definition. — The rural health centre may be defined as an institution for the promotion of the health and welfare of the people in a given area, which seeks to achieve its purpose by grouping under one roof or co-ordinating in some other manner, under the direction of the health officer, all the health work of that area, together with such welfare and relief organisations as may be related to the general public health work.*¹

In rural districts where such public health work has been organised for some time, it may be difficult to group all health activities under one roof or in the same organisation. Nevertheless, an attempt should be made to co-ordinate the work of existing agencies in the most effective way.

On the other hand, where a modern public health organisation is to be created in new territory,² the health centre, as defined above, is the best method of attaining the desired result.

¹ See declaration of the representatives of health insurance institutions on page 34.

² The term "new territory", as employed here, implies that an effective *health service* in the modern sense does not exist.

I. THE PRIMARY HEALTH CENTRE.

First consideration was given to the primary health centre as the health agency coming most directly in contact with the people.

5. *In the general public health armament of a given country, the primary health centre with its branch centres represents the terminal stage; it is the smallest agency adapted to serve the public health needs of the smallest rural area.*

The working programme of this centre should be established on the basis of a preliminary survey concerning:

1. *The topographical conditions of the district — density of the population, distribution (dispersion) of homes, means of communication. This information will facilitate the selection of the sites, and the determination of the number of health centres and branch health centres required.*

2. *The health and epidemiological conditions among the people; this information will be equally useful in establishing the centre's programme of work.*

The Conference felt that the minimum programme would vary according to the importance of the health problems brought to light by the survey. Should one health problem overshadow all others in the area, the centre would naturally give it first consideration. Among health problems mentioned were: Malaria, tuberculosis, hookworm, acute infectious diseases, etc.

6. *The Minimum Programme of a Rural Health Centre.*

In addition to the campaign against those diseases which the survey has shown it to be of the first importance to prevent, the minimum programme of work will consist of: -

- (a) *Maternal welfare;*
- (b) *Infant welfare, including pre-school and school hygiene;*
- (c) *Popular health education; a practical example may be furnished by the provision of shower-baths;*
- (d) *Sanitation; in general, the centre should deal with all the sanitary conditions affecting the people;*
- (e) *Finally, provision of first aid in urgent cases.*

In setting out the programme of the primary health centre, the members of the Conference emphasised its essentially educational character, and indicated the value of its work in that direction.

The Conference was of the opinion that the first essential was to secure the help of the population, and various suggestions were made concerning the means to be employed for this purpose, such as the provision of medical treatment in case of need, the installation of shower-baths, the use of the cinema, museums, etc.

The Conference did not believe it necessary to specify that the primary centre should undertake tuberculosis work. The general conception of the duties of a primary health

centre in this respect was that it would act as a rough filter, sorting out suspected cases of tuberculosis and sending them on to the more fully-equipped secondary centre.

In connection with infant welfare, the advisability of providing a "social consultation" to gain supplementary information concerning the environment of the infant and child was emphasised.

Sanitary work was considered to be of first importance, but it was not emphasised here as the Conference felt it would have to be planned and guided technically by the sanitary engineer attached to the secondary centre, the work of the primary centre being to locate the problems, bring them to the attention of the sanitary engineer and carry out his recommendations.

The Conference considered that no public health agency of this character could afford to ignore the provision of first aid in urgent cases, as such indifference would result in public criticism.

The Conference believed that health centres generally would do well to follow the example set in the Netherlands, where such institutions are provided with equipment for the sick, to be loaned out to families in their homes.

Provision of Medical Treatment. — The question as to whether health centres should give medical treatment was discussed from various points of view. There was the danger that the centre might be overwhelmed by chronic cases, that the emphasis would shift from prevention to treatment, that the medical profession might refuse to co-operate. On the other hand, the Conference recognised that one of the first responsibilities of a governmental health agency was to make provision for the treatment of the sick where such provision did not exist or was inadequate. In districts far removed from hospitals it was felt that the centre should have a few hospital beds.

7. In areas where the absence or insufficient number of physicians prevents the adequate provision of medical treatment, and in the case of patients unable to receive proper treatment elsewhere, the health centre should undertake this work.

On the other hand, in areas where medical care and treatment are adequately provided, the centre should limit itself to such treatment as may be necessitated by the requirements of social prophylaxis.

The adoption of this policy by the health centre will assist in securing the co-operation of the practising physician, who will be all the more disposed to co-operate as the centre, in view of its equipment, is in a position to provide him with valuable assistance in his daily practice.

In discussing the phrase "necessitated by the requirements of social prophylaxis", the Conference had in mind such diseases as tuberculosis, malaria, syphilis, trachoma, hookworm, etc., in which treatment bears an important relation to prevention.

Every attempt should be made to bring the practising physician within the influence of the health centre. It would be to the interest of the population, as well as of the physician, if the latter were to be provided by the primary or secondary centre with X-ray and laboratory facilities for the diagnosis of tuberculosis.

8. Personnel.

(a) The Director. — The primary health centre, like all other health organisations, is under the general direction of the public health officer and of the health administration of the State.

Its actual administration may be entrusted either to an expert medical officer of health (trained in a school of hygiene) or to a general practitioner with a satisfactory knowledge of medicine and the necessary supplementary training (refer to the reports and conclusions of the Conferences of Directors of Schools of Hygiene). This training should, in particular, relate to social hygiene and preventive medicine on the one hand, and on the other to the knowledge required to meet the specific needs of the centre he directs.

In most instances the smaller primary health centres and branch health centres will be directed by the village general practitioner. In order to ensure that he will administer the centre properly, he must have a sound knowledge of general medicine and have received supplementary training in public health. The Conference of Directors of Schools of Hygiene which met at Dresden in July 1930 directed attention to this matter in the following recommendation:

“For those communal health officers who are only appointed as part-time officials, post-graduate instruction in the various branches of public health and preventive medicine is urgently required, especially for those who had no opportunity of obtaining specialised training prior to their appointment.”

Finally, he must have special knowledge concerning the principal health problems with which the centre has to deal.

In the different countries, various methods of providing such training have been adopted. Courses are given for this purpose in schools of hygiene, and these are supplemented in some cases by practical work, sometimes at secondary health centres (Yugoslavia). In Hungary and Warsaw, special courses are given to medical officers in charge of health centres, but these have been restricted mainly to officers in charge of larger secondary centres.

(b) *The Public Health Nurse (Health Visitor).* — The Conference recorded in emphatic terms its opinion of the value of public health nursing work. In regard to the question of generalised and specialised health nursing in rural districts, it was unanimous that the generalised type of nursing should be the rule — in particular, because of its greater efficiency and economy in budget and personnel.

No organisation concerned with social hygiene can afford to dispense with the services of the public health nurse.

Generalised (polyvalent) rather than specialised public health nursing should be the rule in rural districts.

The Conference reached no final conclusion concerning the area and population to be served by a primary health centre, as it was felt that these would vary in each country and would be determined in each case by the preliminary survey. Nevertheless population figures were given in respect of several countries and these varied from 400 to about 4,000, the average being two thousand.

The Conference was supplied with data by the health nursing service in Hungary, on the population which a general health nurse could serve in rural districts.

These were based on the following conditions:

- (a) Birth rate 25 (150 births a year in a population of 6,000);
- (b) Tuberculosis death rate: 200 per 100,000 of population (48 patients);

- (c) Number of elementary school children: 600;
- (d) Suitable means of communication;
- (e) An 8-hour day and a 44-hour week.

Her work would consist of:

- (1) Visits to homes of the new-born and infants;
- (2) Visits to homes of the tuberculous;
- (3) Visits to infectious disease patients;
- (4) Assisting the physician in the examination of school children;
- (5) Holding infant welfare and tuberculosis conferences once a week.

Of her time, 48.2 per cent would be spent in home visiting, 25.9 per cent in schools and clinics, 14.8 per cent in travelling and 11.1 per cent in office work, keeping records, etc.

If more than 20 per cent of her time is spent in travelling, the nurse's district is too large (either because of the size of the area, the population, or because of lack of proper means of communications — good roads, motors, etc.).

Under these circumstances, a nurse might carry out the minimum nursing programme of the primary health centre for a population of not more than six to eight thousand. In Denmark, a visiting nurse deals with numbers as low as 1,600 to 2,000, whereas the child welfare nurse (specialised) can serve 10,000.

Naturally, the size of the population served effectively by a nurse depends on the health conditions obtaining, and the work she undertakes.

In view of these considerations, the Conference agreed that:

Depending upon the various activities of the centre, and the amount of work to be done, one nurse may serve one or more centres.

By means of an intelligent adaptation of her work to the minimum programme of the centre, and taking into consideration such varying factors as the number of families and of patients requiring her attention, the density of the population, the distribution (dispersion) of homes and the means of communication, a nurse may undertake to serve a population of between six and eight thousand.

Nurses whose training and experience have been acquired solely in cities lack knowledge of rural districts and sometimes of rural dialects, as well as experience of the privations of rural life.

The nurses employed in the primary and secondary centres should be in possession of diplomas as general public health nurses (from a recognised or State school) and should have received, during their professional education, theoretical and practical training which would fit them for their rural work.

In several countries, the demands for the organisation of modern public health work have been in excess of the supply of suitably-trained public health nurses.

When it becomes necessary to organise or extend the rural health service, in the absence of sufficient graduate nurses, possessing diplomas in general public health nursing to fill all

the vacancies, is it wise to resort as an emergency measure and only temporarily to the services of a personnel which has received only elementary and partial training?

After considering this possibility in all its aspects, the Conference decided to reply in the affirmative, having regard to the importance which attaches to the organisation and extension of a modern rural health service.

Without doubt, but this method should be applied only on condition that it is altogether provisional, and on the understanding that the personnel so employed shall leave the service at the end of fixed period (at the latest as soon as such personnel can be replaced by graduate public health nurses) unless they undertake to complete the training leading to the award of the diploma mentioned above.

The Conference felt that the health authorities themselves were morally bound to provide such supplementary training in the case of temporarily employed nurses, so that there is a reciprocal obligation.

(c) *The Midwife.* — The Conference felt that the midwife might be utilised to supplement the work of the visiting nurse providing she had received proper training and her work was strictly defined. The danger of permitting a midwife to come into contact with infectious cases was pointed out.

Should the services of midwives be utilised in the work of the centre, and if so, under what conditions and in what way?

The fact that the midwife is in a position to render important services to the centre in the care of pregnant women (pre-natal care) as well as in the supervision of the infant during the first days of life, is beyond question.

In these respects, the midwife will become a useful assistant to the nurse entrusted with this work, solely on the condition, however, that she possess the proper qualifications, not only as a result of her training (diploma in midwifery) but also on account of the special instruction she has received in the work entrusted to her.

Under these conditions, the midwife may be attached to the personnel of the centre, to carry out these well-defined tasks, under the direction of the medical director of the centre. The possibility of utilising her services in this capacity will be facilitated in the case of midwives already in the employ of villages (communes).

(d) *The Sanitary Inspector.* — Experience has shown that the resources of the primary health centre do not permit the employment of trained sanitary engineers. It is essential, however, that the sanitary inspector should be under the technical direction of such experts, while working under the general direction of the chief of the centre.

In some countries, the sanitary legislation provides for the employment of *disinfectors*, and these, after receiving supplementary instruction, may be utilised as sanitary inspectors.

The sanitary inspector will be entrusted with the supervision and execution of minor sanitary improvements (under the technical supervision and direction of the sanitary engineer attached to the secondary centre) as well as of the measures having to do with general health work such as disinfection, etc.

II. THE SECONDARY HEALTH CENTRE.¹

9. *The secondary health centre is a more fully developed organisation than the primary centre on account of its greater completeness of equipment, its larger personnel and the wider scope of its work.*

The secondary centre directs and co-ordinates the work of primary centres and, at the same time, ensures liaison between them and all other health and welfare agencies — in a word, with all agencies connected with the promotion of public health.

10. *Programme. — In addition to its work as a primary centre (in its immediate neighbourhood) and to the prevention of those diseases which have been shown to be important problems by the preliminary survey already mentioned, the secondary centre should deal with the following:*

- (1) *The campaign against tuberculosis;*
- (2) *The campaign against venereal diseases;*
- (3) *Maternal welfare work;*
- (4) *Infant welfare work (including the child of pre-school age) with special emphasis on the welfare of the child of school age (school polyclinics);*
- (5) *Health education — first, for the general population; second, by means of special courses and field work for (a) doctors, (b) nurses, (c) midwives, (d) sanitary engineers and inspectors;*
- (6) *Sanitation;*
- (7) *Laboratory analyses, of a simple and routine character.*

The Conference was of the opinion that, in addition to this work, the centre might undertake the provision of first aid in urgent cases and ensure the prompt transport of sick and accident cases by supervising the proper organisation of this service.

The Conference noted with approval that secondary centres in some countries (Yugoslavia, etc.) made use of museums of hygiene (stationary and mobile) and the cinema, and that these centres were utilised for giving practical training to public health personnel.

The Conference was presented with an outline of the sanitary work to be undertaken by the two classes of centres.

This outline (document C.H.942) may be summarised as follows: Rural sanitary work should include supervision of:

- (a) *Water supplies, individual and communal; wells, springs, cisterns, water purification;*
- (b) *Sewage disposal — latrines and excreta disposal in unsewered districts, sewerage and drainage of villages with sewers, treatment and disposal of sewage to prevent pollution of water courses;*

¹ In some countries in Europe, there are provincial or county health officers who have jurisdiction over areas larger than those served by secondary health centres. Such health officers may co-ordinate the work of the secondary health centres.

- (c) Refuse, garbage, ashes and manure disposal and utilisation;
- (d) Dairies and milk production, food factories; their cleanliness, sanitary efficiency, suitability of machinery;
- (e) Laundries and laundering facilities; where streams, etc., are used for this purpose in rural districts, facilities should be supplied and the installations supervised;
- (f) Drainage (*bonification*) of the soil to prevent malaria; draining and filling of marshes and pools, correction of water courses, etc.;
- (g) Bathing facilities; school, public, open air and covered baths;
- (h) Housing: Damp prevention, ventilation, illumination, heating, material utilised in construction, sanitary fittings, etc. (this includes schools and other public buildings, hotels, shops); housing of animals;
- (i) Factories and workshops — sanitation and prevention of risk;
- (j) Transport facilities; sanitary condition of public conveyances, etc.;
- (k) Settlements in general — choice of site, orientation, water supplies, sewage and wastes disposal, playgrounds and parks;
- (l) Sanitary institutions, such as construction of health centres, dispensaries, preventoria, sanatoria, hospitals, etc.;
- (m) Enforcement of all sanitary laws.

II. Personnel.

(a) *Medical Director.* — *The Medical Director of the secondary centre should be a full-time physician trained in public health; this work should preferably be entrusted to the medical officer of health in charge of the district.*

(b) *Nurses.* — *The rules set out above concerning public health nurses also apply here, it being understood, however, that, in view of the greater development of the secondary centre, the nursing staff attached to it should be in proportion to the work.*

(c) *Midwives.* — *The considerations set out above concerning the employment of midwives apply also to the secondary centre.*

(d) *The Sanitary Engineer.* — *Sanitary engineering work forms an integral part of the work of the secondary centre.*

This service should be directed by a sanitary engineer with special training for rural work who will be attached to the staff of the centre or seconded for that purpose from the Central Institute, according to local conditions.

The sanitary engineering work in the district served by the secondary centre will, in general, deal with all matters concerning major and minor sanitation, such as provision of pure water, sewage and refuse disposal, housing, etc.

(e) *The Sanitary Inspector.* — *As many as may be necessary, in view of local conditions (see the considerations above respecting these inspectors).*

According to the sanitary engineers invited to attend the Conference, sanitary engineering work should be divided as follows among the different classes of centres (including here the State Institute of Hygiene) (document C.H.942).

The Sanitary Engineering Division of the Central Institute would be responsible for:

- (1) The general organisation and supervision of sanitary engineering, and its co-ordination in the whole of the Institute's territory;
- (2) Direction and policy of that service;
- (3) Collection of main data, study of existing conditions, definition of problems to be solved;
- (4) The solution of such problems; preparation of standard schemes for the main problems, such as water supply, sewage disposal, housing, manure storage and disposal;
- (5) Preparation of material for educational purposes, such as photographs lantern slides, models, exhibitions, etc.;
- (6) Preparation of model plans for public health institutions, such as health centres, hospitals, etc.;
- (7) Laboratory work connected with sanitary engineering, routine of control of water supplies, sewage disposal, etc. Studies of special scientific and practical problems;
- (8) Training of sanitary engineering staff;
- (9) Study and approval of plans made by public and private agencies for sanitary work — water supplies, etc.;
- (10) Preparation of draft laws and regulations governing sanitary matters for the use of State, provincial or communal legislative bodies;
- (11) Research into problems of sanitation.

The engineer in the secondary health centre is to be charged with the actual executive work. He is the supervising and law-enforcing agent of the service, in control of the territory served by the centre, under the direction of the head of the centre.

(f) *Laboratory Technicians.* — *In the administration of the public health services, it should be emphasised that, as a general rule, the laboratory investigations (which not only necessitate the most careful technique, but also a fully experienced staff and the most complete equipment) should be undertaken at the Institute of Hygiene, and that only analyses of the most elementary and routine character should be made at the secondary centre.*

Consequently, it will not be necessary in most cases to secure for the centre the services of an expert laboratory technician, as it should be possible to utilise the existing staff for the elementary work which may have to be done.

The State Institute or central hygienic laboratory will utilise the secondary centre as a depot and centre of distribution for its sample containers.

This is the personnel essential for the administration of such a centre, but in case of greater development of one or more of its sections, it may become necessary to secure the services of other technicians (for X-rays, etc.).

Naturally, a suitable subordinate personnel will be required for its internal administration.

12. Committees which might assist the Primary and Secondary Health Centres.¹ — The Conference was of opinion that the work of these centres might receive greater support through the establishment of committees; first, the official health committee provided for by the sanitary legislation of the State; secondly, a non-official committee, including in its membership representatives of the local administration, the medical profession, social insurance organisations, the teaching profession, the clergy, private welfare agencies, and, in general, of all who might contribute to the development and the prosperity of the centre on account of their moral, political or financial influence.

The present health laws of Yugoslavia provide for the establishment of the official committees which are usually constituted as above.

The attention of the Conference was directed to the value of certain committees in connection with public health nursing work, in bringing the nurse into close touch with certain classes of the public and in enlisting their interest and support in her work. Such committees might be: *pre-natal* (to refer pregnant women to the nurse; help with the household work of lying-in mothers, etc.), *child hygiene* (to bring sick infants to the clinic, assist at the clinic, etc.), *school hygiene* (assist during health examination of school children, etc.), *tuberculosis, social work, health, education, etc.* (document C.H.940).

The following principles concerning *equipment and relationship* were adopted.

13. Equipment. — The secondary centre should be fully equipped in accordance with the requirements of public health and modern medicine. In particular, there should be: a standard Röntgen ray outfit (a mobile outfit as well, if necessary); shower-baths; motors for the transport of the staff.

The Conference considered that failure to provide the staff with the means of transport to enable them to do their work rapidly and to reach all parts of their district would reduce greatly the scope of their technical work.

14. Relationship of the centre to other health agencies. — Certain of the agencies with which the health centre should be in relationship (secondary health centres, specialised dispensaries, institutes of hygiene) also form integral parts of the general health organisation of the country. In such cases, the proper relationship already exists. With others (establishments for treatment and prevention, hospitals, sanatoria, preventoria, social insurance institutions) relationships should be established which will permit the centre to obtain their help either directly or through the secondary centres.

* * *

¹ In regard to committees which might assist the district health officer, see page 22.

DECLARATION OF THE REPRESENTATIVES OF SOCIAL INSURANCE INSTITUTIONS.¹

The report of the Conference on Rural Health Centres, held at Budapest from October 27th to 31st, 1930, states that the rural health centre, the object of which is to promote the health and welfare of the people in a given area, attempts to attain that object "by grouping under one roof or co-ordinating in some other manner, under the direction of the health officer, all the health work of that area, together with such welfare and relief organisations as may be related to the general health work".

The representatives of agricultural social insurance fully subscribe to European efforts at collaboration tending to promote rural hygiene, and declare themselves willing to co-operate with the public health services under those conditions and according to those methods which take due account of the legal status of insurance institutions, as well as their character, the sources of their funds and their obligations to their members.

Insurance institutions have rights and obligations determined by law. They derive the largest part of their funds from the contributions of the insured and from employers. In return, they must organise on behalf of their members services of cash benefits and of benefits in kind which are closely interrelated. They are administered by independent bodies composed of representatives of insured and of employers under the control of public authority and responsible to the whole group of insured and employers. Such an organisation brings about a union of the interests involved, which renders possible and facilitates the efficient action of the directing bodies which are supported by the whole insured group.

The representatives of insurance institutions consider that this form of administrative, economic and social organisation, which has proved its worth, deserves to be safeguarded, and that, in consequence, the relations to be established between the public health services and insurance funds in view of the objects of interest to both, should be relations of co-ordination.

¹ The Budapest Conference on Rural Health Centres included no representatives of health insurance institutions, which are important factors in rural hygiene. The Preparatory Committee proposed that representatives of such institutions should be invited to the second session of the Commission on Health Centres. Accordingly two representatives, selected by the International Labour Office attended the meeting, held at Geneva on April 28th, 1931, which resulted in the report on the second item, and made this declaration which was accepted by the Commission.

Methods of co-operation between the public health services and insurance institutions are described on page 22.

CHAPTER IV. — REPORT OF THE EXPERTS ON THE THIRD ITEM ON THE AGENDA.¹

“Sanitation in Rural Districts: The Most Effective and Economical Methods.”

GENERAL CONSIDERATIONS.

The experts consider that the improvement of rural sanitation which tends to raise the standard of life in rural districts is dependent in the first instance on economic conditions and education in hygiene.

Schoolchildren in rural schools should receive health instruction adapted to rural needs and conditions.

The Health Authorities should strive to spread the knowledge of hygiene among the people by every available means.

The experts recommend particularly the practice of providing significant examples of good hygiene and sanitation, which should be located where their advantages may be seen and appreciated by the people — e.g., model houses.

Courses in hygiene for builders, contractors and leaders among the rural population are particularly effective.

Education stimulates the desire for sanitary improvement; suitable legislation provides the means by making cheap credit accessible by grants, bonuses and loans.

Legislation is not effective without proper enforcement and competent supervision.

While the local authorities may be responsible for sanitation there should be central direction, supervision and stimulation.

There should also be co-ordination of the work of all agencies concerned in rural sanitation.

The work of rural sanitation should be based on a close study and appraisal of all the factors at play.

Particular emphasis should be laid on the necessity for rapid and constant means of transport and communication in rural districts for the purpose of rural housing and health services.

Agricultural associations for the improvement of rural life in many fields are potent means of propaganda and should be led to take an interest in water supply, good housing and other aspects of rural sanitation. The health authorities should co-operate with such associations to this end.

¹ The following experts prepared this report at Geneva on May 12th to 15th, 1931:

- M. VIGNEROT (Chairman), Chief of Rural Engineering, Ministry of Agriculture, Paris;
- M. M. PETRIK, Chief of the Division of Sanitary Engineering, Institute of Hygiene, Zagreb;
- M. Alexander SZNIOLIS, Chief Engineer, School of Public Health, Warsaw;
- Mr. O'DWYER, Chief Inspector of Sanitary Engineering, Dublin;
- Mr. J. F. DUNCAN, Secretary-General of the Scottish Farm Servants' Union, Lanarkshire;
- M. W. F. J. M. KRUL, Director of the Bureau of Water Supplies, The Hague;
- Professor GOTSCHLICH, University Institute of Hygiene, Heidelberg;
- Professor BÜRGER, State Institute for the Hygiene of Water, Soil and Air, Berlin;
- M. Ludovic BONAMICO, Chief Engineer of the Bureau of Civil Engineering, Rome;
- M. G. ONGHENA, Chief Engineer, Union of Belgian Farmers, Louvain;
- M. VAN DER KAA, Chief Inspector of Housing, The Hague;
- M. Julio JORDANA, Engineer, Hydrographic Confederation of the Ebro, Zaragoza;
- Mr. H. ROSS HOOPER, Consulting Engineer, Chippenham, England.

A. Sewage Disposal.

I. SEWERAGE SYSTEMS.

The experts are of opinion that a water carriage sewerage system is the best method of removing sewage.

Sewers can only be installed in rural communities having public water supplies piped to the individual houses.

The practicability of installing sewerage systems depends on the density of the population, the character of the soil and the existing economic conditions.

Open drains, intended to remove rain water and street washings may, under special conditions and when no better system is possible, be used for slop water and other house wastes. Excreta should be excluded from such drains.

Such conditions are found in industrial rural areas where wastes like phenol exert a disinfecting action on the contents of the drains. Open drains may also be used for this purpose in rural districts other than industrial when nothing better offers, providing they are properly fenced off, regularly supervised and the configuration of the surface of the soil permits of a rapid flow (hilly districts).

In making these and other recommendations, the experts desired to give due recognition to practicability and economy as well as to efficiency. It would be impracticable in many instances to instal sewers in rural districts where the formation is rocky, or where the houses are scattered.

2. THE DISPOSAL OF SEWER EFFLUENTS.

Sewer effluents may be disposed of by permitting them to flow into a watercourse, lake or tidal basin.¹

Such a method of disposal is satisfactory providing:

(a) That the quality of the water at a given distance below the sewage outfall is equal to the quality of the water above the point where sewage enters;

(b) That the dilution is sufficiently great: the rule that the volume of the stream should never be less than 100 times the volume of the sewage previously cleared of solid matter gives good results in practice.

The system of disposing of sewer effluents described above is the simplest and may be used under the prescribed conditions. Obviously unpurified sewage should not be permitted to flow into a stream above the point at which water is taken for drinking purposes.

¹ One of the experts, M. A. Sznolus, sanitary engineer at the State Institute of Hygiene, Warsaw, did not agree with this and other recommendations (marked with an asterisk) on sewage disposal, and asked that the following statement should be included in the report:

“(1) I believe that before sewage is discharged into a river it should be mechanically purified;

“(2) The recommendation as to the use of fixed racks is not practical as these require frequent cleaning, and this is not always possible in rural districts (3 A);

“(3) I do not believe we should recommend the use of leaching cesspools (4 A).”

3. PURIFICATION OF SEWAGE EFFLUENTS.

When it becomes necessary to purify sewage effluents as in:

- (a) *Closely-populated rural districts;*
- (b) *Districts without an abundance of surface water;*
- (c) *Districts where it is desirable, to limit stream pollution to a certain maximum,*

a number of methods may be adopted in rural districts. These should be simple, adapted to local conditions and require a minimum of care by unskilled staff. These methods are mechanical and biological.

A. Mechanical Methods. — *The simplest mechanical method is the use of fixed racks* intended to retain the solids.*

Settling-tanks also effect a certain amount of purification depending upon the condition of the sewage and the velocity of flow in the tank. In practice, a tank with a capacity of 0.62 of the daily volume of the dry-weather flow, the width equalling one-third of the length, gives good results.

B. Biological Methods. — *These are always preceded by mechanical methods. The principal biological methods are:*

(1) *Sprinkling filters: These are best adapted to rural conditions, being inexpensive to instal and maintain, requiring little attention and no trained personnel and being capable of easy repair;*

(2) *The remaining methods — such as activated sludge (as at present constituted), contact beds or sand filters — are not adapted to rural conditions.*

4. OTHER METHODS.

The following methods may also be used:

A. Leaching Cesspools* and Subsoil Irrigation. — *These methods can only be used when the ground water is not employed as a source of domestic water supply.*

Subsoil irrigation is well adapted for small amounts of sewage such as the effluents from single houses, institutions or small settlements.

Subsoil irrigation should be preceded by some form of mechanical or biological purification.

B. Surface Irrigation. — *This method is one of the best for rural conditions if the soil is suitable, the area sufficiently large and the treatment properly supervised.*

The main consideration should be the proper disposal of the sewage rather than the raising of good crops.

The experts confined their recommendations to simple methods as the more complicated ones require expert supervision and considerable attention, both of which are beyond the reach of many rural districts.

5. DISPOSAL OF SEWAGE IN UNSEWERED DISTRICTS.

The main objects of proper sewage disposal in unsewered districts are:

- (1) The protection of the surface of the soil;*
- (2) The protection of the subsoil water;*
- (3) The protection of the sewage from access of flies.*

These objects can best be attained by the use of water-tight receptacles in a fly-proof superstructure.

As fresh excreta may contain pathogenic micro-organisms and intestinal parasites, provision should be made for storage of sufficient duration to destroy such organisms.

Methods of providing for such storage are watertight tanks with two compartments for alternate use, or double compartment tanks of which only the second can be emptied.

Another method is the use of pails. As these contain fresh material some form of disinfectant should be used, or the contents should at least be covered with dry earth, peat or other deodorant.

The pail system operates more satisfactorily when there is a public system of collection under proper supervision. As such a system is difficult to maintain in rural districts the disposal of the material must unfortunately be left to the householder whose education in hygiene is not usually sufficient.

Single-compartment tanks may be used in villages where a proper system of collection exists. The contents should be transported in watertight containers to a suitable distance and properly treated, as, for instance, by placing alternate layers of sewage and dried peat in a large open tank.

In rural districts where it is not necessary to prevent the contamination of ground water ordinary unlined pits may be used.

The Java type of privy, consisting of a deep hole of small diameter, into which basket work is inserted, is apparently suitable. It requires further study.

Whatever the method of sewage disposal adopted for individual houses, the privy should be located as far as possible from the well or other source of water supply.

Methods of sewage disposal in unsewered rural districts are the subject of regulations in many countries. In some cases, the Central Health Authorities prepare model codes suitable for adoption by the competent local authorities. The study of the most suitable methods and the preparation of plans and construction of model privies have given good results.

These codes should regulate the minimum distance of the privy from the source of individual water supply. In existing codes this varies from five metres (Netherlands) to ten metres (Prussia).

6. DISPOSAL OF MANURE.

Solid and liquid stable manure should be stored in watertight pits situated as far as possible from the house and arranged in such a way as to expose the smallest possible surface to flies. The pits should also be so arranged as to prevent the contents being subject to the washing action of rain water.

Manure pits should be provided with a special watertight compartment for the liquid manure.

The experts recommend that the prevention of fly-breeding by measures tending to promote the development of heat in manure piles should be made the subject of further experiment and study.

In Germany, a process known as *Heissvergärung* (heat digestion) has been developed. The pit is of smaller area, and the manure pile is thus built up more rapidly and to a greater height than usual, the sides being protected by boards. The temperature in the interior due to fermentation reaches from 55° to 60° C., which is sufficient to destroy fly larvæ. This and other methods of preventing fly-breeding require further study.

7. DISPOSAL OF GARBAGE.

In built-up rural villages, the regular collection and systematic disposal of house garbage and refuse is the most effective method.

This material may be disposed of by dumping frequently in thin layers and covering with earth, ashes or other dry refuse. Such a method of collection and disposal requires careful and competent supervision.

Another method of disposal is to feed the garbage to pigs, either collectively or on the individual farms. When this method is adopted collectively, the collection and disposal is usually let out to a contractor whose sole object is the fattening of the pigs and who is apt to neglect sanitary considerations.

Garbage is also a prolific source of flies and measures should be taken to prevent fly-breeding.

A safe rule to adopt is to treat garbage as infectious matter and to dispose of it in such a way as to prevent the pollution of the surface of the soil, the subsoil by percolation (ground water) and the houses in the neighbourhood by flies which breed in the garbage.

Methods of treating garbage by tanks permitting of the development of heat are worthy of further experiment and study.

Incinerating and utilisation plants, while satisfactory, hardly come within the means of rural communities. Home incinerators give satisfactory results.

At Florence, a special concrete tank has been devised which is easy to build and can be made in various sizes. The cell is filled with garbage and refuse, moisture is added and digestion is allowed to go on for from four to six weeks. Temperatures of from 50° to 60° C. are developed.

B. Water Supply.

An abundant supply of pure water in rural districts is not only an important factor in the protection of the health of human beings and of cattle, but is also of great value in the promotion of agriculture.

An abundant water supply has a direct influence on the public health, as it prevents the spread of water-borne disease. It has also an important indirect influence due to the cleanliness it promotes in houses, stables, dairies, etc.

Water supply systems aid the farmer by permitting the watering of grazing cattle, and furnishing means for extinguishing fires and for irrigation.

I. PUBLIC WATER-SUPPLY SYSTEMS.

(a) For a Number of Villages. — *The system of central water supply distributed to a number of villages is, when practicable, the best for rural conditions. A large supply is always to be preferred to a smaller one. This system is to be recommended particularly in the more populated areas, and for districts in which suitable water sources are few, as it permits of the most advantageous utilisation of the potable water.*

The co-operation of a number of villages to secure a joint water-supply system permits of a more adequate plant, gives the opportunity to employ skilled personnel and also permits the use of methods of purification when necessary. It follows that the source which can be developed most economically may be selected, as purification will remove the possibility of danger. In the case of these central water supplies, any modern method of purification may be adopted as it will be carefully applied and supervised.

Collective water-supply systems for groups of villages have developed rapidly in recent years in a number of European countries.

These regional or collective water-supply systems are especially numerous in the Netherlands, where nearly five million persons, or 63 per cent of the population, benefit from the use of a water-supply system and the authorities expect that all communities will be supplied in ten years. There are twelve collective water systems in operation supplying more than 350 communes and two more systems for seventy-seven communes are being installed. In addition, plans for reclaiming the land now under the Zuider Zee provide for large collective water-supply systems.

This system is also being applied in France ; the plant at Santerre in the Aisne which supplies 89 communes, is one of many.

In Germany, a good example is found in the State of Saxony where the development of sources on the rivers Mulde and Wilzsch will, in the first instance, provide running water for fifteen communities.

At the end of 1929, there were forty-three group supplies in Czechoslovakia supplying 214 communities with a combined population of 206,000.

The province of Brabant in Belgium has a group supply for eleven communities.

Group systems are also being constructed in other countries, including Yugoslavia.

(b) For Individual Villages. — *The source of the village water supply should be selected after appropriate investigations in order to secure a water free from the possibility of any dangerous contamination.*

The necessity for any system of purification is to be avoided as such systems require technical supervision, which is not usually available in rural districts.

Village water supplies should be constructed with due regard for simplicity of design, economy and ease of operation and maintenance.

2. PURITY OF THE WATER.

When treatment is necessary, it should be safeguarded in every possible way. The lines of defence should be ;

(1) Protection of the source ;

(2) Purification (sedimentation, filtration, etc.) ;

(3) Disinfection ;

(4) Supervision.

Protection of the source and supervision of the supply are necessary in any case.

When the water is drawn from rocky formations in which fissures exist (limestone, karst) it should be adequately purified. Disinfection by chlorine is at present a practical solution.

When contamination occurs only at rare intervals and for short periods it is advisable to apply chlorine throughout the year, otherwise, when the occasion arises, the apparatus may be out of order. Nevertheless, during the periods of the year when no danger threatens, very small amounts of chlorine may be used, and these may be increased when necessary.

When there is any possibility that a water supply may be responsible for an outbreak of intestinal disease, chlorine should be applied immediately and continued until the investigation is completed.

Portable chlorinating plants should be available at central institutions for use in case of emergency, such as the threatened pollution of a normally pure water supply.

3. SUPERVISION OF WATER SUPPLIES.

Constant supervision of all public water supplies is necessary. This supervision should relate to the source of the supply, the plant and the distributing system, as well as to the effluent, and should be closest during the seasons when the supply is most likely to be contaminated (dry season, floods, etc.)

The personnel engaged in this supervision should be trained in the hygiene of water.

Water-supply systems for individual villages in European countries have also developed rapidly in recent years. Thus in the County of Essex, England, the number of houses supplied from water mains increased from 2,801 in a total of 6,897 in 1925 to 3,735 out of 8,270 in 1929.

In Czechoslovakia, from 1918 to 1928, 1,287 kilometers of mains were laid in Bohemia, Moravia, Silesia and Slovakia, excluding those in large cities. In 1930 and 1931, 304 water supplies were constructed in the whole country.

In Denmark, the number of rural waterworks increased from 62 in 1900 to 1,200 in 1924. As ground water is abundant and electric power available everywhere small systems are the rule.

In France in 1930, 8,604 or 23 per cent of the communes had waterworks in operation or under construction, and new requests are being received so rapidly as to overwhelm the competent services.

These examples suffice to show the great development of water-supply systems in European countries in recent years. Progress in the matter of waterworks has followed closely the spread of electricity to rural districts. The use of electric current and machinery permits of the use of sources otherwise difficult to develop, and it is cheaper and simpler to maintain, requiring practically no skilled supervision.

4. INDIVIDUAL WATER SUPPLIES.

These may take the form of wells, springs and cisterns. They should be constructed by qualified persons who have received proper instruction in the elements of hygiene of water, otherwise they are apt to be dangerously located, badly constructed and improperly protected.

The competent authorities should adopt regulations providing for the proper location, construction and protection of individual supplies, and these regulations should be adequately enforced.

For the guidance of local authorities, a model code should be prepared by the central health services.

Even in the most highly developed countries most of the rural population must depend on individual water supplies — wells, springs and cisterns. It is a very serious undertaking for the health authorities to supervise such supplies. Their first attention might well be given to individual supplies which are used by numbers of people — school wells, public wells, water supplies of shops which deal in food products, etc. The construction of model wells at places where they will be seen and used by large numbers of people is to be recommended. The example of the Prussian Institute for the Hygiene of Soil, Air and Water, which gives courses in the hygiene of water to contractors who construct wells, might well be followed. Where resort must be had to cisterns, the use of lead conduits is to be avoided.

5. THE CENTRAL ORGANISATION.

Progress in matters of water supply must be based on scientific research centralised in a suitable organisation, which thus constitutes a hydrological and geological intelligence service for the purpose of locating suitable sources of water supply and for the collection of all other relevant data.

Such an organisation should as far as possible have jurisdiction over all matters affecting water supply in the State or province.

It would be difficult to over-estimate the advantages of a central organisation of this kind. In view of the information at its disposal for the entire State or province, and the expert knowledge of the specialists attached to it, such an organisation would be in a position to ensure that the existing water sources are utilised to the best advantage and that partial solutions of water-supply problems are avoided.

Such an organisation would place at the disposal of individuals, societies and communities technical information and expert advice on matters of water supply and would act as a centre for the education of the people in the hygiene of water.

Examples of the central water supply organisation recommended by the experts are the Netherlands Government Office for the Supply of Drinking water and the Prussian Institute for the Hygiene of Water, Air and Soil. Institutes of hygiene in other countries do much the same work.

The Netherlands Government Office advises the Government on all matters relating to the water supply — the grant of subsidies, the examination and preparation of plans, supervision over construction and operation of subsidised water systems, the preparation of legislation, etc.

The office also places its services at the disposal of the provincial and municipal authorities in matters of water supply; it acts as a centre for propaganda and education in hygiene and carries out hydrological and geological enquiries.

The Prussian Institute carries out similar work. The courses it gives annually to contractors who construct wells have been mentioned.

There is no doubt that central organisations of this kind promote safety, economy and efficiency in matters of water supply.

One of the most valuable services they can render is to impress upon rural populations the necessity for abundant supplies of pure water.

C. Housing in Rural Districts.

1. *There is urgent need for improvement in the housing conditions of rural districts. Progress in this respect is hindered by the depressed condition of agriculture, the lack of cheap credit and the fact that education in hygiene in rural districts has not reached a sufficiently high level.*

The housing shortage in cities has led in most countries to concentration on the housing problem in industrial areas, and the needs of rural districts have not always received the attention they deserved.

Suitable housing is a fundamental requirement for rural hygiene. It is influenced by social and economic conditions and in its turn exerts a strong influence on these conditions, resulting in better health and a general elevation of the standard of life.

2. *The principal defects of rural housing from the point of view of hygiene are:*

(a) *Overcrowding. Good houses are too few. There are too few bedrooms in the existing houses. The house may be too small or, in planning it, the existing space may have been insufficiently utilised.*

(b) *There is inadequate provision of toilet and sanitary facilities.*

(c) *The living quarters are insufficiently protected from the stables.*

(d) *The house is so located and constructed as to suffer from dampness*

(e) *There is a lack of proper ventilation, lighting and heating.*

(f) *There is insufficient protection from mosquitoes and flies.*

(g) *There is insufficient exposure to the sun.*

There should be sufficient bedrooms in the houses to permit of separation of adults and children, as well as of the sexes.

Stables may be under the same roof as the house, providing there is proper protection or separation. The custom of having the living quarters over the stables is not to be recommended.

If the building is not properly constructed, capillary attraction will cause dampness of walls and floors.

The area of the windows in proportion to that of the floors is not usually sufficient for the admission of light and air.

Open fires without vents are unsatisfactory and should be replaced by other methods of heating. The use of closed stoves in fire-places, as in Belgium and the Netherlands, makes for better heating, less air pollution and economy in fuel, while the advantages of fire-place ventilation are preserved.

Shady trees are often placed so as to prevent the access of sunshine.

The water supply and the privy are frequently inconveniently situated and badly constructed. If properly planned and built, there is no reason why both should not be situated nearby or even adjacent to the house.

Systems of individual water supply under pressure, if properly designed, are not expensive and offer many sanitary advantages.

The entrance of mosquitoes and flies may be prevented by screening windows and doors, planning the house without recesses where mosquitoes may shelter, placing the stables between the house and breeding-places, etc.

3. *Methods of improving Rural Housing. — These are :*

- (a) *Education ;*
- (b) *Cheap credit and improved methods of agriculture ;*
- (c) *Legislation, by-laws and regulations, provided there is sufficient supervision and enforcement.*

The practice of making public buildings models from the point of view of hygiene and sanitation is highly recommended.

The construction of model houses at numerous strategic points encourages imitation.

Good housing will appeal more readily to the rural population if the plans are prepared after a study of local customs and social and economic conditions, so as to preserve features characteristic of the district.

Loans at low rates of interest and grants may be provided by legislation, and are potent means of improving rural housing. The award of bonuses for proper construction yields a large return for the investment of small sums.

There should be building codes prescribing minima requirements in respect of sites, exposure, lighting, ventilation, and all sanitary requirements. Technical supervision and enforcement are required to make these effective.

Such enforcement should not be left altogether to the local authorities.

The health authority should have jurisdiction over all sanitary aspects of housing.

The preparation and distribution of standard plans satisfying the sanitary requirements has given good results and should be encouraged. Such houses should be of simple design and economic construction.

In ascribing to education an important influence on good housing, the experts had in mind general culture as well as education in hygiene. The Folk High Schools of Denmark furnish a particularly striking example of the influence of general education on rural housing.

Legislation which provides for grants, bonuses and loans has played an important part in the promotion of good housing in all important European countries.

In England in 1926, the Housing (Rural Workers') Act was passed "to secure a contribution to the improvement of housing conditions for agricultural labourers and other country workers by facilitating the reconditioning of old houses in such a way as to bring them up to modern standards of comfort and sanitation".

At the end of 1928, 2,070 requests for grants or loans had been received and more than £100,000 disbursed.

An Agricultural Credits Act was passed in 1928 providing for advances towards the construction of cottages, and a new Housing Act adopted in 1930, which entitles County Councils which undertake re-housing to grants from the Exchequer repayable in forty years.

The Act of 1902 (Woningwet) regulates housing in the Netherlands. This requires every commune to adopt by-laws regulating housing, contains provision for the elimination

of houses unfit for habitation, and provides for advances for the purchase of land and the building of houses to companies, societies and institutions. Up to the end of 1923 these advances amounted to about 1,400,000,000 gold francs for 121,595 houses.

In 1916 a law was passed providing loans to agricultural workers for the purchase of smallholdings and the construction of houses. From 1919 to August 1929, 3,164 loans were granted for these purposes.

The Central Authorities in 1925 prepared a model by-law for adoption by the local authorities.

The Central Health Service has prepared a series of plans of small houses, substantial but economical, which satisfy the requirements of the law.

The effect of all these measures may be judged from the following:

In communities with less than 10,000 inhabitants in December 1899, 36.2 per cent of all houses had three or more rooms, while in December 1927 the percentage had risen to 57.

As far back as 1886, the problem of proper housing conditions for agricultural labourers was made the subject of legislation in Germany. From 1921 to July 1929, loans for this purpose in Prussia alone were granted for 41,534 houses. In 1930, thirty million Reichsmarks were provided for this purpose by the Central and State Governments. Between 1923 and 1930, some 472,200,000 Reichsmarks were utilised for the colonisation of agricultural workers, 26,343 colonies being established. In 1930, the "Deutsche Siedlungsbank" was created to facilitate financial transactions in connection with such colonisation.

In France, the "Loi Loucheur" of 1929 provides for the construction or rebuilding of 260,000 houses in a five-year period; one-third of the credits are reserved for rural districts.

The Law of 1929 also deals with housing for agricultural workers.

In Italy, the budget of the Ministry for National Economy for 1929-30 contained a credit of 2,500,000 lire for payment of interest on loans for the construction of houses in colonies and for agricultural labourers. The various institutions for agricultural credits granted loans of nearly 100,000,000 lire for these purposes between 1922 and 1928. In connection with "bonifications", Italy has made other important contributions to good housing in rural districts.

In 1919, a law was passed in Belgium creating the "Société nationale des habitations et logements à bon marché", which advances at 2 per cent credit to local and regional societies. In 1927 there were 274 such societies with a capital of about 36,000,000 gold francs. The State has advanced the sum of 100,000,000 gold francs to the National Society, and the credits available have been utilised for the construction of 29,877 houses.

The Government of Czechoslovakia, in 1930, adopted a law to facilitate the construction of 20,000 small houses before the end of 1931, by guaranteeing second mortgages at low interest, and by additional grants in certain cases. Both forms of assistance may also be obtained for reconditioning and repairs. New houses are tax-free for a varying number of years; this measure is common to a number of countries.

In almost all the European countries there are building codes and by-laws regulating methods and details of construction. The value of such regulations depends entirely on the methods of supervision and enforcement. Supervision by the health authorities appears to give the best results.

An excellent method of improving housing conditions is illustrated by the work of the "Génie rural" in France. Plans for a series of improved types of rural buildings for properties of various sizes and for different districts were published by the Ministry

of Agriculture in 1913. Similar work has been carried out in Germany, Italy, the Netherlands, etc.

Agricultural associations in various countries have done excellent work along this line.

The Institutes of Hygiene in several countries have played a prominent part in the promotion of good housing by educational measures, the construction of model houses, the preparation of model plans, etc.

4. The improvement of housing for agricultural workers presents difficulties which cannot be solved by education and persuasion alone. The agricultural worker is in a particularly weak position in this respect, and suitable legislation, with proper enforcement, as well as public financial assistance, are needed to cope with this problem.

Poor housing for this class accelerates the exodus of the best workers to the cities, where in many cases more attention has been given to housing for industrial workers, and this in turn lowers the standard of rural life and prevents hygienic improvement.

The experts recommend that the attention of the Rural Hygiene Conference should be drawn to the recommendation of the International Labour Conference (1921) on this subject.

The following is the text of this recommendation, which was adopted by 74 votes to 12 with 4 abstentions on November 15th, 1921, by the third Session of the International Labour Conference:

“The General Conference of the International Labour Organisation recommends:

“I. That each Member of the International Labour Organisation, which has not already done so, take statutory or other measures to regulate the living-in conditions of agricultural workers with due regard to the special climatic or other conditions affecting agricultural work in its country, and after consultation with the employers' and workers' organisations concerned, if such organisations exist;

“II. That such measures shall apply to all accommodation provided by employers for housing their workers either individually, or in groups, or with their families, whether the accommodation is provided in the houses of such employers or in buildings placed by them at their workers' disposal;

“III. That such measures shall contain the following provisions:

“(a) Unless climatic conditions render heating superfluous, the accommodation intended for workers' families, groups of workers, or individual workers, should contain rooms which can be heated;

“(b) Accommodation intended for groups of workers shall provide a separate bed for each worker, shall afford facilities for ensuring personal cleanliness, and shall provide for the separation of the sexes. In the case of families, adequate provision shall be made for the children;

“(c) Stables, cowhouses and open sheds should not be used for sleeping-quarters;

“IV. That each Member of the International Labour Organisation take steps to ensure the observance of such measures.”

Full information in regard to this recommendation may be found in the report of the International Labour Office on Agricultural Workers' Housing (document C.H. 1020).

5. *Rural housing may also be improved by suitable reconditioning of existing houses. When properly directed and supervised, such reconditioning may yield excellent results sometimes at comparatively small cost.*

The construction of model villages and agricultural colonies is of particular interest and importance in respect of rural housing. The tendency to locate industrial plants in rural districts should be encouraged, such new construction offering opportunities for the building up of model villages and the application of all sanitary safeguards.

In the planning of these villages and colonies, the Health Authorities should have jurisdiction over all matters of hygiene and sanitation.

The experts recommend the further study of this problem.

D. Land Improvements or Bonifications.

1. *Bonifications are defined by the experts as the complete sanitary reconditioning of the land in areas where the general living conditions of the people are bad, more especially on account of malaria and other endemic diseases which endanger the vitality of the people.*

2. *This complete sanitary reconstruction is not limited to land drainage, but includes all measures required to bring the land itself under cultivation, and the provision of hygienic living conditions for the population by means of a network of good roads, suitable rural housing, a good water supply, sewage and waste disposal.*

3. *Under certain conditions it also includes the irrigation necessary for farming purposes, as well as to enable the cattle to be housed throughout the year, this practice being especially indicated in view of the campaign against malaria.*

4. *Bonifications thus bring about a marked improvement in the standard of living, both economic and hygienic, and should accordingly be regarded as one of the most striking examples of rural hygiene.*

The application of the system of bonifications requires the help of the hygienist. This is particularly necessary during the execution of the work.

5. *The experts desire to draw the attention of the Rural Hygiene Conference to the importance of proper drainage of water by water-courses, and to the serious consequences resulting from the neglect to maintain these properly, not only in respect of agriculture but also in regard to hygiene.*

The term “bonifications” is borrowed from the Italian, as it was in Italy that this idea originated, and the word has no exact equivalent in French or English. Bonifications are utilised primarily as a means of combating malaria, but the experts considered that this method might also be applied against other endemic diseases which act as a serious drain on human vitality.

Beginning simply as drainage of marshy areas, bonifications have developed into the complete sanitary and agricultural reconstruction of a given area, the Italian authorities having found that the prevention of malaria required a radical transformation of the living conditions of the people in an area where malarai prevails. The combination of intensification of agriculture with the application of all necessary prophylactic measures is known as "bonifica integrale". This includes engineering work on a large scale and all measures necessary to render the area fit for agriculture — roads, good water, electricity, good housing and sanitation in general.

Various laws on this subject have been passed in Italy to define the object, regulate the procedure and provide financial assistance in respect of bonifications. The Law of December 24th, 1928, provided the necessary credits and set out the programme from 1930 to 1944 as follows:

	Lire
Hydraulic bonification with complementary work such as construction of roads, aqueducts, irrigation, etc.	4,500,000,000
Irrigation	800,000,000
Rural settlements and housing	500,000,000
Rural aqueducts	210,000,000
Roads and water-supply (not aqueducts).	1,000,000,000
Total	7,010,000,000

The State will contribute a total of 4,300,000,000 lire. The law provides that rural water-supplies may be subsidised by the State in the amount of 75 per cent, and that the construction of rural houses in regions subject to bonification may be subsidised by the State up to 30 per cent of the cost. The amounts to be paid by the State in subsidies is fixed at over four billion lire. From the beginning until 1928 a total of 2,720,000,000 lire was expended for bonifications. This work not only assists in bringing malaria under control but also results in the reclamation of large areas of waste land, and promotes good housing, and other sanitary improvements.

In Belgium, about six per cent of the area requires improvement on account of marshes or periodic flooding. Some 200,000 hectares have been reclaimed from the sea or protected from invasion by the sea. There are laws on these subjects which are now in course of amendment and improvement.

Agricultural associations, such as the Belgian "Boerenbond" have done much to assist in this work by furnishing technical advice, giving examples of the value of this work, educating land-owners, etc. The work itself is done by associations of land-owners. The result of such land improvements is seen in improved agriculture, better economic status of the rural population, better housing, the possibility of draining sewage and the improvement of public water supplies.

The Netherlands is famous for such reclamation projects and is now engaged on the drainage of the *Zuider Zee*, which will provide for a population of some 400,000. The plans provide for collective water-supply systems, regional planning, and a high level of general sanitation.

In Spain, the problem is one of irrigation rather than of drainage. Special organisations have been created for the drainage areas of each of the principal rivers, and these organisations are concerned with the most effective utilisation of the available water, and problems of agriculture, sanitation, etc. Malaria exists in these areas and must be

combated. Water-supplies are being constructed where none existed previously, housing is being studied and improved, and in general the opportunity is being taken to raise the general level of sanitation. The results obtained by the organisation in charge of the drainage area of the Ebro have been particularly good on account of the co-operation which exists between it, the sanitary administration and the agricultural services.

These will serve as examples of work of this kind which has been carried out in many European countries. When competent sanitarians are consulted and due regard is paid to hygienic considerations, such work results in important sanitary improvements in rural districts.

CHAPTER V. — REPORT SUBMITTED TO THE
EUROPEAN CONFERENCE ON RURAL HYGIENE
BY THE INTERNATIONAL LABOUR OFFICE.

(a) SICKNESS INSURANCE AS A FACTOR IN RURAL HYGIENE.

SUMMARY.

Introduction.

- I. Object and Tendencies of Sickness Insurance for Agricultural Workers.
- II. Organisation of Medical Aid in Rural Districts through Sickness Insurance.
- III. Co-operation between Health Services and Sickness Insurance in Rural Districts.

INTRODUCTION.

Insurance originally grew out of the guild system and commerce, and has made its way but slowly into the rural districts. The peasant began by insuring his property against the elements. The hardships which often accompany country life have made him feel the need for insurance against the risks which menace his health and working capacity. To-day the necessity of constant effort for the maintenance of health and for the prevention of any loss of productive power is becoming equally evident to the rural and to the urban populations.

The extension of social insurance and of sickness insurance in particular to those engaged in agriculture is one of the most important measures taken to raise the standard of health and hygiene in rural districts. The present report gives an account of the nature and extent of the contribution of sickness insurance to the improvement of rural health.

The report consists of three parts.

The *first* part sets forth the *objects and tendencies of sickness insurance for agricultural workers*. Insurance aims at maintaining health, preventing avoidable illness, curing the sick and restoring them to health. The extent of its action depends on the persons covered by insurance, the force of its action depends on the administration of its benefits.

The *second* part describes the *organisation of medical aid in rural districts through sickness insurance*. With a view to maintaining health and to detecting and treating illness in its earliest stages, an insurance scheme establishes an organisation of services and material equipment which enables it to provide efficient medical aid.

The *third* part deals with the *co-operation between health services and sickness insurance in rural districts*. Convinced of the value of the co-ordination of all work aiming at the improvement of rural hygiene, sickness insurance co-operates with the health services in order to render more efficient the protection of rural populations against sickness

I. OBJECT AND TENDENCIES OF SICKNESS INSURANCE FOR AGRICULTURAL WORKERS.

NECESSITY AND OBJECT OF SICKNESS INSURANCE.

The maintenance of the health and productive capacity of the workers is of capital importance not only for the workers themselves but also for the national communities desirous of developing their productivity. This object can only be achieved by constant and systematic endeavour to prevent and remedy any loss of health and working capacity.

Social insurance undertakes this systematic effort by adopting measures which are common to every social institution: it confers on persons whose economic position is precarious a definite right to assistance by the community, that right being based on their own contributions to the resources of the community, but, having regard to considerations of economy, it limits the benefits which have to be provided by the community to that which is at once necessary and sufficient for the purpose to be achieved.

Sickness insurance is based upon the mutual aid of those persons who have the greatest need of protection against the possible consequence of sickness. It is administered by the parties concerned, as their own business, the intervention of the public authorities being limited to the supervision of the management.

In the beginning, insurance dealt only with the consequences of sickness, and compensated wholly or in part insured persons who had suffered loss of earnings or other economic loss. Since then, it has progressed. The insured person receives only part of the benefits in cash, the other part being supplied to him in kind. Medical aid occupies the foreground, and insurance is interested more in restoration to health than in compensation. In the latest phase of its development, insurance aims at individual and general prevention with the object of preserving health and protecting it from every possible danger. Thus insurance has gradually become an organised system for the defence and improvement of health.

DEVELOPMENT OF SICKNESS INSURANCE FOR AGRICULTURAL WORKERS.

Intended at first for urban populations, sickness insurance is now widely applied to agricultural workers. For many years it was alleged that difficulties of organisation owing to the dispersion of rural populations prevented the extension of sickness insurance to agriculture. Experience, however, has proved that these difficulties can be overcome.

As the relations between the agricultural labourer and his employer gradually lost their patriarchal character, and as agricultural labourers formed their own trade unions, sickness insurance for agricultural workers became essential. It is now more necessary than ever if the exodus from the country is to be checked.

In countries which have introduced a general scheme of compulsory sickness insurance, agricultural workers have been included, either from the outset or in successive stages. At the present time, in Europe, there are some five or six million agricultural wage-earners who are compulsorily insured against sickness, leaving out of account a large number of other workers in occupations connected with agriculture who are members of voluntary schemes of sickness insurance subsidised by the State.

In the following paragraphs a sketch is given of the present position of sickness insurance for agricultural workers in Europe.

Compulsory Insurance.

Agricultural wage-earners are compulsorily insured on the same footing as wage-earners in other occupations in the following countries: Austria, Bulgaria, Czechoslovakia, France, Germany, Irish Free State, Netherlands, Norway and the United Kingdom. In other countries — Poland, Rumania and the Union of Soviet Socialist Republics — certain classes of agricultural wage-earners, or agricultural wage-earners in certain districts, are compulsorily insured against sickness.

In the *United Kingdom* and the *Irish Free State*, wage-earners in agricultural occupations have been covered since 1911 by the general scheme of sickness and disablement insurance under exactly the same conditions as those which apply to wage-earners in industry and commerce.

In *Germany*, the scheme of sickness insurance for agricultural wage-earners, who number about three millions, was unified by the social insurance code of 1911, which abolished the several regional schemes of insurance for agricultural workers, and placed agricultural workers on an entire equality with other workers subject to compulsory insurance.

In *Norway*, agricultural workers are covered by the general scheme of wage-earner's sickness insurance established in 1915.

In *Czechoslovakia*, the general scheme of sickness insurance was extended to include all wage-earners in agricultural occupations, who, since 1926, are afforded the benefits, in cash and in kind, of invalidity insurance on the same terms as industrial wage-earners.

Bulgaria, since 1924, has applied its social insurance legislation to agricultural wage-earners, with the sole exception of certain classes of seasonal workers.

In *Austria*, the scheme of sickness insurance for agricultural wage-earners has been unified by an act of 1928 which established a complete system specially adapted to the needs of rural populations.

In *France*, the new general social insurance law of April 30th, 1930, has granted special advantages to workers engaged in agricultural and forest occupations. Wage-earners in these occupations are compulsorily insured, as are also share-farmers who work ordinarily alone and do not possess any part of the live-stock at the time when they begin farming. Moreover, voluntary insurance is open under easy and very favourable conditions to other share-farmers and independent farmers who, without being wage-earners, live mainly by the product of their work and whose earnings do not exceed a comparatively high maximum.

Voluntary Insurance.

The object pursued by the French law, which was to bring within the ambit of social insurance all workers, whether wage-earners or not, in agricultural occupations, has been attained without compulsion in a single country — *Denmark*. In circumstances which are exceptionally favourable, by means of insurance which is voluntary but which is heavily subsidised by the public authorities, the Danish sickness insurance funds cover nearly three-fifths of the entire population, and thus include, without any important omission and without distinction of occupation, almost all the adults whose social condition calls for mutual aid.

Though not achieving the same result, voluntary sickness insurance has also made its way into the rural districts of other countries — *Belgium, Spain and Switzerland*, in this last country thanks mainly to the fact that insurance has been rendered compulsory by the cantons or the communes.

In other countries which have already accepted the idea of compulsory sickness insurance, Governments have made plans for extending sickness insurance to cover wage-earners in agricultural occupations. Bills to this effect have already been either tabled or discussed in *Belgium* (sickness, invalidity), *Rumania* (sickness), and *Poland* (invalidity). The development of sickness insurance for agricultural workers is more advanced in *Italy*, where under the auspices of the Ministry of Corporations and by agreement between the two national confederations of employers and agricultural workers, the National Federation of Sickness Insurance Funds for Workers in Agriculture has recently been created.

The depression from which agriculture in Europe has been suffering for several years has doubtless increased the difficulties and checked the movement for the extension of sickness insurance for agricultural workers. Nevertheless, sickness insurance has been proved just as valuable in rural districts as in urban areas, and in no country will it be possible in the long run to exclude workers in agricultural occupations from its benefits.

ORGANISATION OF SICKNESS INSURANCE FOR AGRICULTURAL WORKERS.

Though sickness insurance for agricultural workers has not reached the same standard in the different countries, its development during the post-war period appears to be along convergent lines, and everywhere there seems to exist a desire to extend and intensify insurance in rural districts.

The circle of compulsorily insured persons is widening. All agricultural wage-earners, whether or not they live in their employer's house, are subject to compulsory insurance, whatever the nature and form of their remuneration. With the exception of the wife, no member of the employer's family who works for remuneration is exempt from compulsory insurance. The wage-limit prescribed in several countries in connection with liability to insurance does not affect the great majority of agricultural wage-earners, and even the salaried workers who supervise and direct agricultural work are only rarely excluded from compulsory insurance by the wage-limit. Some classes of persons working on their own account whose economic and social situation resembles that of day labourers and farm servants are subject to insurance on the same footing as wage-earners.

The widest facilities for voluntary insurance have in recent legislation been offered to peasants and farmers, even to peasants who work alone or with the help of members of their family, or who do not employ regularly more than two wage-earners.

Sickness insurance is essentially concerned with the family. It affords protection to the working-class family and not to the worker only. Post-war legislation provides the family of the insured person with free medical treatment and drugs, or at least requires insurance institutions to pay part of the cost of such benefits. For the first time the entire insured population is subject to regular and systematic medical supervision.

The class of benefits provided by an insurance scheme is the best criterion of its value and shows the particular task assigned to sickness insurance in the general work for rural hygiene.

The benefits of sickness insurance are adapted to the threefold purpose of its health work: to maintain and strengthen health, to prevent sickness, and to cure disease in its earliest stages.

The object of the curative benefits is to diagnose the symptoms of disease, to determine their significance for the patient, to relieve his sufferings, to offer him all the assistance he needs, and to secure by appropriate treatment a rapid and complete cure.

The benefits which aim at the maintenance of health include all measures tending to increase the physical resistance of the insured population against disease and all instruction given to the individual in personal and domestic hygiene.

Preventive benefits are based upon the systematic seeking out of cases where medical intervention is necessary, and on the determination of the physical condition of the individuals concerned, their economic situation and their family circumstances. Where necessary, medical and economic measures are taken for the protection of the insured person until a lasting result is obtained.

These tendencies are clearly shown in all countries where sickness insurance has been in operation for many years. They were found by the International Labour Conference, which at its 1927 session undertook a general examination of sickness insurance, to be so similar and so sound that it decided to draw up for agricultural wage-earners, as for wage-earners in all other occupations, a system of international regulations for sickness insurance.

INTERNATIONAL REGULATIONS FOR SICKNESS INSURANCE OF AGRICULTURAL WORKERS.

Under the Convention which was drawn up as the result of the International Labour Conference's discussions and which is already in force in six European countries having several million agricultural wage-earners, States undertake to establish compulsory sickness insurance for wage-earners in every agricultural undertaking whatever.

The Convention guarantees to insured persons, in exchange for a contribution deducted from their wages, not only subsistence allowances in case of loss of wages through sickness, but also a right to medical benefit during the first twenty-six weeks of sickness at least. Medical benefit comprises treatment by a fully qualified medical man and a supply of medicines and appliances adequate as regards quantity and quality. The Convention leaves each State free to authorise or prescribe the conditions under which medical benefit, as thus defined, may be granted to the members of an insured person's family.

The International Labour Conference laid down in the Convention the minimum conditions from the medical point of view that any sickness insurance must fulfil. The Conference further drew up, in the form of a recommendation addressed to national legislatures, a set of general principles which long experience has shown to be the best for promoting the organisation of effective medical aid. These principles relate to the

development of various forms of medical treatment, the supply of drugs, dental treatment and hospital treatment; they urge sickness insurance institutions to assist in inculcating the rules of hygiene upon the workers and to grant preventive treatment to as large a number of persons as possible as soon as the premonitory symptoms of disease appear.

These principles, representing a selection, from general rules which have proved their value, constitute a health programme for sickness insurance institutions and are the basis of their daily work among insured persons and their families.

II. ORGANISATION OF MEDICAL AID IN RURAL DISTRICTS THROUGH SICKNESS INSURANCE.

ELEMENTS OF EFFICIENT MEDICAL AID IN RURAL DISTRICTS.

If it is to be adequate and efficient every system of organised medical aid must afford the population all the means required for the maintenance of health and the detection and treatment of disease in its earliest stage. Insurance must provide this medical aid because the law requires it to do so in the interest of insured persons and in the general interest.

Sickness insurance institutions enable insured persons to procure medical treatment and any sanitary assistance they require, to choose a doctor they have confidence in, to avail themselves of the services of specialists, and to obtain admission to a hospital, sanatorium or convalescent home. The same facilities are, according to recent insurance legislation, likewise granted to members of the families of insured persons.

The doctor who undertakes the treatment and supervision of insured persons is required to take all necessary measures to alleviate suffering and to restore the health of the patient. The efforts of sickness insurance to supplement and perfect its system of medical aid have entailed a considerable increase in its expenditure on benefits in kind as compared with expenditure before the war. The principles of economy on which the administration of social insurance institutions is based require that the doctor should comply with these principles in drawing up his prescriptions. If he has a choice of several methods of proved efficacy for the prevention, alleviation or cure of the complaint from which the patient is suffering, the doctor, having regard to the constitution, mental disposition and social and occupational situation of the patient, must choose the method which will bring about his cure and restoration as speedily as possible, at the smallest possible cost and with the maximum chance of success. In order to make the task of the practitioner easier, insurance institutions endeavour to place at his disposal all the latest facilities for diagnosis and treatment, and to take all steps to instruct insured persons in the rules of hygiene which they should observe in order to maintain their health.

MEDICAL BENEFITS OF SICKNESS INSURANCE.

I. Predominance of Benefits in Kind.

Benefits in kind are the foremost consideration of insurance institutions, and account for the greater part of their funds.

In *Czechoslovakia*, for instance, the rural sickness insurance institutions expend on an average, per case of sickness (confinements excepted), 110.56 crowns for sickness benefit; 70.30 for doctors' fees; 34.30 for drugs; 64.19 for hospital expenses; total 279.35 crowns (1927).

As benefits in kind develop, the place of the doctor in sickness insurance becomes more important, and the greater also is the need of insurance institutions to have in their service a sufficient number of doctors suitably distributed over the whole national territory and in all the rural areas.

2. *Facilities afforded by Sickness Insurance to improve the Distribution of Doctors.*

In areas where doctors are lacking, sickness funds endeavour to make it easier for them to set up in practice; besides affording the essential encouragement of entrusting him with the treatment of insured persons, the sickness funds also assist the doctor by securing him accommodation, by enabling him to maintain one or even two surgeries, or by granting him adequate mileage allowances and special allowance in areas which are particularly difficult to cover.

In sparsely-populated areas, doctors who undertake the treatment of insured persons receive from insurance institutions special advantages such as additional remuneration and opportunities of following post-graduate courses (*e.g.*, insurance doctors in the Scottish Highlands).

By this variety of measures, sickness insurance has facilitated the access of rural populations to the doctors and done much to improve the distribution of practitioners.

In certain countries, sickness funds, acting in conjunction with the medical profession, endeavour to draw up a plan for the systematic distribution of doctors throughout the national territory, with the object of assisting young doctors who could not set up in the towns to obtain practices in the rural districts.

3. *Specialists and Dental Surgeons.*

The system of medical aid afforded by sickness insurance also includes, in the majority of countries, the services of specialists and dental treatment. The principle of free choice operates here also, and insured persons are entitled to choose the specialist or the dental surgeon. When necessary, insurance institutions repay the cost of travelling to consult a specialist.

4. *Facilities for Diagnosis.*

The first condition which must be satisfied by an adequate and efficient system of medical aid and by a vigilant system of prevention is that it should secure sound diagnosis. In the present state of medical science and technique the thorough examination of patients requires special methods and apparatus such as X-rays, and bacteriological, chemical, microscopic, serological, and histological examinations. If the practitioner has not the experience or the apparatus necessary for such examinations, insurance institutions arrange for them and pay the expenses. Specialised diagnosis and treatment centres, dispensaries for the treatment of tuberculosis and venereal diseases, baby clinics, and other similar institutions, help the practitioner in making his diagnosis and drawing up his plan of treatment. These specialised centres and institutions give the doctor valuable information, and even, when circumstances require, provide treatment.

5. *Facilities for Treatment.*

The practitioner in rural districts, more often than his colleague in the towns, needs assistance in the application of special methods of therapy.

For ultra-violet ray treatment, insurance institutions contract with specially-equipped establishments; some possess establishments of their own. The same is the case with hydrotherapy and mechanotherapy.

The conditions peculiar to rural life render it necessary to organise a service of trained nurses and visiting nurses.

The work of nurses in rural districts on behalf of sickness insurance has in certain countries been regulated in detail, as, for example, in *Germany*, where rules were laid down by the Federal Committee of doctors and sickness funds on April 10th, 1924.

6. *Hospital Treatment.*

Not only the urban, but also the rural population avails itself to an ever-increasing extent of treatment in hospitals and other curative institutions.

The objects of hospital treatment comprise not only curative measures, but also diagnosis and the detection of diseases by observation of the patient.

Insurance institutions leave to the public authorities, the State and the local governments the function of establishing and managing hospitals, and only undertake this task themselves in special circumstances.

Nevertheless, sickness insurance is helping considerably to improve and modernise hospital equipment.

The cost of hospital treatment represents an appreciable proportion of sickness insurance expenditure.

In *Czechoslovakia*, the rural sickness insurance institutions expended in 1927, per insured person, 40.38 crowns for medical treatment; 19.14 for drugs; 28.80 for maintenance in hospitals.

In *Austria*, the agricultural sickness funds expended, per insured person per annum 16.05 schillings for medical and dental treatment; 4.92 for drugs; 8.28 for hospital treatment; 2.84 for obstetrical treatment; 2.59 for general preventive treatment (1928).

In *Germany*, rural sickness funds devoted 28.9 per cent of their expenditure to medical treatment; 13.4 per cent to drugs; 37 per cent to sickness cash benefit; 16.2 per cent to hospital treatment; 4.5 per cent to obstetrical treatment (1926).

Insurance institutions bear the cost of conveying patients to and from hospitals; some institutions have their own ambulances.

In order to assist the hospitals and to lessen the drawbacks of hospital treatment for insured persons, and also to reduce their own hospital expenses, a great number of sickness insurance institutions enter into contracts with hospitals and set up their own establishments for special treatments, particularly that of tuberculosis. Certain insurance institutions, moreover, have provided infirmaries for chronic cases on whom hospital space would be wasted, as well as convalescent homes and colonies.

7. *Auxiliary Medical Staff.*

Among the auxiliaries of the doctor, the *trained nurse* takes first place, since her help is indispensable for certain forms of treatment in the patient's home.

It is the duty of the public authorities to see that there are a sufficient number of *midwives* in the rural districts. Sickness-insurance institutions also encourage midwives

to establish themselves in the country by granting them a favourable scale of remuneration and by entrusting them with the care of insured women before and after confinement, unless special institutions for this purpose have been created in the district.

Masseurs and other skilled auxiliaries also receive considerable professional and financial assistance from the sickness insurance.

The regular employment of *visiting nurses* becomes indispensable to sickness insurance in the systematic development of its treatment and preventive services in rural districts.

THE CONTRIBUTION OF SICKNESS INSURANCE TO THE PREVENTION OF SICKNESS AND THE PRESERVATION OF HEALTH.

Sickness insurance contributes considerably to the work of prevention and to the improvement of public health.

It is not easy to estimate the value of this contribution, or to deduce it from the budgets of insurance institutions, in which treatment benefits take the foremost place. It consists in particular measures which differ from one district to another and are conditioned by the nature and urgency of local needs.

1. Local Hygiene.

Insurance institutions contribute to the development of local hygiene by encouraging the building of healthy dwellings by making advances on mortgage, by spreading a knowledge of the rules of hygiene whereby the domestic habits of the rural population are improved, and by making available means of disinfection, means of destroying insects, etc.

A great many sickness funds create and maintain, either on their own account or in co-operation with the local authorities, bathing establishments available to the entire population.

By organising an efficient system of medical aid for insured persons and their families, sickness funds provide an indirect but real contribution to the facilities for diagnosis and treatment available to the uninsured population.

By the grant of adequate and efficient medical and obstetrical assistance through a properly qualified staff, social insurance institutions are combating superstition and quackery.

2. Popular Instruction in Hygiene.

Recognising the necessity of inculcating the practice of the rules of hygiene, many sickness funds have set up special services for health propaganda, their duties including the preparation of films, lantern-slides and tracts, and the organisation of permanent or travelling health exhibitions open to the public, free of charge.

By the nature and extent of the medical aid which it affords to insured persons and their families, and by its activity in the prevention of disease and the protection of health, sickness insurance is indeed reducing the risks for which it is liable, and it is at the same time a powerful factor in raising the standard of rural hygiene.

III. CO-OPERATION BETWEEN HEALTH SERVICES AND SICKNESS INSURANCE IN RURAL DISTRICTS.

THE VALUE AND OBJECT OF CO-OPERATION.

Responsible as they are for the health of their members, sickness funds endeavour to bring about conditions conducive to the preservation of a good state of health. Their efforts would not be fully successful if they did not take into account, when drawing up and carrying out their programme, the work of health services and public assistance institutions. The principles of economy upon which sickness insurance is based require it to be always seeking, by the avoidance of gaps and overlapping, the greatest efficiency through the co-ordination of its work with that of all other institutions having a similar object.

Such a co-ordination of effort is more necessary in the rural districts than in the towns. Rural populations must have an organised system of health protection. Housing conditions and domestic habits are often unhygienic. Rural populations frequently lack drinking-water, opportunities for baths, means of disinfection, etc. The distances between houses make it difficult to arrange for consultations, for it is not easy to find suitable premises. A further trouble is that rural populations stubbornly resist the first attempts at health protection, but this resistance must be overcome in their own interest. In view of the extent and difficulty of the task, all efforts must be inspired by a common will.

Co-operation in the field of health protection has a definite object in view which is determined primarily by local conditions and needs. Each co-operating party contributes to the execution of the programme jointly agreed upon, by performing the function it has undertaken.

FIELDS AND METHODS OF CO-OPERATION.

The preparation in common of a plan for the medical and sanitary equipment of rural districts must be undertaken by health services and social insurance institutions as the first step towards co-operation on a large scale.

Among other fields in which organised co-operation is necessary, mention may particularly be made of the campaigns against tuberculosis, venereal disease, cancer and mental diseases, maternity and infant welfare, child welfare, and the instruction of rural populations in hygiene.

The order in which these different tasks should be generally taken up depends on the comparative urgency of this and that preventive or protective measure. Sometimes the organisation of child welfare or the campaign against tuberculosis will appear the most urgent, sometimes it will be better to deal first of all with venereal disease or alcoholism.

Co-operation will be carried out by means of joint committees composed of representatives of health services and social insurance institutions together with delegates of the medical profession and public assistance institutions. These committees, while not encroaching upon the autonomy of the several parties, will draw up a programme of joint action, and will decide the best methods of procedure and the contribution to be made by each party to their joint undertaking for the defence and improvement of rural hygiene.

(b) AGRICULTURAL WORKERS' HOUSING.

1. The housing of agricultural workers constitutes a social and industrial problem of considerable importance. Improvements in prevailing standards are most necessary, and no effort should be spared on the part of central and local government authorities and others interested, including the general public, to insist on an early advance to better conditions. A recognition of the need for making energetic efforts throughout Europe to attain such higher standards might form part of any resolution dealing with this subject to be adopted by the European Conference on Rural Hygiene.

2. The following explanatory observations may be of use to the Conference. In most European countries a large number of agricultural workers' houses are provided by the farmers as part of, or contingent upon, the contracts of employment which they offer to their workers. Where this is so, the enforcement of certain housing standards is a matter of the enforcement of a certain part of the employment contract. Experience has proved the results of this method to be often unsatisfactory. The worker, who is concerned to maintain his wages standard or to negotiate about hours, is not usually in a position to bargain also on a third item of housing. Collective action is not easy to enforce, as each house is different, repairs are a difficulty, and, finally, the worker is often afraid of sacrificing his job if he makes too many demands; there is also the reverse situation, when he is afraid of losing his home (because of a general shortage of housing in the district), and puts up with unsatisfactory working conditions in his job in order to maintain his right to a house¹.

The employer, owing to financial stringency, which during the present period of agricultural depression is particularly acute, can neither build enough houses nor always maintain those he has in a proper condition.

3. It seems obvious, in the first place, that recourse must be had in most countries to some public loans or moneys for assistance in solving this as well as other branches of the rural housing problem; perhaps here and there the open market may be maintained. This has been done, for instance, in the Netherlands. Where the principle of recourse to public assistance is admitted, there is no particular distinction to be drawn between the financing of schemes to build agricultural workers' houses and to build other rural houses. With rare exceptions, agricultural workers simply have to take their chance of securing a share of the public moneys made available. Under this heading perhaps the principal point to make is that rural housing itself often fails to secure a fair share of national housing subsidies; urban housing eats up most of the money. A resolution of the Conference to draw attention to this and to point out the desirability of earmarking a portion of public housing funds for rural purposes would assist in solving the problem of agricultural workers' housing².

4. There is secondly the question of legislation on standards of housing and their enforcement. It is greatly to be desired that, both in regard to new and to old housing provided for agricultural workers whether by employers, by other private parties or by

¹ This is a point on which organised agricultural workers lay much stress. They demand freedom for all workers to rent a house independently of their employment (abolition of the "tied" cottage).

² The roneed report on Agricultural Workers' Housing prepared by the International Labour Office and submitted to Sub-Committee III of Experts meeting May 12th-15th, 1931, did not deal with general questions of finance, precisely in view of the fact that there is no special distinction to be drawn between the financing of building operations of agricultural workers' housing or of other rural housing.

public landlords, proper standards should be laid down and should, above all, be really enforced. Housing standards in rural districts are in general very low, but lowest as regards wage-paid agricultural workers' dwellings. These general low standards are the results of a combination of different causes — of out-of-date customs or definitely bad traditions, of general poverty, of geographical remoteness, of the physical problems concerning water-supply, drainage, etc., connected with scattered homes, of prevailing economic post-war depression. Stationary or failing rural population will perpetuate bad housing traditions, because rural houses (usually solid and of some age) exist sufficient in quantity for the new generations, so that new houses simply are not built; or, where the population does grow, the special evil of overcrowding arises and often is allowed to reach considerable proportions. The failure to insist on an advance in standards of housing is marked in rural as contrasted with urban districts, and the inferiority of agricultural workers' houses as compared with urban workers' houses is the inevitable consequence and productive of many evils in farming life. Its effects on stimulating the drift from country to town have often been deplored, and it can have an unsettling effect even on agricultural workers who remain on the farms, especially on the younger workers, who become thoroughly dissatisfied with the accommodation available for them.

The European Conference on Rural Hygiene may wish to express its opinion both that existing legislation governing the enforcement of certain standards in rural housing should be strengthened and that every effort should be made to provide some first-class accommodation (for different groups of workers) in each more or less self-contained district, with the special purpose of raising the standard demanded by rural populations throughout Europe. The construction of a few model or good standard houses in any particular district is a useful step to take, as the undertaking of such construction breaks through a whole circle of crystallised bad practices. The abolition of the absolutely worst, and the construction of a little of the best, type of accommodation would go far to put the whole problem of agricultural workers' housing, and of rural housing in general, on a different plane.

5. From a practical point of view agricultural workers' accommodation is best divided according to the use which is to be made of it: (1) accommodation in the farm-house or dependencies thereof for resident farm-workers; this is always provided by the employer; (2) accommodation in separate houses for farm-workers and their families; this is often, but not by any means always, provided by the employer; (3) accommodation for temporarily employed agricultural workers (pickers, etc.); this is almost always provided by the employer. A roneoed report of fifty pages can be obtained from the International Labour Office on these three types of accommodation as at present existing in Europe. In this report an analysis is made of national acts and regulations, etc., bearing on the subject. It is noticeable that if taken together and adequately enforced, the desiderata laid down in these acts and regulations would constitute a perfectly good standard of agricultural workers' accommodation. But in any one country their fragmentary nature (or their complete absence), together with the inadequacy of their enforcement, at present results in a wholly unsatisfactory state of affairs, and occasionally in conditions which are truly shocking, such as the well-known and still existing practice of allowing the stableman to sleep in the stable with the horses.

To sum up the points on which most stress needs to be laid. For workers resident in the farm-house itself privacy is an important consideration and often not properly secured; then may be mentioned security for the person and possessions (by means of lockable rooms, locked cupboards); cleanliness; adequate ventilation, light and warmth; decency as regards separate sleeping accommodation for the sexes; some degree of comfort

in bedding and furniture, more especially as regards washing and sanitary accommodation. Model accommodation outside Copenhagen included all these things and in addition electric light, comfortable furniture, and spacious washing and sanitary arrangements.

For married workers and their families the size of the house to be offered is a primary consideration; the provision of a sufficient number of bedrooms is a standing difficulty. In addition, the drainage of the site, the weather-proofness of the building and its continuance in a good state of repair are of first importance. The same points of light, warmth and ventilation arise as for resident workers, but have to be dealt with on rather different lines. The supply of water and the provision of sanitary conveniences ought never to be neglected, but these are far too often missing. Finally, great improvements can be effected in married workers' accommodation if attention is paid to the provision of annexes, such as a scullery, a wash-house (with boiler), larder, wood-house, potato cellar, etc. Such annexes can greatly relieve the congestion in a small cottage and add much to the comfort of the worker's family. Plans for model accommodation for agricultural married workers, communicated to the International Labour Office, included living-room or kitchen, at least two bedrooms, scullery with sink and copper, sometimes also pantry, coal cellar, larder, bath-room and water-closet, in most cases porch and, in some cases, hall or lobby. In a larger cottage for a foreman, there was, in addition, a parlour.

In buildings for temporary workers, the principal desiderata are weather-proofness and dryness; separation of the sexes; adequate ventilation, and, if the season makes it necessary, some warmth; provision for cooking and washing, and sanitary conveniences; safety from fire has sometimes to be attended to. Separate beds or bunks raised from the floor should be provided and clean paillasses and coverlets served out. The engagement of a paid camp superintendent (who can be selected from among the workers) has almost always proved satisfactory and indeed appears almost essential if order and cleanliness are to be observed. Model accommodation in Scotland provided for all these requirements and in addition, allowed of places for drying clothes, canteens, etc.; this accommodation, however, was designed for large camps of 1,000 workers. On the whole, experience has shown that the problems connected with accommodation for temporary workers can easily be tackled with some expenditure of energy, whereas the difficulties of providing good permanent housing are far greater.¹

6. The attention of the European Conference on Rural Hygiene may be drawn to the recommendation on the living-in conditions of agricultural workers adopted at the third session of the International Labour Conference, Geneva, 1921. This recommendation attempts briefly to formulate attainable standards for agricultural workers' housing. For the text, see page 46.

¹ Plans and photographs of agricultural workers' housing will be on view during the holding of the Conference on Rural Hygiene.

Official No.: **C.H. 961.**

Geneva, June 30th, 1931

LEAGUE OF NATIONS

Health Organisation

REPORT ON MEDICAL SCHOOLS IN CHINA

by

Professor Knud FABER

Professor of Medicine at Copenhagen University.

Series of League of Nations Publications

III. HEALTH ✓
1931. III. 8.

CONTENTS.

	Page
FOREWORD	5
INTRODUCTION	7
EXISTING MEDICAL SCHOOLS :	
I. University Medical Colleges	12
II. Provincial Medical Schools	14
III. Private Medical Schools	14
IV. Mission Schools	15
V. Other Private Schools	16
VI. Military Medical Schools	16
THE SPECIAL MEDICAL SCHOOL	18
THE MEDICAL COLLEGE	28
AUXILIARY MEDICAL PERSONNEL	31
MEDICAL SUPERVISION AND REGISTRATION.	31
CONCLUSIONS	36

APPENDICES.

Appendix I:

Regulations governing the Organisation of Universities	39
--	----

Appendix II:

Regulations on the Giving of Special Courses in Colleges (1930)	41
---	----

Appendix III:

Midwifery Education	41
Provincial Training Centres	43
Provisional Regulations for the Standardisation of National Midwifery Schools	44

Appendix IV:

Itinerary	47
---------------------	----

FOREWORD.

In the plan of co-operation between the National Government of the Republic of China and the League of Nations in health matters, the Minister of Education requested the Health Organisation of the League to delegate an expert to work with the Commission on Medical Education. This Commission had been organised by the Ministry of Education, in co-operation with the Ministry of Health, to undertake a thorough study of medical education in China so that standards might be improved and a sufficient number of competent physicians trained to meet the medical requirements of the country.

In the summer of 1930, I was delegated by the Health Organisation to make a survey of Chinese medical schools and to discuss with the Chinese National Commission their plans for a model curriculum. I left Copenhagen on August 30th, arrived at Harbin via Siberia on September 10th and commenced my work there. On my arrival in Nanking on October 12th, I received a letter from the Minister of Education, Mr. Chiang Mon-lin, and the Minister of Health, Dr. J. Heng Liu, setting out the questions which they wished me to examine.

These were :

(a) The present status of medical schools in China; their number, size, character, standards, etc. ;

(b) Future policies which must be outlined as early as possible so that medical education in China may develop along modern lines ;

(c) Whether there should be only one or more than one standard for medical schools in China ;

(d) What should be the minimum standard for a medical school in China in regard to entrance requirements, pre-medical training and instruction in the pre-clinical and clinical sciences, taking into consideration the financial condition of the country and the urgent need for a large number of medical practitioners and other medical personnel ;

(e) In connection with (d), what would be the minimal hospital facilities required to enable a medical school to teach clinical medicine adequately ;

(f) Whether it is wise to include nursing, midwifery, pharmacy and dentistry under the Commission on Medical Education.

These problems have for some years pre-occupied the Ministry of Education, which in 1928 appointed a Committee to study medical education. This Committee suggested a plan for the next ten years, indicating what should be the types, standards and curricula of medical schools in China during that period.

This plan provides for two types of medical schools, (a) the medical college, to produce high grade physicians, and (b) the special medical school, to train practitioners of medicine.

The requirements and curriculum for the *medical college* were set out as follows :

Two years' pre-medical training in a college of science of a Government or private university. Five years' training in the medical college, the last year as an intern in a hospital, in all, seven years.

For the *special medical schools*, the entrance requirements were : graduation from a middle school of the new type, or graduation from one of the old type plus one year pre-medical course. The course in the special pre-medical school was to last four years, with a *fifth year in a hospital*—the students to be taught the basic sciences, chemistry, physics and biology and thereafter the pre-clinical and the clinical branches of medicine.

The plan was elaborated in all important particulars, the most interesting of which were the following :

Each class in the medical college should have not more than 30 students and there should be not more than 40 in the special medical school. There should be at least one teaching hospital of 200 beds for the medical college, and one of 100 beds for the special medical school, with an out-patient clinic in each case. There should be at least 24 teachers in the medical college and 12 in the special medical school, one-third full-time in each case.

This plan was afterwards approved by the National Board of Health. However, the Ministry of Education considered that further study was necessary before accepting the proposals.

The Commission on Medical Education was therefore constituted to advise the Ministry of Education on all matters concerning the education of physicians. At its first meeting, on February 13th, 1930, the plan for the two kinds of medical school was adopted. Students of the medical colleges must be graduates of higher middle schools, having had two years' pre-medical training before taking the medical course. The pre-medical course was to be given by the college of science of a university or by any other college of science. In case of necessity, the pre-medical course might be given by the college of medicine. The medical course should last for five years, including one year of practical clinical work.

The special medical course should, for the present, last four years, and could be increased in length when circumstances warranted.

The Ministry of Education has promulgated regulations for all universities. Article XXII of these regulations provides that university colleges or departments of independent colleges may give special courses in such subjects as the Fine Arts, Physical Culture, Municipal Administration, Home Economics, Journalism, Library Administration, Medicine, Pharmacy and Public Health.

Article XXV provides that special courses shall last two or three years, but in the case of the special medical course, one year of practical work shall be required at the end of the three-year course.

According to these regulations, the special medical school may be attached to a university college of medicine which would then have two groups of students—one group taking the seven-year course in the medical college, and one the four-year special course in the special college.

After completing my survey of medical schools in China, I was invited to an informal meeting of the Commission on Medical Education which took place on November 14th and 15th, 1930.

At this conference we discussed the problems put before me by the Ministers of Education and of Health and I was informed concerning the plan and the results of the Commission's first session.

I desire to express my thanks to the Minister of Education and the Minister of Health and to all the directors and staffs of the different institutions I visited. I received everywhere the greatest courtesy and assistance in my task.

INTRODUCTION.

The problems of medical education in China are very difficult, on account of their close relationship to the political and economic conditions in the country. The movement for national reconstruction, which is so strong in China at present, will have the greatest influence on the medical profession, on medical education and on medical relief for the people. It is, of course, impossible to obtain more than general impressions of these subjects in the course of a journey lasting only a few months. Nevertheless, it is necessary to describe briefly the special medical conditions obtaining in China.

The object of medical education is to provide medical relief for the people. This may be done :

1. by private practitioners or by doctors appointed and paid by the authorities,
2. by hospitals and dispensaries.

These two methods cannot be separated. The belief that the best medical treatment is hospital treatment and that there is need for large numbers of doctors for this purpose, is gaining ground daily.

Hospitals are of special interest for medical education because a modern and well administered hospital must be the centre of every medical school. It is in the hospital that the student learns to be a doctor. There he must learn how to examine the patient and to study his psychology, to know the various diseases and how to diagnose, treat, and prevent them. Without hospital training the student can be taught the theory of medicine but he cannot become a useful doctor. If a large hospital can be used for clinical teaching, the theoretical branches of medical training can be attached to it without great difficulty.

In China there are about 4,000 to 5,000 doctors trained in modern medicine. The population of the country being roughly 400,000,000, there is one such doctor for 80 to 100 thousand inhabitants. In the United States and in Europe the approximate number of inhabitants per physician was as follows in 1927 :

United States of America	800
Switzerland.	1,250
Denmark.	1,430
England and Wales.	1,490
Germany.	1,560
France.	1,690
Netherlands	1,820
Sweden	2,860

Thus if it were thought desirable to have at least one physician for every 8,000 inhabitants in China, about 50,000 doctors must be trained in the near future.

At present, medical relief in China is given almost entirely by doctors trained in the old Chinese medicine. The physicians with modern training are nearly all practising in the big towns and in the hospitals scattered over China, there being outside of the

hospitals practically no physicians in the smaller towns and in the rural districts. The Chinese Doctors' and Druggists' Federated Association informed me that the number of practitioners of so-called "Chinese Medicine" is 1,200,000 and there are 7,000,000 Chinese druggists. I am not in a position to judge the accuracy of these figures.

To understand the problems of medical education in China, it is enlightening to consider the situation in Shanghai, the largest and most international city in China, where there are said to be about 400 doctors trained in modern medicine. A part of this group consists of foreigners trained in their own countries (British, Germans, Americans, Japanese, French); Chinese trained in a foreign country constitute another part, and a third consists of Chinese trained in modern schools in China, especially those in Shanghai. In the Central National University College they are taught medicine in the Chinese and English languages; in the National Tungchee University College, in German. At St. Johns University (Mission) and in the Medical School for Women the English language is used, while French is employed at the Aurora University Medical Faculty. Three private medical schools graduate yearly a number of very badly trained doctors, and three schools train doctors in the old Chinese medicine—there are said to be about 3,000 practitioners of the latter type in Shanghai.

There are well-equipped private hospitals used for the most part by foreigners (English, Americans, Japanese, Germans) and some well-run private Chinese hospitals for well-to-do Chinese. The general public is served by some rather large mission hospitals (St. Lukes, Lester Hospital). In the Chinese city I found a badly kept municipal hospital directed by a leading Chinese physician trained abroad.

Smaller hospitals and large out-patient clinics are connected with the schools for old Chinese medicine. There are a large number of splendid Chinese drug-stores and some foreign drug-stores with Japanese, American, German or Swiss proprietary remedies.

In the other large cities the situation is about the same.

In the smaller towns are mission hospitals with their own doctors and large numbers of doctors of Chinese medicine who, in the rural districts, constitute the only available medical personnel. In the north of Peiping we visited Ching-ho, a market town of 2,500 inhabitants, the centre of an area with about 20,000 people. We found two doctors of Chinese medicine, each with a drug-store and a small library of old Chinese medical books. They received patients at these shops, made prescriptions after having felt the patient's pulse and then dispensed the medicines. There was no hospital, no midwives, no nurses or other medical helpers.

The purpose of medical education in China must be to train doctors able to profit by the progress of medicine in the world generally, that is, to produce doctors trained in modern medicine. When the future policy of medical education in China is considered, we must realise that although modern medicine was introduced a century ago and has won the confidence of the Chinese people to an increasing extent during the last few decades, its progress has been slow and it still has to win its way against Chinese medicine with its old traditions.

There is, nevertheless, great need in China for physicians with modern training. The demand results in great part from the rapidly-growing number of hospitals which have the greatest difficulty in obtaining experienced physicians as well as younger assistants. There is also a great demand for doctors in all public medical work, in the army, in the Customs service, as well as in the health service. Every attempt to provide medical treatment as well as health service for the general public is hampered by the lack of doctors. There is also an increasing demand for private practitioners, especially in the towns, where confidence in modern medicine is growing, particularly as regards surgical and eye diseases, but to an increasing extent also for general medicine.

The need for hospitals is very great in China. There are a considerable number of hospitals, but most of them are small and only a part of them are used for the general Chinese public. In the *Medical Directory*, issued in February 1930 by the National Medical Association of China, about 500 hospitals are listed; approximately half of these being mission hospitals. It was the missions which introduced modern hospital treatment into China about 100 years ago (Macao), and in 1835 the Canton hospital was opened. Since then the different missions and mission doctors have done valuable work in maintaining hospitals. The secretary of the mission division of the Chinese Medical Association informs me that there are now 250 mission hospitals in China, that 200 of these have a total of 14,134 beds and that 157,093 in-patients and about 3 million out-patients received treatment at these hospitals during 1929.

There are also hospitals connected with the various medical schools and military hospitals. A large percentage of the remaining hospitals are really private clinics or nursing homes where private practitioners treat their patients. This is the case in respect of two large and well-equipped hospitals in Shanghai—the Country Hospital and the General Hospital. These and many others are maintained and used mostly by foreigners. The Japanese maintain large hospitals in Mukden, Tsing-tau and Tsinan, and a splendidly equipped modern institution at Dairen. A certain number of hospitals are maintained by Chinese doctors, for instance, the Metropolitan and the Central Hospitals in Peiping, the Orthopædic Hospital in Shanghai, etc. Nearly all of these hospitals have out-patient departments which are usually extremely well patronised by the population.

The greatest need is for hospitals for the general public and for the poor. Outside of mission hospitals there are only a few municipal hospitals for poor patients. I have seen several and found them in such bad condition that very few patients would use them. In some there were only about 10 patients although many more beds were available and they constituted the only municipal hospital accommodation in large cities. There was a lack of support on the part of the authorities, but the low standing of the medical staff certainly was equally responsible for the bad conditions. In China there is also an almost complete lack of hospital accommodation for the tuberculous, as well as for the insane and for lepers, in spite of Dr. Kerr's hospital for the insane in Canton and the well-kept leprosy hospitals in Hangchou and Tsinan.

To meet the requirements of the general public for hospital accommodation, it is to be hoped that in the centre of each province, as well as in all of the larger cities, large hospitals with all the different services—medical, surgical, obstetrical, skin diseases, eye and ear diseases, etc.—will be established. Smaller hospitals, with out-patient departments and dispensaries, are needed in the smaller towns. Small hospitals with travelling dispensaries should be established at strategic points in the rural district.

There seems to be great difficulty in having public hospitals adequately supported in China. As in most other countries, the establishment and maintenance of public hospitals must be undertaken by the local authorities or the provincial governments. My study of hospitals in China leads me to point out the great need for central control and supervision of such hospitals by means of inspection by doctors and experts in hospital management, under the authority of a Central Board or Ministerial Department. Such hospitals ought not only to be well-equipped and adequately supported, they ought, first of all, to be staffed and administered by doctors with sufficient training who maintain and develop their professional knowledge after graduation, and who do conscientious hospital work.

It is said that a majority of the Chinese object to being treated in hospital. This may have been true; it is easy now to see the very opposite. If the hospital is well kept and managed with due attention to the habits and psychology of the Chinese,

and if the doctors have the confidence of the public, the hospital will be fully used. Most of all depends on the chief physician. If he is a good clinician and personally supervises the medical treatment and the hospital, patients will come. If he has lost his professional morale and neglects the hospital, it will be abandoned by the public.

This is another illustration of the great need for well-prepared doctors in China, doctors trained according to modern principles.

EXISTING MEDICAL SCHOOLS.

It is difficult to learn the exact number of medical schools in China because the registration is not yet complete. Some schools have recently closed, others have reopened, but are not yet under the control of the Ministry of Education. According to the *Medical Directory*, issued by the National Medical Association, there were in China in February 1930, 24 medical schools teaching modern medicine.

I had the opportunity to visit 19 medical schools and secured information concerning three others which are open at the present time—a total of 22.

These schools fall into four groups. The first comprises the four medical schools belonging to universities supported and under the direct control of the National government. The second group consists of the schools maintained by the provincial governments. There are now only two of these left and one will close shortly. The third group comprises private schools, including all mission schools—in all 13. The fourth and last group is made up of the three military medical schools.

The following table gives the name of the school, the town in which it is situated, the year it was established, the number of students and of graduates (the last year or the average for some years) and the number of hospital beds used for teaching.

It has been very difficult to obtain exact information, but I believe the list to be as nearly correct as possible at this time. The number of hospital beds used for teaching is less reliable—in some cases the number is too small because affiliated hospitals are used, in others it is too high because nearly all the hospital beds are used for private patients.

	City	Year established	Number of		
			Stu- dents	Gradu- ates last year	Hospi- tal beds used for teaching
1. Governmental Medical Colleges:					
Tungchee University Medical Faculty	Shanghai	1907	128	9	c. 160
National University of Peiping Medical College	Peiping	1911	(240)	?	180 (not opened)
National Central University Medical College	Shanghai	1927	62	12	210
Sun-Yat-Sen University Medical School	Canton	1927	130	20	170
2. Provincial Medical Schools:					
Hangchow Medical College	Hangchow	1911	70	0	0 (closing)
Hupeh University Medical College . .	Pao-ting-fu	1921	(194)	?	30
3. Private Medical Colleges and Schools:					
P.U.M.C.	Peiping	1906	93	16	230
Manchuria Medical College	Mukden	(Post-graduate 117)			
		1911	231 ¹	16	395
Aurora University Faculty of Medicine University of St. John Pennsylvania Medical School	Shanghai	1903	407 ² 85	27 10	200
	Shanghai	1880	37	15	268
West China Union University Medical School	Chengfu	1914	49	c. 15	?
Shantung Christian University Medical School	Tsinan	1916	93	15	104
Mukden Medical College	Mukden	1911	100	14	180
Hackett Medical College for Women .	Canton	1899	65	12	100
Women's Union Christian Medical College	Shanghai	1924	70	5 to 7	200
Tung-Teh Medical School	Shanghai	1918	145	30 to 40	40 (15)
Nan Yang Medical College	Shanghai	1924	480	82	0
South-Eastern Medical College (or Tun Nan Medical School)	Shanghai	1926	270	68	40 (20)
	Canton	1906	252	23	c. 100
4. Military Medical Colleges:					
Naval Medical College	Tientsin	1881	?	?	50 (10)
Army Medical College	Peiping	1918	220	37	50 (10)
Yunnan Army Medical College . . .	Yunnan	1920	?	56	?

¹ Chinese.

² Japanese.

There are said to be 15 schools teaching old Chinese medicine in China; I have visited the three situated in Shanghai; particulars concerning these are as follows:

	Year established	Number of		
		Students	Graduates last year	Hospital beds used for teaching
Special School of Chinese Medicine	1917	110	30	50
Academy of Chinese Medicine	1925	80	18	40
Shanghai College of Chinese Medicine.	1927	100	20	0

Of the other schools, two are situated in the province of Chekiang and one in Canton. Besides the schools, there are said to be about 570 medical organisations for the purpose of encouraging the study of Chinese medicine. These accept students. The largest proportion of Chinese doctors are trained by the "apprentice" system.

* * *

I. The *University Medical Colleges* are supported by and under the direct control of the National Government. The National Central University College in Shanghai follows the plan for teaching now recommended by the Ministry. After two years pre-medical work in the Department of Science, National University of Nanking, the students spend four years in the medical school and one year as interns. The pre-clinical work is given at Woosung (near Shanghai) where there are well-equipped but somewhat small laboratories for all the subjects. The clinical teaching is given in the Red Cross Hospital at Shanghai, which has been converted into a teaching hospital, the members of the Faculty acting as staff. The conditions at this college are not altogether satisfactory. The old hospital is not suitable for teaching purposes, there being a lack of accommodation for laboratories and clinical teaching, and the number of patients is not sufficient. The out-patient department is so badly installed that the college has arranged to establish another in the centre of the town in a building which in the summer-time is used as a cholera hospital. The worst feature of the college is the separation of all the theoretical work from the hospital, the former being carried out at Woosung several miles from the centre of the town. The theoretical and clinical work of the students is thus divided in a very inconvenient way, making difficult the early clinical teaching. The out-patient clinic at the Health Station in Woosung is used for teaching physical diagnosis, but this arrangement is not at all satisfactory. Nevertheless, the teaching in this school is very good, on account of the excellent staff of Chinese and foreign doctors, the true scientific spirit underlying all the work and the interest shown in providing good clinical training in the hospitals. This college has been at work for only a few years, but it certainly deserves to be able to continue its valuable work under better conditions. The deficiencies mentioned are much regretted by those in charge of the school, who have taken steps to raise funds for a large hospital with 400 beds, next to which laboratories for the pre-clinical sciences are to be erected.

At the National University Medical College in Peiping the conditions are much worse. It has been in existence for nineteen years and at the beginning showed considerable promise; but later economic difficulties made it very difficult for the college to thrive. In recent years it has had little financial support, and when I visited the school in September it had received no financial support for months. The teaching resembles the German system, with five years' training—two years' pre-clinical and

three years' clinical. The basic pre-medical sciences are taught in the school during the first two years. The laboratories and class-rooms for the pre-clinical work are very bad and those for the clinical teaching are still worse. I was told that formerly there were only about 20 beds available for teaching. Now the college has made arrangements for establishing a hospital under its control, but the funds so far have not been sufficient to maintain more than an out-patient department. The new hospital will have a capacity of 180 beds. It will be situated on a large plot of land with space for many more buildings, but it is to be located rather a long distance from the medical college. There are among the teachers well-trained and interested men and it seems very necessary that there should be a modern, well-equipped and adequately supported medical college as a part of the University of Peiping. But it will not be possible to bring this school up to the desired standard of a university college without complete reconstruction.

In the first place the hospital must be completed and enlarged. The pre-clinical teaching, if possible, should be given at the National Peiping University in the Department of Science. For the pre-clinical and other theoretical work it would be best to build the necessary lecture rooms and laboratories on the large plot of land where the teaching hospital will be located.

The other two national medical colleges of the Tungchee and Sun-Yat-Sen Universities are teaching according to the system used in German universities. There is a five-year course, comprising two-years' pre-clinical teaching in the college and three years' training in clinical medicine and pathology. No pre-medical work outside the school is required, but the basic sciences—chemistry and physics—are taught in the Department of Science of the university. The teaching is by lectures and laboratory work. The clinical teaching is not given in the wards but by clinical lectures. In the wards the work is done by the assistants and the interns after their graduation. However, in the Sun-Yat-Sen Medical College the students are taken for work in the wards during their last year.

The better equipped of the two is the Sun-Yat-Sen College in Canton. The hospital was founded in 1916 under the name of Sing-Kung Hospital. In 1926 it became part of the Chun-Shan University and changed its original name to "First Hospital of Chun-Shan University". It now has 140 beds but an enlargement is planned with 400 beds; funds are needed also for more free beds. The first Sun-Yat-Sen hospital has 110 beds, and is directly affiliated to the medical college; an enlargement of one hundred new beds is planned. In the town at some distance from the school there is an out-patient department and a second small Sun-Yat-Sen hospital affiliated to the college. The medical college came under government control in 1926. For its re-organisation seven professors from Germany were appointed, who organised the institutes and the teaching. New institutes have been built during recent years for anatomy, pathology and pharmacology, and further new buildings are planned for physiology and bacteriology. English is used for teaching in the other departments of the University, but German in the medical school. The medical students now have some difficulty in understanding the above-mentioned foreign lectures, especially during the first years; the lectures in anatomy and physiology are translated into Chinese as delivered.

The medical college of the University of Tungchee in Shanghai is organised in a similar way. As in the Central University School there is the same deplorable division between the theoretical and clinical teaching. In Woosung, chemistry and physics are taught in the University Department of Science. There is a new and well-equipped institute for physiology and another for anatomy, directed by two full-time German professors teaching in German. In Shanghai there is accommodation for clinical teaching in the Pau-lun hospital and there are rather small institutes for

pharmacology and pathology. The hospital has in all about 160 beds and an out-patient department. About one-half of the patients are private patients in small rooms. There are four wards with a total of about 80 patients of the third class¹. While the pre-clinical teaching in Woosung seems satisfactory, I have the impression that the clinical teaching is not as good as it might be, because the students are not allowed to work in the hospital before graduation. The college is in great need of a good hospital of its own.

The number of students in the four national university colleges is from 400 to 500, and about 50 or 60 graduated last year.

II. *Provincial Medical Schools.* — The school for medicine and pharmacy in Hangchow has no hospital, the only material available for clinical training being an out-patient department, situated rather a long distance from the school. The latter has two good buildings with laboratories for chemistry, physics and for pre-clinical teaching. The chemical laboratory is spacious and appears to be well-equipped. Because of the complete lack of facilities for clinical teaching, the medical school has been closed. There is every reason to permit the school to continue as a school for pharmacy. The accommodation for lectures on pharmacy is available and there is a staff of well-trained teachers. Outside of this school, there are practically no Chinese schools for teaching modern pharmacy.

The other provincial school is the Hupeh University Medical College in Pao-ting-fu, which I did not visit. I was informed that it was of a low standard but that efforts were being made to improve it. This school possesses a hospital for teaching but it is much too small, having only 30 beds.

Formerly there were several more provincial schools which were established during the last fifteen years. All but the two mentioned above have been closed for some time. The others are said to have been poorly equipped and badly run. There seems to have been little understanding of the need for a teaching hospital. The idea seems to have prevailed that a medical school consisted of class-rooms and some laboratories and at most a few patients for demonstration. The fundamental importance of bedside teaching appears to have been forgotten.

III. *Private Medical Schools.* — The Peiping Union Medical College was founded in 1906 by the co-operation of six American and English missionary societies. In 1915 the College was taken over by the Rockefeller Foundation which from that time has assumed its full support. From 1915 to 1922 the College was fully reconstructed, and the new buildings of the college and hospital were inaugurated in 1921. With a hospital of 250 beds and extraordinarily well equipped with all the necessary facilities for pre-clinical and clinical teaching and research, this is an excellent medical school and its influence on the development of modern medicine in China cannot be over-estimated.

The students are admitted after a three or four-year pre-medical course in a university or college, or by entrance examinations. They spend five years in the medical college, the last as interns.

The graduates have a high standing. The number, one must admit, is not large. In 1930 there were 93 students and in 1929, 16 graduated. From 1924 to 1930 sixty-four graduated.

However, besides the regular course for undergraduates there is very important post-graduate teaching. During the last year 117 took post-graduate work or special

¹ Patients in Chinese hospitals are divided into classes, according to the quality of the accommodation.

laboratory work. The graduates from this medical college are nearly all engaged as assistants or teachers in the same or other colleges and hospitals or are attached to the Public Health Services. The college is working to a certain degree as a normal school for teachers for other medical schools. This depends not only on the thorough education given to the graduates but on the real scientific spirit reigning in the College, as shown by the research work carried out by the different staffs. The number of teachers is very large, totalling more than 100, while there is a number of assistant professors, associates and assistants. After some years' work in the College many of these will be well qualified to go out to other institutions as teachers, bringing with them the principles and spirit of progress of modern medicine. In this respect the Peiping Union Medical College is surpassed by no other institution in China and it is to be hoped that it will be able to continue its development in the future.

If I might mention some directions in which further evolution could be desired, these would be : an enlargement of the hospital so that a greater variety of patients could be under treatment ; a further development of the specialities. I understand in particular that it is felt to be a defect that there is no psychiatric department, so that no clinical instruction can be given in this field and no leaders can be trained. The treatment of the insane is a real problem throughout China which has not yet been taken up seriously.

The Japanese Manchurian Medical College has also a high standard, with excellent laboratories and class-rooms for pre-medical and pre-clinical teaching and a large hospital for clinical training. The complete course of the University Medical College is almost exclusively taken by Japanese students, more than half of whom, on graduation, go to Japan where they are qualified to practice. The course of this college is said to be of the same standard as that of the Imperial Universities of Japan. It consists of three years' pre-clinical teaching, four years' medical course and one year (voluntary) post-graduate course. In addition to this complete course, there is a "practical course" for Chinese students. The entrance requirements for this are graduation from a middle school, entrance examination, and one year preparatory course, to acquire Japanese. The practical course lasts four years.

In 1929 there were 216 Japanese and 23 Chinese students in the complete and 107 Chinese in the practical courses ; 27 Japanese and 1 Chinese graduated from the medical college and 15 Chinese from the practical course, during the last school year. The teachers and the equipment are the same for both courses.

As this dual system of medical education was accepted up to a point by the Ministry of Education, it is interesting to see how it works in Mukden. From a rather short visit to the school I secured the impression that while the teaching in the college certainly was of a high standard, not so much interest was taken in the practical course for the Chinese.

IV. *Mission Schools.* — The next group of schools consists of 7 mission schools. To understand the situation of these, it is necessary to know something of their origin. After the first mission hospital was founded in China, the need to train young Chinese as assistants or doctors to help in the hospitals became apparent. The first serious step in this direction was taken by Dr. Hobson, who published in Canton in 1850 the first Chinese translation of a work on anatomy and physiology. Since that time all the mission hospitals have trained Chinese students in modern medicine and the number of textbooks translated into Chinese has grown steadily. The centre of this work is in Tsinan, where the editor and secretary, Dr. P. L. McAll, has just issued a catalogue of 45 Chinese textbooks translated from other languages.

In this pioneer work of medical education it was found that the practical training of helpers in the different hospitals was not satisfactory. A movement to amalgamate these very small schools into larger ones, where modern and more scientific teaching could be given, began early in the present century. In this way the P.U.M.C. and the present large medical mission schools replaced a larger number of the older schools. The Shantung Medical College, for instance, has absorbed four different medical schools. The idea of teaching Chinese doctors in the hospitals was originally to obtain assistants and hospital physicians, and the aim of the mission medical school is still to train assistants and doctors for the many mission hospitals scattered over China.

The Shantung University School is of the highest standard among these mission schools, but all seven do good work. Lack of financial support makes it difficult to secure a sufficient number of teachers and nearly all of these schools need larger hospitals for clinical training. The mission hospitals I have visited are all well kept and the out-patient departments are well attended. After the Shantung school I consider that the Mukden Medical College is doing the best work. Nevertheless, the small budget makes it impossible to maintain as large a teaching staff as is desirable. It would be very useful if this school could become more closely connected with the North-Eastern University so that it could attain the standard of a university medical college. It is said that such an arrangement has been discussed and it is to be hoped that a favourable decision may be made so that the pre-medical teaching might be removed from the medical school to the well-equipped department of science of the North-Eastern University, and the theoretical training of the college come under the control and receive the support of the university.

All of the above mission schools have a two-year pre-medical course in the university to which they are attached or in another college of science and the medical course lasts five years, the fifth being spent in the hospital.

These seven mission schools have about five hundred students this year, and 88 graduated last year. It is reported from the Shantung University College that of 220 graduates since 1915, the position of 197 of them is known—105 of them are working in hospitals or missions in the different provinces, mostly in small towns. The rest have formerly served in mission hospitals and are now in Government employ or in private practice, most of them having small private hospitals or clinics.

V. The last group of *private schools* comprises three schools in Shanghai and one in Canton. They are all of a much lower standard than the schools mentioned above, the equipment and facilities for teaching being indeed so defective that very great improvements are necessary before they can give suitable medical training. It is understood that the Government has decided to make a special investigation of the three schools in Shanghai so that they may be properly regulated. A visit to these schools was indeed depressing. There was a total of 895 students, nearly 200 having graduated in the last year. The German system of teaching was used, with two years' pre-medical work and three years of pathology and clinical medicine. There were a number of class-rooms for lecturing but practically no laboratory facilities. In the North-Eastern medical school there were small laboratories, in Nanyuan a room for anatomy and a laboratory for chemistry, in Tung Jeh a small room for anatomy; but I found no other laboratories. Hospital facilities were found in the South-Eastern and in Tung Jeh, Schools but so dirty and badly kept that no students should be allowed to visit them. Most of the patients were private patients not to be used for teaching. In the third class there were only 10 or 15 patients in each school. In Nanyuan there were no beds for patients. The students were said to be taken out to some hospitals in town where the patients were shown to them. I found better

conditions in the old Kuang-Wa Medical College in Canton, but only one large laboratory used for all laboratory teaching, and the hospital was too small and badly run. In all of these schools the arrangements for anatomical work were insufficient and seemed to be very little used.

VI. *Military Medical Schools.* — I inspected two schools belonging to this last group, one at Peiping, the other in Tientsin. The political disturbances have caused their financial support to be irregular or altogether lacking. The army medical school in Peiping has good buildings and space for 300 hospital beds. At the time of my visit there were only 50 beds available and only 10 patients in the hospital. The teaching must have been quite insufficient. The naval medical school in Tientsin is located in a building dating from the time when the school was established in 1881, under the patronage of the Viceroy Hi Hungshan, as one of the first Chinese schools teaching modern medicine. After that other buildings were erected and just beside the school is a hospital formerly very much used by the public, as well as an out-patient department. Later the school was used as a naval medical school and little interest was shown in modernising the training. The financial support of this school has been insufficient and lately nearly entirely lacking. The hospital with formerly about 100 beds, now has only 50. When I visited the hospital there were only 10 patients. The laboratories are few and in bad condition so that they could not be used for teaching without great difficulty. The lack of financial support had made it impossible to maintain the school at its old standard. The French colony has given the college a handsome and well-kept Pasteur Institute where rabies treatment and bacteriological work is done.

If there is to be a future for this school, there must be a more or less complete reconstruction. It does not seem necessary to maintain it as a navy school because the naval physicians could be trained just as well in the other military school. The valuable plot in the middle of the French concession on which this school stands might be sold and the school moved to a new hospital in the Chinese city.

* * *

Reviewing the medical school situation in China, it is seen that for satisfactory training of physicians in modern medicine only the four National university schools, the two private and the seven mission schools can be counted on. From these thirteen schools about 180 doctors graduated last year. In comparison with the ordinary medical schools in Europe and the United States this number appears very small. The Edinburgh medical school alone graduates about 140 students yearly. In the United States from 75 to 100 physicians graduate yearly from the better schools.

Reasons for the small number of medical students in China are said to be as follows :

1. Young people take little interest in the study of medicine.
2. The expense of the long medical course is too heavy for the student.
3. The entrance requirements are too high and a large number of the applicants fail to pass.
4. The medical schools are not sufficiently equipped with laboratories and especially with facilities for good clinical teaching—their staff of teachers is too small so that a larger number of students could not be trained properly.

5. I might add that in these schools there has been, very naturally, a strong feeling on the part of the staff of their responsibility to produce only very well-trained doctors to extend and defend the principles of modern medicine, and they have not yet felt it their business to train as large a number as possible to relieve the need for doctors in China.

Reviewing these reasons it is generally admitted that interest in the study of medicine is growing fast among students. Moreover, when the entrance requirements are low and no pre-medical college work is required, the number of applicants is large, although the course lasts five years. At the three very unsatisfactory private schools in Shanghai, where the entrance requirements are low, although the course takes five years, there are 895 students and 190 graduated last year—these numbers being larger than the total for the thirteen high-grade medical schools. Interest in the study of medicine is not lacking, but the entrance requirements are high and only two-thirds or one half of the applicants succeed in entering the better medical schools. Last year, for instance, 350 students took the entrance examinations for the Shanghai college (all departments) and only 180 passed. The examination was in Chinese, English, mathematics, history and one of the sciences. The majority failed in science and English. After the college years there is often another examination prior to the medical course and again after the different divisions of the course. In order to obtain more medical students it seems necessary to set less strict entrance requirements and to try to secure better teaching in science in the middle schools.

A very serious hindrance is the relatively heavy expense for the long courses. Not only the annual fees but the living expenses and the period in dormitories come rather high. If there is a large number of medical students they will come in great part from middle-class families who find it difficult to provide the necessary funds. This question is so serious that the possibility of asking low fees in the national medical colleges must be considered; and, at the same time, arrangements must be made for very cheap board and lodging in dormitories or elsewhere.

Most of the schools could take more students but it must be admitted that in order to do so they would need better equipment and an improved and larger staff. Perhaps there is reason to believe that teaching methods might be changed so that larger classes could be taught with the same equipment. The laboratories might be used more continuously and the teaching could be done in larger classes. Clinical lectures and diagnostic clinics could be used to a greater extent as a substitute for ward rounds. But for the exceedingly valuable hospital work of the students as clinical clerks and interns, more hospital accommodation is certainly needed.

When less than 200 physicians are graduated yearly, it is evident that this number is negligible in proportion to the needs of China and one can readily understand that the Ministries as well as the medical profession feel that a new policy must be adopted. First something should be done to enable the existing schools to train more students. This is not sufficient, however; more schools must be established. The Commission on Medical Education and the Ministry of Education have suggested that in the future there should be two kinds of medical schools—the university medical school with a high standard, and the special medical school with a lower standard. It seems to me quite necessary to adopt this policy. I wish to emphasise, however, that these schools and especially the school of the lower type must be organised in such a manner as to permit of training a much larger number of students than has as yet been done in the medical colleges. It is much less expensive to establish one school to train a large number of students than to organise two or three schools for smaller numbers—less expensive in hospital and laboratory equipment, and very much less expensive in regard to teachers. It is generally admitted that qualified teachers in China, and

especially Chinese teachers, are sadly lacking. The existing supply must be utilised to the best advantage, and they must be provided with enough assistants to enable them to train a larger number of students.

For the future, the following questions arise :

1. How to develop special medical schools of the lower type.
2. What attitude to adopt regarding the present schools of different types.
3. How to supervise the medical schools and how to promote their future development.
4. What position to take regarding the registration of medical schools and medical practitioners.

I have attempted in the pages which follow to answer these questions.

THE SPECIAL MEDICAL SCHOOL.

The aim of this school is to train as many practical physicians as possible every year. Particular stress must therefore be laid on the clinical teaching, and a good modern hospital must be an integral part of the school.

According to the regulations of the Ministry of Education governing the organisation of universities all kinds of colleges may give special courses of from two to three years in length. In the case of a special course in medicine, one year of practical work is required on completion of the three-year course. Is there any probability that this method of establishing special medical schools will be followed, and should the future policy be to encourage it or to try and find other methods ?

Many objections can be raised against the plan of attaching the special medical school to existing medical colleges.

First, none of the university medical colleges at present has the accommodation, laboratory and clinical facilities necessary for such a special course, in addition to its ordinary teaching ; considerable enlargements would be required for additional students in the special course. It would also be very difficult for the teachers to train simultaneously two kinds of students whose qualifications differed widely (lower entrance standards) and who require different methods of teaching. The result might easily be that the medical college would be converted into a special school with many students, with a few students of a higher college standard, or it would only be possible for the college to train a few students in the shorter course.

The Manchurian Medical College, in addition to the ordinary medical college course, gives a practical course of shorter duration. But here the medical college dominates because it is used by a large number of Japanese students being trained for the Japanese qualification. The practical course is for a much smaller number of Chinese students. My impression of this experiment is not encouraging.

Establishing such medical schools in connection with medical colleges will meet with so many difficulties that the result will not be of help to China in supplying physicians. If a large number of physicians is to be trained in the near future, a certain number of independent special medical schools must be established, eventually, perhaps one in each province. Each of these should graduate at least 60 doctors yearly, increasing in the future to 100 a year.

If 50,000 doctors are to be trained in China in the next 50 years, 1,000 must graduate every year. The university medical colleges might be encouraged to train from 300 to 400 yearly. From 7 to 10 special medical schools would be needed in the near future to train the remainder.

A beginning could best be made by establishing a single experimental or model special school. When this has succeeded it would serve as an example for the others.

The first thing required is a plan for such an experimental or model school which might be organised in different ways. My plan is of course subject to a number of criticisms. The main considerations must be that the entrance requirements do not prevent the entry of a large number of students, and that the aim of the school is to train practical physicians. It is a question whether a course lasting only four years is sufficient to train a doctor. In most countries, five years are thought to be necessary, but when the great need of doctors in China is considered, *it must be admitted that an experiment with a four-year school is necessary*. This experiment presupposes the best teaching, sufficient accommodation and the use of a modern hospital as the centre of the teaching. As I have already suggested, it will be necessary for each provincial capital to provide such a hospital for the general public. Co-operation between the municipal and provincial Governments will then be very useful for the establishment of such a provincial school.

I propose the following plan for the National special medical school in China.

1. The teaching in the school should be done in Chinese as already decided by the Commission on Medical Education. Only when the students are trained in Chinese can they become efficient doctors for the Chinese people. Only then will they be able to understand the psychology and the special characteristics of their patients and the diseases which affect them. At the same time it is necessary for the Chinese student and doctor to know at least one foreign language, because the number of Chinese textbooks is limited at present and the translation of medical terminology into Chinese is not yet complete. Future medical graduates must be able to read medical literature in at least one foreign language. I am not competent to decide what language should be selected. The Commission on Medical Education has decided that the Colleges of Medicine may, as hitherto, themselves select the foreign language. In the experimental special school I presume English must be the preferred language, because it is most generally taught in the middle schools and used most generally in China. The structure of the English language resembles more closely that of Chinese than any other European language. The same foreign language should be used in all the special medical schools.

2. The school should be organised as a national Chinese school and the scheme of teaching should not be American, British, French or German. It should be organised for practical teaching with reference to the diseases and conditions as well as to the economic situation in China. Clinical training must be given first consideration.

3. The entrance requirements should be graduation in science from a senior middle school. Since the re-organisation of the middle schools in 1928, the students spend 6 years in the middle school—3 years in the junior and 3 years in the senior classes. Two courses are usually offered: (a) The arts and social sciences and (b) mathematics and natural sciences. Personal observation has convinced me that the teaching of natural sciences, in some middle schools, is very well organised, with the necessary laboratory training for students. In others this branch is neglected and in some, I believe, only the course in arts is given.

It is to be hoped that the development of the middle school will continue and that the courses in natural science will be developed increasingly. At present it is perhaps necessary to require that the student shall be a graduate of a middle school giving a suitable course in science or, better still, to have a model senior middle school attached to the medical school.

In addition to graduation from the middle school there is the question of an entrance examination to the medical school. It would be best if this examination

should include only the Chinese and English languages, and perhaps mathematics to show that the student is not altogether incompetent.

4. If the medical course lasts only four years, its subdivision into trimesters, each of eleven weeks, is the best method. The basic and pre-clinical sciences would take $1\frac{1}{2}$ year, the clinical and pathological sciences $2\frac{2}{3}$ years. It is necessary to give two trimesters training in chemistry. One trimester will be sufficient for physics if special stress is laid upon light, sound and X-rays. In biology, the teaching in the middle school must suffice; only an orientation is here necessary. In my opinion, the requirements in anatomy can be reduced considerably below the ordinary standards. Dating from olden times when anatomy was the only scientifically taught subject in the medical faculty, too many details are still taught and too much attention is paid to unnecessary details about muscle attachments, the ligaments, the smaller communicating arteries and veins, the lesser nerves, etc. The time spent on gross anatomy could, I imagine, be reduced to nearly half that required in the ordinary medical colleges. The greatest need in this connection is a good short textbook. Great stress should be laid on practical work, that is, the dissection of human bodies. Each student should have the opportunity of dissecting half a cadaver and of examining the viscera at post-mortem examinations in the hospital. Histology is important and the use of the microscope must be taught at the beginning of the course. The course in physiology may be and usually is, divided into bio-chemistry, including metabolism and experimental physiology. Applied physiology, with demonstrations of patients suffering from oedema, heart-failure, palsy, etc., might be introduced as a special branch of physiology.

In accordance with modern practice, laboratory training in all subjects, including anatomical dissection, should be the fundamental method of teaching. When a large number must be taught, for instance, 60 to 100 every year, the classes must be divided into groups and the courses repeated each trimester. The courses should be directed by the professor, who is chief of the department, but he should have sufficient assistants to teach and help the students and to manage the courses when it is necessary to repeat them. The laboratories should be sufficiently large to accommodate at least 30 to 40 students simultaneously. The same arrangement must be made for the laboratory training in other subjects, especially, bacteriology, pathology and pharmacology.

Physics, chemistry and anatomy should be taught in the two first trimesters. In the third trimester of the first year physiology, anatomy and parasitology should be taught. In the first trimester of the second year physiology, bacteriology and pathology are to be given. In the second trimester of the second year the clinical teaching should commence, and at the same time courses in pathology and pharmacology must be given. Practical as well as theoretical teaching in medicine and surgery should be given. In the last years, besides the clinical teaching, there should be instruction in pathology, public health, toxicology, legal medicine and a course on the history of medicine with special reference to the history and merits of old Chinese medicine.

5. The basis of the teaching should be the clinical instruction in the hospital attached to the school. This teaching may be given by different methods. From the time that clinical teaching in a university was first organised in the Netherlands in the seventeenth century three different methods have been used.

A. Clinical lectures with demonstrations of patients.

B. Clinics where the students examine the patients and afterwards report on the case to the professor, who discusses the patient, the diagnosis and the treatment with the students.

C. Students wardwork. In England and America the students work as clerks, in France as "*stagiaires*" and *externes*, in Scandinavian countries as volunteers and practicans, in Germany partly as "*famuli*".

The first two forms of teaching are of special interest, when it is necessary to train a large number of students in one school and when there is not a large staff of teachers. Both of these methods are extremely useful, however.

A. The clinical lecture, when given by a professor with great clinical experience and a real scientific spirit, is a very impressive performance, arousing the interest of the students and making them understand the spirit and the scientific basis of medicine. Such a lecture can be followed simultaneously by young and older students. They are all able to pick up something, and their interest in medical work is stimulated. Lecture rooms, with arrangements for the demonstration of patients and laboratory findings, X-ray pictures, charts, etc., with room enough for many students from all the three years in which clinical teaching is given, should be available in the medical school.

B. The examination clinics, often simply called clinics, are an excellent method of teaching when properly used. The student ought to examine the patient before the clinic is held and carry out all the routine and more complicated laboratory examinations. In the beginning these should be done the afternoon before the clinic, and a written report should be made. Later on, it may be useful to permit the student to examine the patient an hour or two before the clinic and then make an oral report. The point is that the student is really examined by the professor, that he must defend his diagnosis and discuss the treatment seriously. The professor ought not to turn the clinic into a clinical lecture. In surgery and the specialities the same method can be used with necessary modifications. A large number of students can attend and profit by these diagnostic clinics, which ought to be held in special classrooms and not in the wards, where the students get tired of hanging around between the beds. There is no good opportunity for free discussion between the student and his teacher in the wardrounds, now so freely used in medical teaching. These clinics ought to be a feature of all clinical teaching during the three years it lasts.

C. The clinical teaching in the wards ought to be done in two ways. The student should do wardwork during the three clinical years. The first year he should work in the different wards as a *stagiaire* or volunteer as a helper for the older students, interns and nurses. For example, he should spend two hours every morning in this work, and so become accustomed to hospital life and work, get some idea of the various diseases and their treatment and be prepared for the next year's clerkship. At the same time, the students should be taught the elements of medicine and surgery and the methods of examining patients. The system of rotation should be used, so that one trimester is spent in the surgical wards and operating rooms, one trimester in the medical wards and in wards with infectious diseases, tuberculosis and other subjects. During the time they spend in the surgical wards, students should be taught elementary surgery, antiseptic and aseptic methods, theory of inflammation, fractures, etc. When in the medical wards, they should be taught physical examination, laboratory technique, chemical and microscopical work, and given elementary instruction concerning the various diseases. The teaching should be done in courses, in diagnostic clinics, with special reference to examination of the patient, case-taking, etc., and in elementary lectures in medicine.

In the second of the three clinical years the wardwork should be done by means of clerkships, each student acting as a clinical clerk. This method was so well developed,

first in England and Scotland, afterwards in America, that a description is unnecessary. The students ought to be divided into three classes, each working successively in surgery, medicine and obstetrics and pediatrics. They should "receive" some patients in the afternoon, keep in touch with them in the wards, and make all necessary examinations there under the supervision of the interns. Too much time during the wardround should not be given to questioning the students; this had better be done in the diagnostic clinics in special classrooms. When the students spend three hours in the wards, enough time will remain for about two hours of clinics and lectures daily. In the third year the students might be assigned to the various out-patient departments where they would examine the patients and report to the doctor in charge. They should work in the surgical and medical departments and in the different specialities, and at the same time be taught the specialities: skin, eye, ear, etc., in clinics.

If the student desires to continue his studies after graduation, it would be very useful for him to take a year as intern in the same, or in another, hospital. Instead of taking the ordinary rotatory type of internship the students should be utilised as assistants in different departments and thus commence a certain degree of specialisation which would be necessary, should they afterwards be utilised in the hospitals and dispensaries organised by the community. They may be surgeons, internists, oculists, obstetricians, etc. In the same way the sanitary personnel must have its special training after the fourth year.

6. A modern hospital with an out-patient department is necessary for clinical teaching. The hospital must be big enough and have a sufficient number of departments, so that the students may have the opportunity to study the different diseases they will meet in their future practice in China. There must be departments for surgery and medicine, the latter with special divisions for tuberculosis and for communicable diseases¹. There should be a maternity ward, and special rooms for diseases of children and for gynæcology; smaller, but separate departments for skin diseases, venereal diseases, eye and ear diseases and, if possible, for mental diseases. I wish to emphasise the necessity, in view of the anti-tuberculosis campaign, of having

¹ By communicable diseases are meant here only such diseases as plague, smallpox, cholera, leprosy, rabies and influenza. Other infectious diseases may be treated in the medical department.

To understand what sort of patients may be expected to seek hospital treatment, it is of interest to examine the diagnoses of the in-patients received during 1928 in St. Luke's Hospital, Shanghai, which has 154 beds for males. These were as follows :

	Number of patients
Animal parasites (including malaria)	89
Infectious diseases (including bacillary dysentery, typhoid fever, pneumonia)	156
Communicable diseases (including influenza)	33
Tuberculosis	79
Syphilis	28
Intoxications	66
Deficiency diseases	36
Digestive system	154
Blood and circulatory system	43
Diseases of the nervous system	63
Respiratory system	57
Other diseases	76
Total . . .	880

In the surgical department most of the beds were occupied by patients with traumatic diseases (wounds, contusions, fractures, etc.) and with abscesses, cellulitis, etc. In addition, patients with tumours and appendicitis were frequent.

in the hospital of the school a department of tuberculosis capable of housing 30 patients with pulmonary tuberculosis. Only in this way can the students really learn the manifestations of this widespread disease.

The teaching hospital must have at least the following number of beds—100 surgical, 100 medical, 30 for tuberculosis, 20 for isolation, 20 for maternity cases and 10 each for diseases of the eye, ear and skin. A larger hospital, with 400 to 500 beds would of course give better clinical opportunities, though this is not suggested at present on account of the expense, while affiliated hospitals might be used for this purpose—yet, when the hospital is altogether separate from the medical school, it is very bad for teaching purposes. The classrooms for clinical lectures and for the clinics ought to be in the hospital as well as the laboratories for teaching clinical laboratory work.

7. It is absolutely necessary that the special medical school should have a well-trained and sufficiently large staff of teachers interested in teaching and in the progress of medical science. The teachers of the more important pre-clinical subjects should be full-time men. The clinical teachers should be allowed to practise as specialists in addition to their hospital work. This is not only necessary for obtaining good teachers, but it is very useful for keeping them up to the necessary standard as first-class practitioners.

In most cases the best policy would be to combine this special medical school with a general hospital in the city or in the centre of a district or province. But the hospital ought to be so well planned that there are ample facilities for the student work in the wards, together with all the necessary classrooms and laboratories.

8. I have deemed it necessary to discuss in detail my ideas of the teaching in the special medical school, for only when the teaching is arranged and carried out efficiently, will a school with a 4-year course be able to fulfil reasonable expectations.

As I mentioned before, there are several schools in China with courses lasting 5 years, yet whose results are very bad. Better results will not be obtained if such schools are allowed to continue as 4-year schools of a lower grade. The four-year school should not be established and should not be allowed to function unless its facilities are sufficiently good; a sufficiently large, properly equipped and adequately supported hospital, adequate laboratories and good teachers are absolute necessities. The Government should not allow a school to be established, unless it is certain to comply with these requirements, and the best policy for the present would be to restrict the establishment of such schools to the central and local Government. Only under the most exceptional conditions should a private four-year school be allowed. In any case the first experimental special medical school should be established in co-operation with, and very closely supervised by, the Government.

9. When the first special medical school is established, regulations concerning its graduates might be adopted. It is worth while to consider whether it would not be wise to provide that the graduates from this school (supported as it will be by public funds) must agree for some years to accept official positions, and particularly in hospitals and dispensaries in small towns or in rural districts which must be organised by the communities. In order to utilise the graduates in the public health service, it will be necessary to give them additional training.

It is sometimes said that in a country like China the emphasis in medical relief must primarily be laid on preventive measures and general sanitation. The value of these cannot be overestimated, but in addition to the need of the general population for medical relief, there is no doubt that preventive medicine can succeed only when the country possesses a medical profession capable of recognising diseases. A primary

need of preventive medicine is therefore the training of physicians. In their clinical instruction students must learn not only the diagnosis and treatment, but also the etiology and prevention of the infectious diseases they find in the hospitals. It is impossible to divorce curative from preventive medicine. The natural course is for the students to be grounded in general epidemiology by the clinical teachers and the teachers of bacteriology and parasitology.

The special public health workers further require a knowledge of the more technical side of public health — *e.g.*, water-supply, sewage-disposal, quarantine, food, etc. This should constitute a special course outside the special medical school. For the ordinary practitioner a short course in hygiene is necessary, given, say, during a trimester in the fourth year.

10. While the location of the first experimental special school is a problem which must be decided by the Government, I venture to make a suggestion in order to show how the school could be organised in accordance with the plan described above and to underline the value of amalgamating as much as possible less effective schools into fewer and better supported institutions.

In my opinion, the city of Tientsin presents important and interesting possibilities in this connection. There exists in Tientsin an old and formerly well-known medical school which recently has experienced many difficulties. The buildings of the school as well as of the hospital are old and not very suitable. Total reconstruction would be desirable. The school and hospital are situated on a large plot of land in the middle of the French Concession and would certainly realise a large sum. The health authorities in Tientsin are apparently anxious to have the hospital removed to a more suitable location in the Chinese city and to enlarge it considerably. There is a provincial medical college connected with the Hupeh University in Paotingfu. This school is said to need improvement and reconstruction. It would seem to be advisable to consider amalgamating the two schools and building up an experimental special school attached to a new hospital in the Chinese city. The endowment fund and the operating expenses of the school could in large part be raised by the sale of the plot in the French Concession together with the credits still allocated to the Hupeh medical college.

In order to exemplify how the plan for the special medical school could be carried out in detail, I have prepared a curriculum which follows below. Changes can of course be introduced. It is impracticable to describe every detail of the plan, which may be modified from time to time in the light of the teachers' experience.

The plan requires as a minimum teachers of physics, chemistry, anatomy and histology, physiology, bacteriology and parasitology, pathology, pharmacology, public health, legal medicine and in the clinical subjects. The teachers would number fourteen—seven in the theoretical and seven in the clinical subjects, not including physics and chemistry. In addition there must of course be the necessary number of assistants.

The number of hours in the four years would be about 4,000, of which 1,600 would be allocated to theoretical subjects, lectures and practical work included. The clinical teaching would take about 2,400 hours, including lectures and wardwork.

The hours in the theoretical subjects would be subdivided as follows :

	Hours		Hours
	p. a.		p. a.
Physics	110	Pathology	234
Chemistry	220	Pharmacology and therapeutics	276
Anatomy and histology . . .	374	Public health	44
Physiology	242	Legal medicine	22
Bacteriology and parasitology	176	History of medicine	22

First Year.

			WEEKLY	
		Lectures	Practical work	Total Hours
First trimester :	Physics	4	6	10
	Chemistry	4	6	10
	Anatomy	4	—	4
	Languages	6	—	6
				30
Second trimester :	Chemistry	4	6	10
	Anatomy	2	6	8
	Histology	2	6	8
	Languages	6	—	6
				32
Third trimester :	Physiology, biochemistry and metabolism	4	6	10
	Anatomy	4	6	10
	X-ray of the normal	2	—	2
	Parasitology	3	3	6
	Languages	4	—	4
				32

Second Year :

First trimester :	Physiology	4	6	10
	Bacteriology	4	6	10
	Pathology	4	6	10
	Applied anatomy	2	—	2
				32

Second and third trimesters. Class divided into two parts : A and B, taking medical and surgical work in rotation.

		WEEKLY
		Hours
A.	Surgical wardwork	12
	Surgical propædeutics	3
	Minor surgery	3
	Surgical clinics	2
		20
B.	Medical wardwork	12
	Physical diagnosis	3
	Laboratory diagnosis	3
	Medical clinics	2
		20

Fixed.

In second trimester :	Pathology	6
	Applied physiology	2
In third trimester :	Pharmacology	8
		8
	In each trimester . . .	8

Third Year.

First, second and third trimesters (in rotation). Class divided in three :
A, B, C.

	WEEKLY Hours
A. One trimester : Clerkship in medicine, tuberculosis, communicable diseases	17
B. One trimester : Clerkship in surgery, ophthalmology, dermatology	17
C. One trimester : Clerkship in obstetrics, gynæcology, pediatrics	17

Fixed.

Surgical clinical lectures	2
Medical clinical lectures	2
Clinics in medicine	3
Clinics in surgery	3
Conference in pathology	1
Pharmacology and therapeutics	2
	<hr/>
	13

Fourth Year.

First to third trimesters (in rotation). Class divided in three : A, B, C.

A. One trimester : Out-patient department, work in surgery, ophthalmology, otolaryngology.	17
B. One trimester : Out-patient department, work in medicine, dermatology, venerology	17
C. One trimester : Out-patient department, work in obstetrics, gynæcology, pediatrics	17

Fixed.

Surgical clinical, lectures	2
Medical clinical, lectures	2
Clinics in medicine and surgery	2
Clinics in specialities.	2
Obstetrics and pediatrics	1
First trimester : Mental diseases	2
Therapeutics	2
Second trimester : Public health	4
Third trimester : Legal medicine	2
History of medicine and "Chinese Medicine"	2
	<hr/>
In each trimester.	13

If in future it is intended to raise the special medical school to a higher standard, the basic pre-medical sciences could be taught in a one-year course in a university or college and a year's internship made obligatory.

THE MEDICAL COLLEGE.

The object of the university medical college must be to produce first-class practitioners, and at the same time a higher type of doctor, who will have the ability and the desire to continue their training, so that they will be fitted to become leaders and teachers in the hospitals and schools of China. These medical colleges must therefore be maintained at a high standard, and the teaching must have a more scientific character than in the special school. This higher standard obtains only in some of the existing medical colleges. We must first consider the four national medical colleges, and of these the two in which the teaching is in Chinese come first—the national colleges in Shanghai and Peking. Both of these schools need reconstruction. The National Central Medical College in Shanghai is certainly the most prosperous of the national medical schools, and for this reason it deserves to have the facilities which would make it into a model national medical college and cause it to have a great influence on the evolution of medical education and medical science in China. This college needs, large modern hospital, 300 to 400 beds and a new medical school building near the hospital as proposed by the leaders of the college. There are good reasons for building the new hospital in Shanghai, for a city as large as Shanghai is well adapted to be the seat of such a hospital and to provide the clinical material for teaching of the most practical character. There certainly ought to be a real Chinese medical college in the largest city in the country.

An even more complete reconstruction of the Peiping National Medical College is required, because the standard of the college is at present much below what should be required of a university medical college. It is to be hoped that the National Government will provide funds to reorganise these two schools in which the medical training is given in Chinese. The Sun-Yat-Sen University Medical College is making good progress but needs help towards further development, especially of its hospital and facilities for clinical teaching. In a still higher degree that is also the case of the Tungchee University Medical College.

To set up a standard model curriculum for the national university medical colleges is difficult, because they are organised in quite different ways, some after the German or Japanese, some after the Anglo-American system. It seems to me that the best plan to follow is the standard proposed by the ministerial Committee requiring two years' pre-medical college work and five years' medical training, the last as interns in a hospital. I consider two years' pre-medical teaching necessary, because it is generally agreed that the middle-school training is uncertain and college training is therefore necessary.

In Europe, pre-medical training covers only the basic sciences, physics, chemistry and biology, and lasts for one year in nearly all countries. In Germany, two years' training is given in pre-medical and pre-clinical subjects together. Except at Oxford and Cambridge pre-medical teaching is everywhere given in the same university or medical school as the other medical teaching.

The greatest stress is laid on pre-medical training in the United States of America. Before entering a medical college it is very common for the students to have had three to four years' pre-medical work in a university. Pre-medical work was introduced because the teaching in the secondary schools was not found to be satisfactory. This system has the advantage that the students are trained for some years in the same college with students from other faculties and that, besides the special pre-medical work, they have training of a more general nature in languages, history, etc. The idea is that they should have some general culture before going in for medicine.

As far as medical students are concerned there are two objections to this system—first, that it does not appear to be logical to devote three years to pre-medical and only four years to the medical school; secondly, the system is very expensive for the students. These objections seem to have some weight, when the problem is to consolidate the system in China.

Nevertheless, the same conditions which have led to its development in the United States of America now exist in China. Secondary education in the middle-school is not considered to be adequate by the leading medical teachers in China.

It is hoped that the middle-schools will continue to improve in the years to come, and then the question must be reconsidered. Otherwise the departments of science in the Universities might arrange one-year pre-medical courses, perhaps omitting biology. The economic status of medical students in China renders it essential not to extend the length of the medical course more than is absolutely necessary.

A certain latitude should be given the staff of teachers in the medical college to arrange the curriculum and to change it, when necessary. I believe that the greatest need at present is to supervise the clinical training to see that it is carried out sufficiently thoroughly during the four years spent in the medical college. Clinical training should be given during a period of two and a-half years at least and the students should spend two to three years in the wards and the out-patient department. The clinical lectures with demonstration of patients are very good, but, if they are the only method of teaching clinical medicine, they do not suffice. A university medical college should have a teaching hospital of 300 beds or more, with the different departments, surgical, medical, tuberculosis, obstetrics and minor specialities and an out-patient department. At least the four national medical colleges should have these teaching facilities.

The university medical college should aim to graduate the highest standard of medical practitioners and to train physicians who later on are competent to teach in the different colleges and schools or to act as chiefs of hospitals or hospital departments. The staff of the college should be imbued with such a scientific spirit and interest for the progress of medicine that the more gifted students will feel impelled to continue their medical training after graduation.

There is a great need for medical teachers and leaders in China and the demand will grow when new schools are established. We must consider how graduates from the colleges may be educated to become competent teachers. It is generally agreed that the lack of teachers is at present the greatest obstacle in the way of bringing the medical schools up to the desired standard. Well-trained men, who are primarily interested in educational work, compensate for the lack of adequate equipment and facilities.

In many countries, post-graduate courses are organised, generally for practising physicians who desire to complete their training and keep up with the evolution of modern medicine. These post-graduate courses can be taken by practitioners from lower-grade schools who desire a certificate at the end of the course to improve their standing in the profession, or by practitioners as refresher courses, without interruption to their professional work. It would be very useful indeed to establish such post-graduate courses for graduates from the special medical schools, who could obtain in this way a degree from the colleges. It would be more difficult to organise refresher courses, because the very busy practising physician in China would with difficulty find time to attend them. In the large cities, specially Shanghai and Peiping, there are good opportunities for such courses and an attempt to organise them should be made.

Nevertheless, post-graduate courses will not suffice for the training of teachers for the schools and colleges. For this purpose, specialists in the different subjects must be developed.

It is necessary to divide the teachers into two groups, one including teachers of the theoretical pre-clinical subjects, anatomy, physiology, bacteriology, pathology, pharmacology, public health, etc. ; the second, teachers of the clinical subjects.

To qualify as a teacher in one of the theoretical subjects requires several years work as assistant and research worker in a well-organised and scientifically conducted institute. An assistant should teach under the direction and responsibility of the chief, and it is very desirable that he should do some research work under the latter's direction.

This training can be taken in China or in a foreign country. It would be best to commence in one of the institutions of China and, if possible, complete the training by studies abroad. There are now several institutions in China, and there will be more in the future, where such special training can be given. The value of this training depends of course on the ability and scientific spirit of the leader of the department, and there are wide differences in these respects in the different schools. The conditions for the training of specialists in the Peking Union Medical College are already excellent and this will also be true of the Lester Institute in a short time. In addition, some of the scientific medical schools in China provide suitable conditions for training assistants in various pre-clinical subjects. It will take some years for an assistant to master a subject and still more time before he can undertake original research work. It would be very useful for him to study for a time in a foreign country under a highly qualified teacher after he has acquired a knowledge of his subject at home. Scholarships for such promising students would be very useful. It seems perhaps to be a long road, but there is no other way to become a qualified teacher.

When we come to the question of clinical teachers and of leaders of big clinical departments, it is necessary to emphasise that clinical training ought to be done in the doctor's own country, where he will work and where he must learn the medical conditions. This is necessary for ordinary practitioners as well as for specialists. Good clinical training can be had in different specialities in foreign countries, but the best results are secured when the student is well trained beforehand in a speciality and knows what to look for. Very often students are neglected in the clinical department of a foreign medical school, because so many native students must receive instruction. Foreign students may attend clinical lectures, accompany the professors on their wardrounds, take courses and work in the clinical laboratories, but the language difficulty and their position as foreigners usually prevent them from making thorough clinical studies. There is a wide difference between the value of foreign training in the pre-clinical and the clinical subjects. In the first, the student can get the fundamentals and do research work, in the second, he can only expect a more superficial secondary training which may enlarge his vision and stimulate his desire to work on his return. There are of course always the advantages of observing and studying foreign countries and languages and becoming familiar with the evolution of medicine. This is excellent for a man who is to be leader in his own country, but real clinical knowledge must be acquired at home and then, if possible, completed abroad.

To what extent can a higher clinical education be had in China at the moment ? After the ordinary course in a good medical school of the highest standing, the student ought to spend the following years as intern or assistant in medical schools and hospitals and then train himself for work as a specialist in some clinical subject, medicine or surgery, or one of the minor specialities. He must work a number of years as assistant and co-worker with some prominent clinical teacher and specialist, and he must teach in the medical school. This is only possible where there is a modern hospital in which teaching is thorough and scientific.

In the future as many positions as possible as assistants in the different clinical departments must be established, where medical graduates can receive training as specialists for a number of years. The limited resources available make it difficult for even the best of the National Medical Colleges to fulfil teacher-training functions within the immediate future. The Peiping Union Medical College already possesses excellent conditions for such training and for serving as a local centre where teachers and students from less well-equipped and staffed institutions may go for intellectual stimulus. It is well, however, to point out some deficiencies in facilities which should be remedied if it is to serve this purpose fully.

The present facilities of the Peiping Union Medical College are relatively extensive, certainly for China, but they provide only for the instruction of classes of 25 students. General considerations and the small additional facilities necessary to train 50 students in a class make it appear logical to provide for this larger number. The production of leaders is not only a question of high entrance requirements and educational standards but also of an indefinable innate quality which is found only in a certain proportion of individuals. Classes of 50, in addition to being more efficient and economical units, would double the chances of producing men of ability, qualified to become teachers, research workers and administrators, as well as increasing the number of competently trained doctors.

There are two fields of instruction in which the College is at present deficient. The important field of psychiatry has neither special teachers nor hospital facilities. In the second place, good graduate facilities on a small scale are available in practically all the principal branches of medicine, with the exception of the non-existent department of psychiatry and the department of hygiene and public health. While the latter has given undergraduate instruction of good quality, it is essential, especially in line with the new public health movement in the country, that this too should possess facilities for post-graduate public health training.

The sum required for making good these deficiencies would not be large compared with the rest of the budget of the College.

AUXILIARY MEDICAL PERSONNEL.

Even if a certain number of special medical schools should be established in the immediate future and more students than at present should graduate from the medical colleges, there will still remain a great lack of doctors with modern training in China. Moreover, it cannot be expected that doctors from the two kinds of medical schools will be willing to work and able to make a living in the rural districts and in the interior of the country. To provide medical relief to these districts by means of well-trained doctors means that the central or local Government must appoint and pay them to remain.

Medical relief has been given to the poor by this means everywhere in Europe. As advised by public health workers in China, the best method would be to establish smaller hospitals in the country and to attach to them dispensaries or out-patient clinics. In the rural districts, such dispensaries should be of the mobile type. Health stations and public health workers should be attached to the hospitals.

To direct and administer these hospitals and dispensaries will require well-trained physicians, and the graduates from the special medical schools would serve very well for this purpose. If the hospitals and the health services in the country should develop faster than the special medical schools, the question of medical workers of a still lower grade might be raised. Formerly, in some European countries, doctors of this type, known as "feldschers", or surgeons were trained for medical

service in the rural districts. In India there are four kinds of doctors : (1) the graduates from a university school, (2) licentiates of medicine, (3) assistant surgeons mostly used in military hospitals, and (4) hospital assistants, now called sub-assistant surgeons. The three last categories receive a medical education of four or five years.

To train assistant surgeons of a rather low grade in a few years' course and to send them out in the rural districts would not seem to be a wise policy in China. In contrast with other countries, there is in China a very large number of native doctors of old Chinese medicine which has its own traditions and has won the confidence of the population. To send badly trained doctors of modern medicine out to compete with the native doctors might easily bring modern medicine into disrepute. Such assistant surgeons should be allowed to help in the dispensaries, but only under the strict supervision of well-trained physicians. However, this will only be possible when a certain number of graduates from the medical schools are attached to small hospitals, and it seems to me that the question need not be raised until that time.

Another idea is to train a number of hospital assistants who should not be allowed to treat patients but only to help the hospital doctors in institutions which can not afford to maintain a sufficient medical staff. These would constitute a superior grade of male or female nurses, and I imagine it would be difficult to distinguish them from well-trained and experienced nurses.

At Hankow, there is a mission Institute of Hospital Technology which trains men or women for more or less complicated technical work in medical schools or hospitals. Other *technicians* are trained in the different medical colleges. There seems to be a great demand for well-trained technicians who do work which the physicians would otherwise be obliged to do, and so save time and money. They can be used for laboratory, serodiagnostic, bacteriological, parasitological and histological work, while in the wards they keep the records if there are no students. In Germany, such courses are much valued, and after two or three years' training, students are awarded a diploma as laboratory experts and are much employed in hospitals and by medical men ; other courses might be given in the use of X-ray in hospitals.

It would be very useful if the Government organised courses of this kind in one of the national hospitals—for example, in Nanking, where there is a hospital and the necessary laboratories ; these should perhaps be enlarged for teaching purposes. It would not be difficult to get teachers. The teachers and the students themselves would be very useful for the hospital and for other medical institutions in the city. I believe that at present this kind of hospital assistant would be most useful.

Another variety of hospital and dispensary helpers are the *pharmacists*. The training of pharmacists in China is very irregular. Most of them study as apprentices in established pharmacies—a few are trained abroad. There is a school for pharmacy in Hangchow and a faculty of pharmacy at the French University "Aurora" in Shanghai as well as one at the Shantung University. The school in Hangchow is attached to the medical school, which is to be closed. It would be most useful if this school of pharmacy might continue, and it must be the policy in the future to organise more schools of pharmacy, attached to universities or medical colleges.

There is a great demand in China for well-trained *dentists*. There is one school of dentistry attached to the Chengfu medical college and a newly established school in Shanghai. The least expensive way to establish such schools would be to attach them to the national medical colleges. An experimental school of dentistry could, without difficulty, be organised in Nanking in connection with the national hospital.

The problem of training *personnel for the public health service* in China is perhaps somewhat beyond the scope of medical education, but it is not possible to make a sharp distinction between curative and preventive medicine, and the practising

doctor ought to be trained in both. The ordinary practitioner requires special training in epidemiology, which he should be taught while studying the diagnosis and treatment of infectious diseases. The public health worker requires a special training in preventive medicine after graduation.

Nurses.

The very serious problem of the education of *nurses* is in full evolution in China, where regular courses for teaching probationers are arranged in most hospitals. Chinese girls appear well fitted for this work, but it is very important that they should previously have received a good general education; those of lower class, only educated at primary schools, are said to be frequently too unreliable. It is to be hoped that future recruits will be graduates of junior middle or preferably senior schools. To require one year's college work in pre-medical sciences, as is done in the nursing school of the Peiping Union Medical College, seems unnecessary and too costly for ordinary nurses, but is very useful in the case of head nurses or matrons. There is said to be a great need of such head nurses who are in a position to supervise the education of the probationers and maintain discipline among the nursing staff. It would be of value if more of such well-organised high schools or normal schools for training head nurses were established.

Midwives.

The *midwife* must also be considered. Until recently there have been no trained midwives in China, and only a few schools of midwifery attached to mission hospitals and nursing schools. The problem has now been taken up seriously and Dr. Marion Yang has done exceedingly useful organising work. The first national school for midwifery in Peiping is now training midwives and the next will be established shortly in Nanking. The interesting plan for the organisation of midwifery in the future is described in the appendix to this report.

The idea is to have two courses for midwives, a two-year course for fully trained midwives, and a six months' course for others who are intended for the rural areas. There are also two-month courses for training the old-type midwives now in practice in order to improve their technique, to teach them asepsis, cleanliness, etc.

The question arises as to the possibility of organising courses for doctors practising the old Chinese medicine, so as to give them some knowledge of the most fundamental aspects of modern medicine, especially antisepsis, wound treatment, infections, etc., just as the old-type midwives are to be taught in the two-month course. I do not think the time is ripe for such an enterprise. The organisation of such courses would be considered as an official authorisation of the native doctors, which would do more harm than good. When China has a sufficient supply of modern doctors to warrant discontinuing the training of more practitioners of Chinese medicine, it will be time to take up the problem of teaching those still in practice something of modern medicine. If a doctor trained in the old Chinese medicine wishes to have a modern training, he might be accepted by a special medical school. At present, a large number of young men trained in the schools of Chinese medicine are said to take special courses in Japanese schools and to return to China as physicians practising modern medicine.

MEDICAL SUPERVISION AND REGISTRATION.

Medical education in all its aspects is within the competence of the Ministry of Education, which is responsible for supervising and registering all medical colleges and special schools. This Ministry has promulgated all the rules and regulations for registration. The fact that there is no technical adviser or expert in medical matters

in this Ministry is considered to be a drawback. It is difficult to decide on suitability for registration on the sole basis of the answers to questions sent out by the Ministry. A personal investigation by a medical expert would, in many cases, yield better information to decide what steps should be taken. This is true in a still greater degree when local authorities and school boards should be influenced to improve their institutions, and especially if new schools are to be established—*i.e.*, new special medical schools.

If this view should be accepted, it is not within my competence to make definite proposals on the arrangements to be made. The Ministry is alone competent in this matter. Nevertheless, I may be permitted to make certain suggestions.

A special section for medical education might be established in the Department of Higher Education or a medical expert might be appointed to advise the Ministry. Another method would be to utilise the Commission on Medical Education, which could be considered as an advisory body to the Ministry. The Commission would require a permanent secretariat—a medical secretary, with the necessary assistants. It should be the duty of this secretary to make personal investigations of medical institutions established or planned. He would report to the Commission and to the Ministry. The Commission would use his reports as a basis for its advice to the Ministry and the latter could base its decisions upon these reports. When we remember that, in addition to training doctors, all problems concerning the training of midwives, dentists, pharmacists, nurses and medical technicians are under the control of the Ministry of Education, and that this training is in full evolution, it does not seem superfluous to have an advisory organ with special medical knowledge.

The registration of medical colleges and schools is, I understand, a part of the enormous work carried on by the Ministry of Education in supervising and registering the universities in China. I am told this work has improved higher education in China to a considerable degree; has led to the abolition of many inefficient smaller university schools, and developed the remainder along proper lines. Nearly 30,000 students are now educated yearly in the universities of China.

The registration of medical colleges and schools should have the same objects, but in this connection there are special conditions to consider. The great need of doctors in China makes it necessary not to go too fast in closing schools of lesser value as long they are administered in an honest way.

Besides the colleges of high standing there will always be some not up to the full standard, but which are nevertheless doing valuable and honest work. They ought to be encouraged to reach the standard as rapidly as possible, and in the meantime they should receive provisional registration. There are now medical schools which should not be registered even provisionally, and more of these may develop in the future. The best way would be to close down such schools. Nevertheless, the question should be considered if this is justifiable before new schools are established. An attempt to regulate, to amalgamate or to improve these schools should first be made.

Decisions on all these questions—registration and judging the work of the schools, proposals for regulation and improvement—can only be reached after thorough personal investigation by a medical supervisor or expert.

The requirement of registration does not appear at present to include the four national medical colleges. Nevertheless, it is necessary to subject them to the same investigation and criticism. It seems difficult to deny registration to a college because some deficiencies are found, and at the same time take the registration of a national medical college for granted although its deficiencies are greater.

The registration of physicians in China is difficult, because it is impossible, at present, to prevent unregistered doctors from practising medicine. Various methods

of registration may be followed. The most natural method would be first to register the physicians now in practice and then the graduates from the definitely or provisionally registered medical colleges and schools. After registration, they are justified in asking for authority to use a title indicative of their profession, but it would be desirable to permit the use of one title for physicians graduated from a medical college and another for physicians graduated from a special medical school. This distinction, at least, will be found necessary, and it will be demanded by graduates from the colleges.

The great question as regards registration is what policy to adopt in respect of the old Chinese medicine and the million "doctors" now practising this method. To understand this very complicated problem it is necessary to consider the present position of Chinese medicine.

The leaders of the "Academy of Chinese Medicine" informed me that Chinese medicine was founded 2600 B.C. and completely elaborated under the Han Dynasty about 200 B.C. The *Chinese Medical Book* was compiled for public use under Imperial order 250 years ago. Up to the present, not less than 2,300 Chinese medical books are in wide circulation and are studied just as in older times Galen and Hippocrates were studied in Europe. Chinese medicine seems to be based partly on observations and investigations, partly on philosophical speculations. Compared with the West, the standard of medical knowledge seems to have been rather high in China in olden times. The main object of this system was to find remedies for disease and about 3,000 varieties of Chinese medical preparations from all kinds of sources are said to be in current use to-day. These are, as a rule, given in very complicated prescriptions. The use of acupuncture is also still very common.

Although old Chinese medicine is practised by all native practitioners and although it is taught in about 15 medical schools and by a large number of medical organisations in addition to its use of the apprenticeship system, it appears to be undergoing dissolution to some extent, and to be losing the confidence of the people.

In addition to the scientific study of the anatomy and physiology of the human body, there appear to be two advantages in modern medicine, which have made it superior to Chinese medicine in daily practice. First comes nosography, the knowledge of the different diseases, which has been acquired during the last two centuries in Europe. The practitioner of Chinese medicine knows nothing about the various diseases and is therefore not able to make a diagnosis. Only the most common epidemic diseases are described and known by name. The treatment is still purely symptomatic, resembling in this respect all other quack treatment. The second advantage is the modern knowledge of surgery and infectious diseases. The Chinese consider that the real superiority of modern medicine is in the treatment of surgical diseases and especially diseases of the eye.

The introduction into Chinese medicine of modern medical ideas is frequently seen. In addition to the old drugs, more and more patent medicines of foreign origin are given nowadays to the patients by the native practitioners. In the "Chinese medicine" hospitals we found patients diagnosed as having malaria, dysentery, typhoid fever, etc., and when there was fever the temperature was taken, but as a rule the diagnoses were "cold", "weakness", "pains" or some other quite unspecified morbid condition.

In the most modern schools of Chinese medicine there is a rather interesting movement to create a new "Chinese medicine" by a "co-operation between foreign and Chinese medicine". The leaders of the Shanghai College of Medicine, established in 1927, seem to think such a co-operation would save the prestige of Chinese medicine; it would be a "revolution in the old Chinese medicine", but they would continue to "fight hard for the value of our medicine".

Schools of Chinese medicine are said to have been numerous some 1,000 years ago but later they shut their doors. There was a kind of school at the Imperial Court where the students studied the old classical medical books. Nowadays, a new movement is observed. Schools of Chinese medicine have been established during the last 15 years, at the same time as many schools of modern medicine were being created, and new schools are still being organised—*i.e.*, the Shanghai College of Medicine in 1927. When we visited these schools, we were informed that the course takes five years, two for theoretical work and three for practical clinical training in Chinese hospitals or outpatient clinics attached to the schools, or the students may serve three years as apprentices to private practitioners. The theoretical teaching is given in the form of lectures. We were told that anatomy, physiology and chemistry were taught during the first year, the instruction in these subjects being based partly on Chinese, partly on Western ideas. There were no laboratories or other equipment, no text-books in use; a few anatomical charts were the only aids to teaching.

This modern movement in the old Chinese medical world seems to indicate that the ideas of modern medicine are beginning to penetrate even into the practitioners of that method, but the whole problem must be considered, when the question is raised of the registration of physicians in China and of what position should be taken by the Ministry of Education in regard to such schools. It must be admitted that nowadays old Chinese medicine must be considered as quackery even if more of the Chinese drugs are found to have a value yet unknown to modern medicine, but it will be very difficult to prevent the Chinese from seeking medical relief from doctors of Chinese medicine and just as difficult to prevent a steady recruitment of new practitioners of this type.

When an ever-increasing number of Chinese physicians trained along modern lines come from the medical schools, the people will begin to appreciate more and more that there may be various kinds of doctors but there is only one science and one art of medicine. I believe this evolution would be hastened if the students in the medical colleges and in the special medical schools were required to take a course of medical history including the history, the philosophy and the *materia medica* of old Chinese medicine. This would give them a better understanding of the kind of competition they will meet in their future practice. The best way to combat the superstitions of old Chinese medicine is to bring them out into the daylight. The modern Chinese doctor must know them, so that he may be able to educate the people concerning them.

CONCLUSIONS.

I have summarised below my conclusions as to the policy I should venture to recommend for medical education in China in the near future.

1. There should be two kinds of institutions for medical education: (a) The medical college; (b) The special medical school. The medical college should produce physicians and teachers of high types; the standard should be as high as in most countries in Europe and in the United States of America. The special medical school should train practitioners of medicine in a shorter course, but the standard should be such that the graduates from these schools could do reliable medical work.

2. The National Government should seek first to improve, develop and support adequately the existing National Medical Colleges, which are under its direct control. The Central University Medical College in Woosung-Shanghai needs reconstruction;

it should have a large modern teaching hospital as its centre and the institutions for medical teaching need rebuilding and to be in direct connection with the hospital. The Peiping University Medical College also requires complete reconstruction of the teaching facilities and laboratories in the College, an enlargement of the attached hospital and sufficient financial support for both. The premedical teaching should, if possible, be removed from the Medical College to the department of science in the National Peiping University.

The Sun-Yat-Sen University Medical College stands in most need of enlargement of the hospital and of the facilities for clinical teaching. The Tungchee University Medical College in Woosung-Shanghai needs improvement and more adequate support for the clinical teaching and for the theoretical institutions in the Paulun Hospital in Shanghai. The teaching of chemistry and physics in the department of science and of physiology and anatomy in partly new buildings in Woosung will make it difficult to unite all the teaching in one institution. When more medical schools are organised in the future, the possibility of converting the Tungchee Medical College into a post-graduate school or of amalgamating it with the Central University College, should be considered. The Mukden Medical College should be given assistance so that it might become a university medical college by attaching it to the North-Eastern University.

In the immediate future no more national university medical colleges should be established. The Government should concentrate on the development of special medical schools; they represent the basic training necessary for all types of physicians. After the fourth year, further specialisation could be carried out.

3. The standard of a *medical college* should be: secondary education in senior middle school or entrance examinations of a similar standard; two years pre-medical work in the department of science in a university or in the college itself, and four years medical training in the college plus one year as intern in the college hospital or other accredited hospital.

4. A modern teaching hospital of about 300-400 beds and an out-patient clinic should be attached to the college. The hospital should have departments for surgery and for medicine with special wards or beds for at least 30 tuberculous cases and with beds for communicable diseases, for obstetrics and for the minor specialities. The students should work in the wards and in the out-patient department during the last twenty-four or thirty months of the four-year course.

5. Chinese should become the language used in teaching in all the national colleges as soon as possible, but the students ought to learn at least one or two foreign languages, according to the choice of the college or of the State.

6. The National Medical Colleges should have accommodations for at least 30, and better, for 50 students in each class. The students' expenses should be as low as possible, not only as regards fees but also for board and lodging in dormitories. When the students graduate on the completion of the final examinations and after the intern year they should be given degrees—for instance, Doctor of Medicine.

7. Private medical colleges should be encouraged to attain to the same standard but they must be permitted to have a smaller teaching hospital and then only allowed to train a smaller number of students. The hospital should have at least 200 beds.

8. One of the main objects of the national medical colleges must be to produce graduates able to continue their education and become teachers in the different medical sciences and specialities. For this reason it is to be hoped that a sufficient number

of scholarships can be provided for promising workers; also that more and more posts for assistants and instructors may become available in the theoretical as well as the clinical departments of the medical colleges.

9. The object of the *Special Medical Schools* should be to produce a larger number of medical practitioners. The entrance requirements should be lower than those of the medical colleges and the course in the school should be shorter.

10. The entrance requirements should be graduation from a course of science in a senior middle school. If thought desirable, an entrance examination in Chinese, English and mathematics might be given. The course should last four years, the last thirty-two or thirty-six last months years of this being devoted to clinical teaching in the hospital and out-patient clinic, the first one and one-third year to instruction in the pre-medical and pre-clinical sciences. It would be advisable to divide the school year into trimesters of 11 weeks each. The school should be attached to a modern hospital of at least 300 beds with an out-patient department and all the usual clinical departments because clinical training must be the basic training of general practitioners. The students should be encouraged to take a fifth year as intern in a hospital but it should not be obligatory.

11. The first of these special medical schools should be organised by the Government and under its control as an experimental national Chinese school of medicine.

12. If this type of medical school should prove satisfactory, more special schools should be organised in future in other cities and provinces. The aim should be to have a special medical school in each province. The idea of establishing a special school in connection with the existing medical colleges should not be encouraged because these colleges do not have sufficient facilities at present to provide for proper training of this kind. It would be more useful to attach to the medical colleges, schools for pharmacists, dentists and technicians, just as a nursing school should be attached to the hospital. Private special medical schools should not be allowed except under very special conditions.

13. It is necessary that the teaching in the four-year course should be done in a thorough and conscientious way by teachers of high scientific standing. To prevent the establishment of bad schools it is necessary to adopt high requirements before authorising and registering such schools. First of all there must be a modern hospital with 300-400 beds as a centre for the school. The minimum should be 300 beds and an out-patient department. Then there must be suitable accommodation for teaching and laboratory work and for instruction in all the theoretical subjects. There must be a faculty of well-trained specialists, Chinese or foreign. The teachers in the important theoretical subjects should be full-time. In the clinical subjects the teachers should be allowed to have private consultations in addition to their hospital work. Until there is assurance that these requirements will be fulfilled no provincial or municipal Government should be permitted to establish a special medical school. However, when the local Government is willing to establish a modern hospital, the central Government should, if possible, give the help and funds necessary for establishing a provincial medical school.

14. The teaching in the special medical schools should be given in Chinese, and one foreign language should be required. I presume it should be English.

15. The special medical schools should be able to teach a large number of students. The first school should commence with 60 students in each class and later, if possible, this number should be increased to 100. The course should be as inexpensive as possible for the students.

16. An examination should be given after the second trimester in chemistry and physics, after the fourth trimester in anatomy, physiology and bacteriology; after the fourth year in clinical medicine, pathology, pharmacology, public health and legal medicine. There should be a final practical examination in the clinical branches. The central authority should send inspectors to supervise the examinations.

17. When the student graduates he should be given a degree—for instance, Licentiate of Medicine. If he desires the degree of Doctor of Medicine he should be able to earn it by taking post-graduate work and further training as an intern in a recognised hospital. An attempt should be made in the future to organise post-graduate teaching for these and other practitioners.

18. *Registration of Medical Colleges and Schools.* The Ministry of Education should require that all the national medical colleges and national medical schools should at least attain the standard required for the registration of other schools. If there should be private medical colleges, not quite up to the same standard but doing honest work in training physicians, they should be registered provisionally for a limited period and be encouraged and assisted to improve. They should not be forced to close so long as the need for trained doctors in China is so great. The badly run private schools should not obtain such provisional registration and their graduates should not be registered as physicians. If they cannot give reasonable guarantees of improvement in the near future the question of closing them should be considered. Private colleges should not be permitted to become special medical schools with four-year courses unless they fulfil the requirements for these schools.

The policy to be adopted regarding the schools and practitioners of old Chinese medicine should be given special consideration in the future.

19. The question of training midwives, dentists, pharmacists, nurses and technicians should be considered by the Commission on Medical Education. This Commission should be the permanent advisory organ of the Minister of Education. It would be very useful if some medical expert could be closely attached to the Ministry as Counsellor or Adviser or as permanent Secretary to the Commission on Medical Education.

The inspection of the different medical institutions, the promotion of improvements and the organisation of new schools should be done by means of actual visits by a medical expert. He would report to the Ministry and to the Commission on Medical Education.

20. I would propose the following programme for the first three years :

(a) Reconstruct the University Medical Colleges in Shanghai and Peiping, at the least; support the Sun-Yat-Sen University College with the necessary funds.

(b) Organise the first special medical school ;

(c) Encourage as many provincial or municipal governments as possible to build hospitals as a preparation for the creation of special medical schools ;

(d) Give provisional registration to good private medical schools now operating and encourage them by grants-in-aid to come up to the required standard.

Appendix I.

REGULATIONS GOVERNING THE ORGANISATION OF UNIVERSITIES.

PROMULGATED JULY 26th, 1929, BY THE MINISTRY OF EDUCATION.

Article IV. — Universities shall be divided into colleges of general arts, sciences, law, education, agriculture, engineering, commerce, and medicine.

Article VII. — The college of a university or independent colleges may give special courses.

Article XXI. — The length of courses in universities shall be five years in the college of medicine and four years for all other courses.

REGULATIONS GOVERNING THE ORGANISATION OF SPECIAL SCHOOLS.

PROMULGATED BY THE MINISTRY OF EDUCATION ON JULY 26th, 1929.

Article IX. — The length of course for a special school shall be 2 or 3 years.

REGULATIONS GOVERNING UNIVERSITIES.

PROMULGATED BY THE MINISTRY OF EDUCATION ON AUGUST 14th, 1929.

Article II. — A university must, according to Section I, Article V of the Regulations governing the organisation of universities, have at least three colleges, and in accord with the purpose of education of the Chinese Republic and the principle of emphasising practical sciences in universities, a university must include a college of science or one of the colleges of agriculture, engineering and medicine.

Article X. — The minimum standard of annual current expenses and initial expenses (including funds for construction and equipments) for university colleges or independent colleges shall be temporarily fixed as follows :

College or Department	Initial Expenses	Annual Current Expenses
	(In Mexican dollars) ¹	
College of General Arts or Department of General Arts	100,000	80,000
College of Sciences or Department of Science	200,000	150,000
College of Law or Department of Law	100,000	80,000
College of Education or Department of Education	100,000	80,000
College of Agriculture or Department of Agriculture	150,000	150,000
College of Engineering or Department of Engineering	300,000	200,000
College of Commerce or Department of Commerce	100,000	80,000
College of Medicine or Department of Medicine	200,000	150,000

¹ These are worth normally about 40 per cent of the gold dollar.

Appendix II.

REGULATIONS ON THE GIVING OF SPECIAL COURSES IN COLLEGES (1930).

Article XXII. — Colleges of universities or departments of independent colleges may give special courses in such subjects as education, physical education, municipal administration, home economics, fine arts, journalism, library administration, medicine, pharmacy, and public health.

Article XXIII. — The Party principles, military training, Chinese and foreign languages shall be required in connection with any of the special courses given.

The apportionment and standards of curricula of the different special courses shall be given in separate orders.

Article XXIV. — Admission to the special courses shall be granted to a successful candidate in an entrance examination who possesses a diploma from a senior middle school or a school of like standing.

Article XXV. — The term of special courses shall be two or three years, but in the case of the special course in medicine one year of practical work shall be required at the completion of its three-year curriculum.

Article XXVI. — At the completion of a special course, students who have fulfilled all requirements for graduation shall be given diplomas by the universities or colleges.

Article XXVII. — Article XIII and Article XVII shall apply likewise to special courses.

Appendix III.

MIDWIFERY EDUCATION.

Objectives.

I. *National Midwifery Schools (Two-Year Course).*

- (a) To produce "quality" midwives.
- (b) To train teachers, supervisors and administrators for provincial midwifery training centres.
- (c) To give post-graduate course (first midwifery school only).
- (d) To give higher normal course to produce teachers for two-year course (first midwifery school only).
- (e) To demonstrate city co-operation scheme with local health organisations (first midwifery school only).
- (f) To be responsible for at least five provincial training centres.

II. *Provincial Midwifery Training Centre (Six-Month Course).*

- (a) To produce "quantity" midwives.
- (b) To demonstrate maternity and child health in rural areas.
- (c) To co-operate with rural educational or health organisations.
- (d) To train and supervise the old-type midwives in their districts.

III. *Local Training Classes (Two-Month Course).*

- (a) To improve the technique of old-type midwives.
- (b) To train the "old women"¹ for opportunities of health education.

The eventual objectives of "Maternity and Child Health" are :

1. Training of 100,000 midwives in 50 years.
2. Adequate supervision and control of midwives and midwifery education.
3. Establishment of nationwide maternity and child health facilities.
4. Investigation into problems of maternity and child health.

First Five-Year Programme (1929-1933).

Survey I. Survey of midwifery education.

Training II. Establishment of five regional "national" normal schools : (Peiping, Nanking, Hangchow, Canton, Hankow) (1932).

III. Establishment of one "provincial" school in each province (1933).

IV. Sufficient strengthening of facilities of the first national school to obviate necessity of sending individuals abroad who are to staff the "national" normal schools. To develop the first national also into a "higher normal".

Administration V. Administration—through medical inspectors supervising : Establishment of adequate supervision and control of midwifery.

Investigation VI. Investigation—medical problems of M. & C. H.

To have the above-mentioned objectives carried out successfully the following points should receive consideration :

1. General education, to awaken the mass of people ; secure a health conscience ; to demand better health.
2. General environment to be corrected.
3. Personnel should be carefully selected and properly trained.
4. Adequate financial support and freedom from political changes.

If the first three are expected to be satisfactorily carried out, there should be a centre available for training the following personnel :

Physicians, Nurses, Public Health Visitors, Social workers, Midwives.

Satisfactory training in maternity and child health requires a citywide child health programme if the general public is to be afforded the required care and if there are to be sufficient teaching facilities. Peiping has a population of 1,000,000, there are about 80 births a day and 20 out of the 80 die each day. To lower the mortality and to set up training facilities, the following should be established immediately :

1. Eleven free medical consultation stations—one in each police district—for expectant mothers, well infants, *post-partum* mothers and any gynæcological conditions ;

¹ Now acting as midwives.

2. Free delivery service ; there should be at least 25 publicly employed midwives to care for the very poor people who are unable to engage even the old-type midwives ;
3. A city maternity hospital of at least 200 beds to care for expectant mothers, confinement cases and other complicated conditions.

The above three activities will be a part of the city child health programme.

City Maternity Hospital.

(a) Building and ground from local municipal Government.

(b) Expenses :

1. Remodelling and equipment \$15,000 (contribution from 5 co-operate institutions \$3,000 each).
2. Running expenses \$60,000 per year. This sum can be collected by obtaining one-fourth of the total from each of the following : the city Government, co-operative institutions, students and patients (4,000 cases per year).

(c) Staff :

1. Administrative responsibility. Local Child Health Institute.
2. Teaching and supervisions from co-operative institutions :

(d) Students :

Medical :	30 = 5 × 6 (5 in one group for two months).
Maternity nurses :	100 = 25 × 4 (25 in one group for three months).
Midwifery students :	100 = 25 × 4 (25 in one group for three months).
Social workers :	20 = 5 × 4 (5 in one group for three months).
Public Health Visitors :	30 = 10 × 3 (10 in one group for four months).

A complete city scheme will strengthen both the provincial and the national programme. In other words, the national programme must first be applied to one city in one province, then be copied elsewhere.

PROVINCIAL TRAINING CENTRES.

Staff :

- (a) Teaching staff—graduate from the “ Higher Normal Course ”.
- (b) Technical staff—graduates from the “ Refresher Course ” and training centres.

Students : The students will be selected from the respective villages to which they will return for service after the course is finished. Every population unit of 3,400 should send one student. The size of each class should be limited to not more than 15 ; this figure is based on the amount of field teaching facilities available.

Take Hopei Province as an example—population about 30,000,000, number of births 900,000, if the estimated birth rate is 30. The number of midwives required is 9,000 and this number should be produced within 30 years' time. There should be 10 provincial training centres. With 15 students in each class, each centre will be able to produce 30 graduates each year and 300 from the ten centres. Then we may expect to have 9,000 six month graduate midwives at the end of the 30th year.

Support : The tuition, room and board should be paid by the government that will employ the student on graduation.

Buildings : A Chinese building in the country style with about 20-25 rooms to be provided by the local Government.

Maternity home	15 beds	8 rooms
Students dormitory	15 beds	7 rooms
Staff dormitory	2 members	3 rooms
Class-room	30 members	2 rooms

Budget :

1. Capital = \$850

	\$
Beds and Beddings for 15 patients	150
Equipment for School	200
Equipment for Maternity Home	400
Others	100
Total	<u>850</u>

2. Annual Expense = \$3,000.

	\$
Salaries and wages : Chief Midwife	50,00
Assistant Midwife	40,00
Intern Midwife	10,00
2 servants	10,00
Food for patients & staff (18)	90,00
Supplies	30,00
Maintenance	20,00
Total (per month)	<u>\$250,00 = \$3,000</u>
	per year.

September 1930.

(Signed) Marion YANG.

PROVISIONAL REGULATIONS FOR THE STANDARDISATION OF NATIONAL MIDWIFERY SCHOOLS.

SECTION I. GENERAL PRINCIPLE.

Article 1. A midwifery school shall have for its aim the training of competent midwives with the purpose of enabling them to teach or practice midwifery after graduation.

SECTION II. ENTRANCE REQUIREMENTS.

Article 2. All candidates for the entrance examination of midwifery schools shall be :

- (a) Either a graduate of the junior middle school ;
- (b) Or a person having qualifications equal thereto.

Article 3. Only female students between twenty and thirty years of age shall be admitted to the midwifery schools.

SECTION III. NUMBER OF STUDENTS TO BE ADMITTED.

Article 4. The number of students to be admitted in any school shall not exceed twice the number of beds in the maternity hospital affiliated therewith.

SECTION IV. COURSE OF INSTRUCTION.

Article 5. The course of instruction in all midwifery schools shall be two academic years.

Article 6. The subjects to be given in the two semesters of the first academic year shall be as follows :

Subjects	Number of hours per week
<i>1st Semester.</i>	
Anatomy	4
Physiology	3
Nursing	1
Bacteriology	2
Materia medica	2
On duty	20
Practice in maternity ward	<u>12</u>
Total	44

<i>2nd Semester.</i>	
Anatomy	4
Physiology	3
Urinalysis	1
Midwifery	4
The care and feeding of children	2
First aid	1
On duty	17
Practice in maternity ward	<u>12</u>
Total	44

Article 7. The subjects to be given in the two semesters of the second academic year shall be as follows :

Subjects	Number of hours per week
<i>1st Semester.</i>	
Midwifery	4
Gyneacology	2
The care and feeding of children	2
Clinic	2
Class demonstration	4
On Duty.	10
Practice in maternity ward	20
Total	44
<i>2nd Semester.</i>	
Abnormal midwifery	2
Dietetics	1
Dermatology	1
Practice in maternity ward, etc	10
On duty.	30
Total	44

Article 8. In the maternity ward practice, every student shall individually, or in groups of not more than three, take charge of delivery and the post-natal mother and baby not less than twenty-five times. The students are required to take detailed notes relating to the maternity ward practice.

SECTION V. THE FACULTY.

Article 9. The faculty members in all midwifery schools shall be composed of the following :

1. One president who shall be either a midwife or a doctor of Medicine (specialised in obstetrics) registered as such with the Ministry of Health.
2. A number of doctors and midwives graduated from schools registered by the Chinese or foreign Governments.

SECTION VI. NECESSARY EQUIPMENT.

Article 10. Every midwifery school shall maintain a maternity hospital in which a suitable number of beds shall be maintained for a certain number of students and a new bed shall be added for an increase of every two students. In the second academic year, every student shall take charge of at least twenty-five deliveries.

Article 11. In the maternity hospital affiliated with a midwifery school there shall be a properly equipped delivery room with equipment for laboratory and sterilisers.

Article 12. There shall be one or more isolation wards in the maternity hospital affiliated with a midwifery school.

SECTION VII. EXAMINATION AND SCHOLASTIC RECORD.

Article 13. All the examinations in midwifery schools shall be strictly conducted.

Article 14. Attention should be given to the average daily marks. Marks for practice in the maternity hospital may average over half of the marks given for the semester or academic year.

Article 15. An examination shall be given in each subject on the completion of such subject and at the end of each semester and academic year.

Article 16. In the graduation examination, the National Midwifery Board shall be notified to send a person to conduct the examination in compliance with the regulations governing public examinations.

Article 17. The students shall submit the notes taken during practice to the instructors to be graded.

SECTION VIII. REVENUE AND EXPENDITURE.

Article 18. All midwifery schools shall be provided with a reliable sinking fund or some other reliable sources of income to meet the annual expenditure.

Article 19. Any midwifery school which has rendered valuable service to the community shall, after actual investigation by the National Midwifery Board, be recommended by the latter body to the central or local Government for subsidy.

SECTION IX. SUPPLEMENTAL.

Article 20. These regulations shall take effect from their joint promulgation by the Ministries of Education and of Health upon the recommendation of the National Midwifery Board.

Article 21. All amendments to these regulations shall, upon the recommendation of the National Midwifery Board, be promulgated jointly by the Ministries of Education and of Health.

Appendix IV.

ITINERARY.

The Professor FABER left :		1930.	
Copenhagen	August 30th	Hong-Kong	November 1st
Berlin	" 31st	Canton	" 2nd
Moscow	September 1st	Hong-Kong	" 6th
Harbin.	" 10th	Shanghai	" 10th
Mukden	" 11th	Nanking	" 13th
Peiping	" 15th	Shanghai	" 16th
Tientsin	October 3rd	Tsingtao	" 27th
Tsingtao	" 7th	Dairen	December 4th
Tsinanfu	" 9th	Harbin	" 5th
Nanking	" 12th	Moscow	" 15th
Shanghai.	" 15th	Berlin.	" 17th
Hangchow	" 26th	Copenhagen	" 19th
Shanghai.	" 28th		

Official No. : C. H. 1054.

Geneva, August 1931.

LEAGUE OF NATIONS

HEALTH ORGANISATION

PROTECTIVE MEASURES

against

**DANGERS RESULTING FROM THE USE OF RADIUM, ROENTGEN
AND ULTRA-VIOLET RAYS**

BY

Professor Hermann WINTZ, M.D., Ph.D.

*Director of the University Gynæcological Clinic
and Roentgen Institute, Erlangen*

WITH THE ASSISTANCE OF

Privatdozent Walther RUMP, Ph.D.

Series of League of Nations Publications

III. HEALTH. V
1931. III. 9.

PREFACE

During its twelfth session, the Health Committee had before it a memorandum prepared by Dr. JITTA, member of the Committee, and Dr. VAN DER PLAATS, radiologist at Utrecht, on the dangers that may be entailed by the use of X-rays.

In accordance with the Health Committee's recommendations, the Health administrations in various countries were invited to supply information on the regulations in force in this connection.

The Health Organisation secured the valuable services of an eminent radiologist, Dr. H. WINTZ, Professor of Clinical Gynæcology at the University of Erlangen, who undertook to prepare the present report on the basis of the information thus collected. In drawing up the report, Professor WINTZ was assisted by Privatdozent Walther RUMP, Ph.D., who has special knowledge of the subject.

The Health Section appreciates the painstaking care with which the authors have done their work and desires to extend its most cordial thanks to them.

*Health Section of the Secretariat
of the League of Nations.*

CONTENTS

	Page
Introduction	5
<i>Chapter I. — PROTECTION AGAINST DANGERS CAUSED BY RADIATION</i>	<i>7</i>
A. Protective Measures for Persons remaining in Proximity to Sources of Short-Wave Rays	7
1. The Magnitude of the Tolerance Dose	9
2. Means of reducing the Dose Output	11
3. The Dose Output of a Roentgen Tube	12
4. The Coefficient of Absorption of Lead	14
5. The Requisite Thickness of Lead considered in Relation to Voltage, Current in the Tube and Distance	16
6. Protection of Adjacent Rooms	18
7. Protective Measures from the Gamma Rays of Radio-active Substances	19
8. Protective Measures in the Case of Other Kinds of Radiation	22
9. Protective Measures against Scattered X-Rays	23
10. Tests for the Soundness of Ray-proofing	27
11. Dangers caused by Valve Tubes	28
B. Measures for the Protection of the Patient	28
1. The Avoidance of Inadvertent Direct Radiation	29
2. Safety Measures in Connection with Filters	29
3. Reliability of Measuring Instruments	31
4. Training of Medical Attendants and Assistants	32
5. Dosage Questions	34
6. Dosage in X-Ray Diagnosis	36
7. Protective Measures in the Use of Gamma Rays, Corpuscular Radiation and Ultra-Violet Light	37
C. Tabular Survey of the Regulations issued up to the Present in Various Countries	41
<i>Chapter II. — PROTECTIVE MEASURES AGAINST ELECTRICAL ACCIDENTS IN X-RAY AND SIMILAR ESTABLISHMENTS :</i>	
1. The Dangers of Current and Voltage	48
2. The Dangers of X-Ray Apparatus	48
3. Protective Measures for the Primary Circuit	50
4. Protective Measures for the Secondary Circuit	50

	Page
Chapter III. — HYGIENIC MEASURES IN RADIATION ESTABLISHMENTS :	
A. For Persons employed in X-Ray and Similar Establishments	54
1. The Treatment Room	54
2. Hours of Work for Persons employed in Radiation Establishments	55
3. Hygienic Measures in Other Radiation Establishments	56
B. Hygienic Measures for the Protection of the Patient :	
1. General Remarks	56
2. Measures for the Avoidance of X-Ray Sickness	57
C. Tabular Survey of the Regulations hitherto published in Various Countries	58
Chapter IV. — PROTECTIVE MEASURES AGAINST THE DANGERS OF X-RAY FILM FIRES :	
1. Nitro-cellulose and Acetyl-cellulose Films and their Properties	59
2. Accidents caused by the Burning of X-Ray Films	60
3. Regulations for the Storage of X-Ray Films	61
4. Conclusions	64

LIST OF GRAPHS :

I. The Relationship of the Coefficient of Absorption of Lead to the Voltage in the Roentgen Tube.	66
II. Thickness of Lead Protection required at a Focal Distance of 50 Centimetres with 1, 10 and 100 Milliamperes as determined by the Voltage in the Roentgen Tube	67
III. Thickness of Lead Protection required with 10 Milliamperes and at Distances of from 0.1 to 20 Metres, as determined by the Voltage in the Roentgen Tube	68
IV. Distance required, with Various Thicknesses of Lead, for Radium Preparations of from 10 Milligrammes to 10 Grammes	69
BIBLIOGRAPHY	71



INTRODUCTION

The use of Roentgen, radium and ultra-violet rays in medicine is still in its infancy as a science; in a very short space of time, it has, however, acquired considerable importance. Outside the medical field, the technique of Roentgen and ultra-violet irradiation has also been turned to account in the examination of materials.

The practical uses of Roentgen, radium, and ultra-violet rays thus concern a very large section of the public, and, since both the rays emitted and the apparatus are attended by certain dangers, protective measures are necessary.

In the following pages, I shall first discuss the processes and conditions on which the protective measures are based. My observations will, however, need to be supplemented as time goes on, for a subject in so fluid a state of development cannot be adequately surveyed at any arbitrarily selected point of time.

That rays may prove dangerous to the human organism was established in the first days of experimental tests with Roentgen and radium rays. Through negligence or ignorance many research workers and doctors sustained injuries or even lost their lives.

Knowledge of the deleterious action of the rays does not, however, dispose of the problem of protection ; far from it. For effective protection from injury means, not only eliminating the damaging action of the rays, but also removing all the dangers that accompany the generating process and the whole of the work in this field.

The matter of this survey thus falls automatically under the following headings:

- I. Protection from direct injury by rays.
- II. Protection from the accidents that may be caused by the generating plant.
- III. Protection from unhealthy conditions in working premises (hygienic measures).
- IV. Protection from the dangers of fire or of gas poisoning in the event of X-ray films catching fire.

Regulations designed to provide against these dangers are in force in all countries. So far, hygienic measures have received least attention, but underestimation of their importance undoubtedly brings as many dangers in its train as the absorption of rays by the organism. In reading some of the regulations, it is indeed hard to resist the impression that the dangers of injury by direct exposure to radiation have undoubtedly been overestimated. Where health and life are at stake, regulations cannot, admittedly, be made too severe; it must, however, be borne in mind that such regulations restrict in some measure the scope of the work, thereby setting a limit to the beneficial action of the rays. The legislating authorities must therefore steer a middle course between this Scylla and Charybdis. For this very reason the whole problem is not as simple as it may perhaps appear to the onlooker.

Chapter I.

PROTECTION AGAINST THE DANGERS CAUSED BY RADIATION.

Protection measures are required :

A. Generally for persons who, for professional reasons, or owing to the special location of the premises in which they work, are in proximity to sources of short-wave radiation, that is to say :

1. The director of the establishment (the doctor);
2. The establishment staff operating the controls of the source of radiation (X-ray apparatus, quartz-mercury lamps, etc.); persons engaged in putting up radio-active substances into containers ;
3. Persons remaining in rooms in the vicinity of sources of radiation (X-ray establishments, radio-active substances).

B. In cases where short-wave radiation is applied to human beings (examination with X-rays and ultra-violet light, therapeutic treatment with X-rays with the radiation of radio-active substances, with ultra-violet light and with cathode rays).

A. PROTECTIVE MEASURES FOR PERSONS REMAINING IN PROXIMITY TO SOURCES OF SHORT-WAVE RAYS.

In gauging the injurious effects of radiation on the human organism, reference may be had, by way of comparison, to the action of poisons. In toxicology the most important thing to know is what quantities are harmful and what quantities can certainly be tolerated by the body without ill-effects. Such standards also apply in the case of radiation.

In the therapeutic application of radiation, the idea of the tolerance dose is a current notion. It signifies the amount of radiation which the tissue concerned is still able to tolerate. Experience has shown, however, that such a dose cannot be regarded as entirely harmless; for even though, after its administration, the tissue undoubtedly undergoes none of the morphological alterations which are known as Roentgen injuries, yet it is left with a reduced power of resistance to otherwise inoperative influences. Further investigations have shown that this *locus minoris resistentiæ* is engendered even by doses equivalent only to 50 per cent of the tolerance dose. This holds good for all kinds of tissue, even though the radio-sensitivity, and thereby the tolerance dose, differs for each.

The above observations show that the tolerance dose is never a harmless one and that tolerance doses can in no case be readministered indefinitely to any particular piece of tissue after the visible effects have disappeared on each occasion.

The only dose, therefore, that could be harmless, would be one which would produce no effect whatever, on the particular piece of tissue concerned and could hence be administered *ad libitum*.

The conditions to be fulfilled by such a "tolerance dose" are thus very stringent, and would seem to warrant the question whether such a dose can exist at all. In the first place, however, the mode of action of the rays must be briefly discussed.

If Roentgen or radium rays are directed on to living cells, part of the radiant energy is absorbed. The only elementary process which is known with certainty to occur when X-rays impinge upon a material object is the ejection of electrons. A state of greater energy is thus induced in the atom. When it reverts to a condition of lower energy, a form of radiation known as fluorescent radiation occurs. The collision of electrons may also release the acquired energy in the form of kinetic energy (thermal motion) or chemical activity.

If a large part of the radiation is absorbed, there is an accession of energy to numerous cell molecules, the electronic paths are deflected, chemical activity takes place, heat and radiation are engendered. This energy exceeds the measure which is compatible with the life activity of the cell; its functions are disturbed or it dies.

Such an accession of energy occurs, however, even on absorption of a very slight amount of radiation. Only a few molecules are stimulated, and the life activity of the cell is intensified.

Similar facts have long been known in respect of light and heat. There is no reason for not assuming that they apply also to energy taken up in the form of absorbed X-rays. Stimulating effects, produced by the administration of X-rays in small amounts, have already been observed by numerous research workers.

We thus reach the conclusion that a really harmless dose of radiation can only be said to be given if it is incapable either of destroying or damaging the cells, or of exercising any stimulating action.

The exact determination of such a dose would seem to be impossible. We must accordingly be content to speak of a harmless dose, whenever no alteration in the condition and activity of the body can be detected by available methods of clinical examination and observation.

This, moreover, has been the principle adopted in the investigations undertaken with the object of determining the magnitude of a harmless X-ray dose.

I think it necessary, however, to refer to a further point of clinical experience.

Just as the organism is known to possess powers of habituation to certain poisons, so the body cells are similarly able to neutralise small amounts of X-rays. We observed this capacity of the cells for habituation when administering therapeutic amounts of radiation by fractional doses. If 100 per cent of the skin unit dose, instead of being given in half an hour, is distributed over 5 days, 20 per cent of the skin unit dose being given on each occasion, the biological effect is about 35 per cent less powerful than when the whole dose is administered at a single sitting. In distant field radiation, also we know that the conversion must not be made by the law of inverse squares, but that the computed dose must be increased by the amount of radiation which is termed the additional biological dose ("Biologische Zusatzdosis"). All this indicates that the cell is able to deal rapidly with the energy of small amounts of X-rays, and that a particular effect cannot be secured by adding together the several doses separately given.

The administration of a specific amount of radiation at one sitting thus produces a different effect from the gradual absorption of the same amount as occurs, let us say, in the case of attendants. A comparison of the biological action is doubtless not legitimate, for, when the absorption of rays is distributed over a lengthy period, habituation becomes so important a factor that much of the radiation taken up in the body is wholly without biological effect.

1. *The Magnitude of the Tolerance Dose.*

We will now consider the tolerance dose with reference to the dose injurious to the operator. We are tied down to the technical terms of measurement which apply in radiation of patients. The foregoing observations will, however, have made it clear that these numerical data can only be of conditional validity.

Reliable measurements have only been obtainable from X-ray establishments quite recently, when protection from rays had already received considerable attention. It would doubtless be interesting to go back and compute the amount of radiation absorbed in former years by the persons who sustained injuries. But such reconstruction is now impossible, for we must remember that in these cases the injuries — let us say severe lesions of the hands — were not caused by the radiation alone, but by other factors such as developing chemicals or disinfectants. The ill-effects of tainted air in small unhygienic X-ray theatres must also be taken into account. To this must be added the fact that the inadequate screening of Roentgen tubes gave rise to fields of radiation that were dangerous in certain parts of the various rooms and less so in others.

Hence it is, that correct measurement only became possible for the first time in establishments with modern equipment and totally encased Roentgen tubes.

Complete protection from very short wave-length radiation (hard X-rays, gamma rays) is technically impossible owing to their great power of penetration; all that can be done is, by increasing the distance from the source and by the interposition of protective material, to attenuate the radiation to a point at which the residual intensity causes no appreciable injury to the human organism even on constant exposure. It is, in the nature of things, extremely difficult to assign any specific numerical value to such a tolerance dose, and there is consequently very little previous work in this field to fall back on for guidance.

The first attempt to define the tolerance dose in terms of a numerical value was made by MUTSCHELLER.¹ He based his computations on several typically good installations in X-ray establishments, and found that, in the course of one month, the staff absorbed 1/100th of an erythema dose (skin unit dose). On the assumption of 200 hours' work per month, it was concluded that radiation should be regarded as harmless if weaker than would be required to produce "erythema in 20,000 hours" (with 8 hours' exposure per day it would take about 8 years to reach the figure of 20,000 hours).

In this form, the definition of a tolerance dose cannot be very readily used. The figures are obtained from a comparison of the X-ray dose measured at a particular spot in the radiation theatre, with the dose of radiation required to produce skin erythema or pigmentation under ordinary conditions of radiation, i.e., exposure for a short time. Account has not been taken of the fact that, when the period of radiation is so enormously prolonged, the time factor (the biological additional dose) must assume considerably greater proportions. If we proceed to extrapolate from the values determined for prolonged and discontinuous radiation, we shall arrive at a time-factor value of about 10; yet, even if the specified intensity of radiation is increased tenfold, no erythema or pigmentation will ever be produced. Even when, under the conditions of less adequate protection than usually prevailed in the past, the organism received a dose some hundred times as great, the skin was never affected, but the injury took the form of alterations in the blood composition. Only after a number of years, when still higher doses had been repeatedly absorbed, did skin affections set in, developing, in certain cases, into X-ray cancer. (An attempt recently made by us to produce such skin injuries

¹ *American Journal of Roentgenol.*, 13, 53, 1925.

deliberately in animals gave a negative result; the radiation of mice with 6-60 r for an hour each day, on the same skin field, produced no discernible signs of a skin reaction even after a considerable time.)

If MUTSCHELLER's figures are to be used, it will be best to express the skin unit dose, i.e., the amount of radiation which, with the short-time method of administration, produces a definite, harmless skin reaction, in r units (international Roentgen units). A circular enquiry instituted at one time by Küstner ¹ yielded an average value for Roentgen radiation, as currently used in deep therapy, of : 1 skin unit dose = 550 R (without the additional dose of scattered radiation) or, since 1 R = 1.066 r , 1 skin unit dose = roughly 600 r . We shall be conforming to MUTSCHELLER's method, if we disregard the time factor, in which case the tolerance dose works out at 1/100th skin unit dose, or 6 r per month, or, assuming 200 working hours per month, about 1×10^{-4} r /sec.

GLOCKER and REUSS ² and BEHNKEN ³ assume the same value, BOWERS and VAN DER TUUK ⁴ 0.7×10^{-4} r /sec. BARCLAY and COX ⁵ reported a case in which 0.007 skin unit dose per diem was tolerated for 6 years without ill-effects ; on the basis of an eight-hour day, this would represent a dose of 15×10^{-4} r /sec. CHANTRAINE and PROFITLICH ⁶ compute the dose at 0.05 to 0.1 r per hour, or 1.4×10^{-4} r /sec. SOLOMON ⁷ assumes that 4,000 R per annum is harmless ; on the basis of 300 eight-hour days, this would equal approximately 7×10^{-4} r /sec. SCHECHTMANN ⁸, on the other hand, is of opinion that the tolerance dose should only amount to 1 r per month, since the ionisation of the air in the radiation theatre is not without importance to the staff. FRICKE and BEASLEY ⁹ and JACOBSON ¹⁰ took direct measurements at various clinics in Cleveland and New York, and found that, there, 24 R at most were absorbed per year (2.4 per cent of a kilo-roentgen per year) which would amount to 0.3×10^{-4} r /sec. No blood changes whatever were observed, not even in a roentgenologist who worked without a lead rubber apron and absorbed about 5 R per hour (0.5 per cent of a kilo-roentgen hour) or about 150×10^{-4} r /sec. (!). My own experience would lead me to regard 10×10^{-4} r /sec. as safe. Since, however, the general standards of safety must on no account be set too low, the *admissible dose output* ¹¹ will be taken, in the following pages, at 1×10^{-4} r /sec., assuming an eight-hour day and 300 working days per year. In the case of persons who remain constantly in proximity to sources of radiation giving off rays without intermission (radio active preparations) the tolerance dose should be proportionately reduced, so that a dose output of $\frac{1}{3} \times 10^{-4}$ r /sec. could be held to be harmless.

These requirements appear, at first sight, exaggerated; for what I have defined as permissible absorption of radiation represents about 12 per cent of the skin unit dose. In connection with the question of injuries caused by pelvic photographs, we ascertained on one occasion that the absorption of 5 per cent of the skin unit dose at a single

¹ *Strahlenth.*, 26, 120, 1927.

² *Fortschritte Röntgenstr.*, 40, 501, 1929.

³ *Fortschritte Röntgenstr.*, 41, 245, 1930.

⁴ *Fortschritte Röntgenstr.*, 41, 767, 1930.

⁵ *American Journal of Roentgenol.*, 19, 551, 1928.

⁶ *Fortschritte Röntgenstr.*, 38, 121, 1928.

⁷ *Précis de Radiothérapie profonde*, Paris, 1926.

⁸ *Fortschritte Röntgenstr.*, 42, 645, 1930.

⁹ *American Journal of Roentgenol.*, 18, 146, 1927.

¹⁰ *American Journal of Roentgenol.*, 18, 149, 1927.

¹¹ The term "dose output" used here and elsewhere purports merely to be, as nearly as possible, a literal rendering of the German "Dosisleistung" and must be read as having the meaning of "Dosisleistung".

sitting must be regarded as harmless. According to the standard just set, 12 per cent of the skin unit dose is administered to the human organism in the course of a year. It is therefore an amount of radiation which can be pronounced harmless with absolute certainty, and, if my own experience leads me to regard ten times this amount, i.e., 120 per cent of the skin unit dose, as harmless when distributed over a whole year, the most stringent requirements in respect of protection have undoubtedly been satisfied. The conditions laid down may, in themselves, be greatly exaggerated, but they can assuredly be fulfilled under present-day conditions. Careful measurements in my various radiation theatres have shown that a dose output of 1×10^{-5} r/sec. is nowhere reached. There is hence no reason to reject the standard defined out of hand on the plea that it would be technically impossible to attain.

2. Means of reducing the Dose Output.

Every radiation emitted from a source of small and limited spatial extension obeys the so-called law of inverse squares, that is to say, that the intensity of radiation dose output, varies in inverse proportion to the square of the distance from the source. The first requirement for effective protection from rays is therefore that the distance from the source of radiation should be made as great as possible.

Furthermore, the dose output is reduced by the passage of the radiation through a material substance (protective material, masonry), this reduction taking place according to the formula:

$$D = D_0 \cdot e^{-\mu \cdot d},$$

D_0 being the dose output before passage through the attenuating material, D the dose output as attenuated by the material, e the value 2.718, μ the coefficient of attenuation and d the thickness of the material (in centimetres). The dose output of the emergent rays is thus the smaller the smaller the original dose output D_0 and the greater the coefficient of attenuation μ and the thickness d of the protective material.

The dose output at a spot situated at the distance a from the source of radiation, in the case of radiation which has first passed through an attenuating substance, is obtained by the equation :

$$D = D_0 \cdot \frac{e^{-\mu d}}{a^2}.$$

D_0 being the dose output in a distance of 1 cm.

According to what has been said above, if adequate protection from radiation is to be afforded, the dose output D should not exceed 1×10^{-5} r/sec. Hence :

$$10^{-5} = D_0 \cdot \frac{e^{-\mu d}}{a^2}.$$

From this we can obtain the thickness d of protective material required given a particular distance a from the source of radiation:

$$d = \frac{2.3}{\mu} \cdot (\log D_0 - 2 \cdot \log a + 5),$$

and the distance a at which, given a particular thickness d of protective material, the radiation is harmless:

$$a = 316 \cdot \sqrt{D_0 \cdot e^{-\mu \cdot d}}$$

This distance a might be termed the "range" of the radiation.

From the above equations, the values of d and a can be computed for particular conditions of ray emission. There are, however, one or two difficulties to be cleared up first. These relate to the determination of the initial dose output D_0 and of the coefficient of attenuation μ .

In the first place, the Roentgen rays will be considered.

3. The Dose Output of a Roentgen Tube.

The dose output of a Roentgen tube depends, first, upon the voltage in the tube, secondly, upon the current in the tube, thirdly, on the material of the anti-cathode. The form of the tension curve, whether continuous or pulsating tension, is also a factor, but these differences may be disregarded here. So far as the applied cone of radiation is concerned, filtering is obviously also of considerable importance.

We will dispose first of the material of the anti-cathode. The intensity of the white radiation, which is the main consideration, increases proportionately to the atomic number of anti-cathode material. The substance principally used nowadays is wolfram, with an atomic number of 74. The only substance of higher atomic number which might be considered would, for the moment, be platinum, with an atomic number of 78. The difference is so slight that it will be sufficient to base our considerations on wolfram; if substances of lower atomic number are used, the dose output grows steadily smaller.

Of the remaining two factors, voltage and current, voltage is by far the more important, since the dose output of the heavily filtered radiation, with which we are always concerned when dealing with protective materials, increases roughly in proportion to the cube of the voltage in the tube¹ whereas it remains in direct proportion to the current. For this reason, the regulations hitherto published on the subject merely refer the required thickness of protective material to the tube voltage and entirely ignore the current.

In my opinion, such provisions are inadequate; especially where the technical examination of materials is concerned. But in Roentgen therapy also, with distant field radiation, when high tensions are used, currents of 50 ma and more are reached. In medical X-ray diagnosis currents rising to 1,000 and 2,000 ma are used, though admittedly only for short periods. The current in the tube must therefore also be taken into account, for the dose output at 30 ma, for instance, is ten times as great as at 3 ma, and the dose output beyond the protective material is proportionately increased.

For these reasons, the thickness of the protective material must be determined by reference, not merely to the tube voltage, but to the dose output, and we must first enquire how the dose output can be ascertained from the voltage and current in the tube. For this purpose, it will be best to take the energy of the Roentgen rays as a starting-point.

Since the classical gas X-ray tubes are no longer in use save in a few exceptional cases, consideration may be limited to the modern incandescent cathode tubes. The efficiency of the latter in respect of X-ray production is sufficiently well known. The following observations are based upon the energy measurements of RUMP². The total quantity of radiant energy emitted from the Roentgen tube is equivalent to:

$$E = 1.5.i V^2.Z.10^{-9} \text{ Watts.}$$

¹ RUMP : *Z. Physik.*, 43, 254, 1927 ; ВЕННИКОВ, *Fortschritte Röntgenstr.*, 41, 245, 1930.

² *Z. Physik.*, 43, 254 and 44, 396, 1927 : cf. also КИРЧЕНКО : *Allgem. Physik d. Röntgenstr.* Volume 24, 1, of the *Handb. der experiment. Physik*, page 113, Akad. Verlagsgesellschaft, Leipzig, 1930.

i being the current in the tube in ampères, V the tension in the tube in volts, Z the atomic number of the anti-cathode material. If $Z = 74$ (wolfram anti-cathode), the equation reads:

$$E = 111.i.V^2.10^{-9} \text{ Watts.}$$

This total energy spreads out in all directions from the focal point, so that, at a distance of a cm. from the focus, a quantity of energy equivalent to:

$$E' = \frac{9 \cdot i \cdot V^2}{a^2} \cdot 10^{-9} \text{ Watts}$$

impinges on each square centimetre of surface.

This formula applies to the total radiation as emitted by the anti-cathode of the Roentgen tube. Such radiation is known to be very unhomogeneous, and covers a very wide field of the spectrum, beginning at the boundary wave-length determined by the voltage and extending to very long-wave rays. The latter are already largely absorbed in the anti-cathode and in the glass wall or the lumen of the Roentgen tube, so that the radiation becomes more and more homogeneous the more absorbent material it passes through. Thus, for instance, about 80 per cent of the total energy is lost in an ordinary filter of the kind used in deep therapy. The powerful filtering process that takes place in the protective materials arrests the whole of the soft components and the radiation is thus rendered largely homogeneous. In order to allow for this, a homogenisation factor must be introduced, which — to be sure — is not entirely independent of the tube voltage. It will be sufficient for present purposes to take an average value, empirically determined, and to express the hardest components of the radiation, i.e., those that matter so far as the penetration of the protective material is concerned, by the equation :

$$E'' = \frac{i \cdot V^2}{a^2} \cdot 10^{-10} \text{ Watts/sq. cm.,}$$

or, in terms of ergs:

$$E'' = \frac{i \cdot V^2}{a^2} \cdot 10^{-3} \text{ ergs/sq. cm.}$$

This is therefore the effective amount of radiant energy, which was represented above by D_0 and which, on passing through protective material, is attenuated in accordance with the formula previously given

$$(D = D_0 \cdot e^{-\mu \cdot d}).^1$$

For purposes of conversion into the current r dose unit (international Roentgen unit), which is based upon ionisation of the air, the amount of energy must be known which is required to produce a pair of ions in the air. As a mean value resulting from the investigations carried out in recent years by KULENKAMPPFF, RUMP, EISL and others, this amount of energy may be taken at 33 volts, irrespective of the wave-length of the radiation. From this it follows that $1 r = 0.11$ ergs of energy absorbed in 1 cm. of air at 0°C . and at a pressure of 760 mm. of mercury ; and we then get

$$D_0 = 1.25 \cdot \frac{i \cdot V^2}{a^2} (\tau/\rho) \cdot 10^{-3} r/\text{sec.},$$

¹ It is clear that so large a correction cannot be attended with any very great accuracy, but the object here is not to make an exact determination of the energy, but rather to find a formula which tallies with previous evidence and enables the dose output to be split up into its factors, so that the thickness of protective material required can be determined, not only for various voltages, but also for any modification of the tube current and of the focal distance.

τ/ρ being the total mass absorption coefficient of the air ¹ which depends in a large measure on the wave-length and can be ascertained from curves. ²

With a residual radiation $D = 1 \times 10^{-3}$ r/sec. on the far side of protective material having a thickness of d cm., this works out at

$$e^{\mu \cdot d} = 1.25 \cdot \frac{i \cdot V^2}{a^2} \cdot (\tau/\rho).$$

4. The Coefficient of Absorption of Lead.

The second difficulty resides in the determination of the coefficient of absorption μ , which is largely dependent on wave length. In practice, the only protective material to be considered is lead, and only the coefficient of absorption of lead need be determined, since an equivalent thickness of lead can always be calculated for other materials.

The difficulties attaching to the determination of μ reside, first, in the non-homogeneous composition of the radiation, and, secondly, in the fact that the range of wave lengths most frequently used for technical purposes encompasses a zone of selective absorption.

BEHNKEN ³ therefore proposed to use, not the coefficient of absorption, but the half-value layer of the radiation, to determine the requisite thickness of lead. BEHNKEN ⁴ gives a series of curves showing the fraction to which radiation of a specific half-value layer is reduced by passing through lead of a particular thickness. It should be observed, however, that the half-value layer can only afford an unequivocal measure of the quality of the radiation, if the radiation is homogeneous or at any rate "practically homogeneous". In practice, however, radiation is very frequently used that is by no means "practically homogeneous". To this it should be added that the point to be considered in this case is solely that of protection from the radiation present in the room, outside of the applied cone, and that this radiation has no direct relationship to the applied cone. The effect of BEHNKEN'S proposal would be that a Roentgen tube operating under specific unchanging conditions would require increasing thicknesses of lead protection as the filtering of the applied beam became greater. For instance, radiation produced with an input of 200 kv and filtered with 0.5 mm. Cu., as illustrated in Plate 1 (*op. cit.*, page 246) has a half-value layer of 1.1 mm. Cu.; this radiation is reduced to $\frac{1}{1000}$ of its intensity by 2.3 mm. Pb. If the same radiation is filtered in the applied cones with 1 mm. Cu., the resulting half-value layer is 1.5 mm. Cu. ; in order to attenuate this radiation to $\frac{1}{1000}$ of its intensity, 2.9 mm. Pb. would be needed. If the same radiation is filtered in the applied cone, with 2 mm. Cu., the half-value layer works out at 1.9 mm. Cu., for radiation of this quality, the requisite thickness of lead can no longer be read from Chart 7 (*op. cit.*, page 249), since the curves rise very steeply from 1.7 mm. half-value layer onwards.

It is not practicable in my opinion to make the requisite protective thickness of lead dependent upon chance factors, such as the filtering of the applied cone, which varies considerably in practice. If, however, it is tacitly assumed that the radiation must, so far as possible, be homogeneous, the method amounts to nothing more than a determination of the coefficient of absorption, since for homogeneous radiation we have the equation: $\mu \cdot \text{half-value layer} = 0.693$.

¹ WITZ and RUMF in the *Handb. d. Gyn.*, published by Stoeckel, Volume IV, 1, page 401, published by J. Springer, Berlin, 1930.

² *Ibid.*, page 325, plate 108.

³ *Fortschritte Röntgenstr.*, 41, 245, 1930.

⁴ *Ibid.*, page 249, plate 7.

Inevitably, therefore, we must fall back on the primary radiation emitted by the Roentgen tube and endeavour to get round the difficulties attaching to the determination of the coefficient of absorption.

These difficulties lie, as already mentioned, in the non-homogeneous composition of the radiation and in the selective absorption of lead.

So far as the lack of homogeneity of the radiation is concerned, this consists in the fact that the spectrum of white radiation contains a continuous series of wave lengths, beginning at the boundary wave length, rising to a maximum, and extending into the long wave lengths. By filtering of the radiation, the spectrum is narrowed down in such a way that, with increasing thicknesses of filtering material, the long-wave end and the maximum shift towards the short-wave end. When the filtering in the protective material is very strong, as it must be to reduce the dose output of the tube to the tolerance dose, the medium wave length of the residual radiation can be roughly identified with the boundary wave length, which is directly related to the peak voltage of the tube by the Planck-Einstein law ($\lambda_0 V_{\max} = 12.35$); the experimental values determined for homogeneous radiations can thus be used.

In this connection, very detailed measurements of the coefficient of absorption in its relation to wave lengths have been made by Allen ¹. The values for lead are charted in Graph I (see Annex) in such a way that the voltages yielded by the Planck-Einstein law are given instead of the wave lengths. The squaring adopted has been that of a logarithmic scale in both co-ordinates; the curves are thereby flattened out into straight lines, and we thus obtain the line A-B-C-D, which makes a sudden jump at 89 kv., corresponding to the absorption edge of lead. This can only occur, of course, with purely homogeneous rays, whereas, if they are not homogeneous, the jump flattens out into a curve affording a smooth transition from the straight line A-B to the straight line C-D. This can be seen, for instance, in the measurements taken by KAYE ² and BERTHOLD ³ and by GLOCKER and REUSS ⁴. These measurements also show, however, that the coefficient of absorption diminishes with increasing thicknesses of lead, and only becomes constant with a fairly powerful lead filter. This is due to the fact that the homogenisation of the radiation progressively increases with increasing thicknesses of the attenuating substance. This behaviour is particularly well illustrated by the curves published by HERRMANN and JAEGER ⁵ and by a recent paper of GLOCKER and REUSS ⁶, in which it is shown that the coefficient of attenuation of lead for 200 kv. only reaches its constant minimum value with 4 mm. of lead. The measurements of HERRMANN and JAEGER (*op. cit.*) cover voltages up to 400 kv. and thus provide a highly valuable transition to the radium gamma rays. Using these experimental results, and plotting the attenuation coefficient values for tensions of 70 kv. and 100 kv. by extrapolation from the measurements of KAYE (*op. cit.*), we obtain the curve appearing as a produced line in Graph I as the trend of the coefficients of absorption. The plotting of the experimentally determined points shows, more especially in the zone of high tensions, that the radiation behaves as practically homogeneous when subjected to the very heavy filtering which is necessary for protective purposes.

As will be seen from the table on page 17, the thicknesses of lead yielded by this curve agree satisfactorily with the values hitherto regarded as correct; it should not be

¹ *Physic. Rev.*, 24, 1, 1924; 27, 266, 1926; 28, 907, 1926.

² *Brit. J. Radiol.*, 1, 295, 1926.

³ *Strahlenther.*, 16, 147, 1923.

⁴ *Fortschritte Röntgenstr.*, 40, 501, 1929.

⁵ *Ibid.*, 42, 115, 1930.

⁶ *Ibid.*, 42, 651, 1930.

overlooked, however, that, at low voltages (70 and 100 kv.) the thicknesses of 1 and 1.5 mm. of lead do not produce complete homogenisation, so that higher coefficients of reduction should really be used in calculation; the homogenisation factor (see above) would, however, have to be reduced. The two factors offset each other and result in a certain balance being established; direct measurements by GLOCKER and REUSS¹ have shown, however, that, with a current of 5 ma on the tube, a focal distance of 30 cm. and 80 kv. pulsating tension, a residual radiation emerges from the far side of 1 mm. Pb. which is forty times the permissible value; even with 2 mm. Pb. the emergent radiation was 4-5 times the tolerated dose with a voltage of 80 kv. 17 times with 100 kv. and 33 times with 115 kv. GLOCKER and REUSS¹ comment on this result in the following terms:

"In laying down minimum thicknesses in regulations for protection from radiation there are, it is true, certain practical considerations to be borne in mind as well; the period during which the apparatus is operated in diagnostic establishments is shorter than in therapeutic establishments, so that a somewhat larger dose may be regarded as harmless in the former case."

The said authors² add that, in the German regulations concerning protection from radiation, the permissible dose has been fixed approximately ten times higher for diagnostic work than for deep therapy.

It should further be observed that general regulations governing protection from radiation are not intended solely for medical establishments and that, in Roentgen tube factories, scientific laboratories, etc., work is frequently carried on for hours at a stretch with low voltages but powerful currents. In view of this, further detailed investigations would be necessary.

5. The Requisite Thickness of Lead considered in Relation to Voltage, Current in the Tube and Distance.

With the aid of the curve in Graph I all questions as to the required thickness of protective material with various voltages, currents and distances can be answered in such a way that the dose output does not exceed 1×10^{-5} r/sec.

On this basis, Graph II shows a set of curves from which it is possible to determine what thickness of lead is necessary, with a particular voltage, if, given a focal distance of 50 cm. the tolerance dose is not to be exceeded with 1 ma, 10 ma and 100 ma of current. Thus, for instance, the requisite thickness of lead is indicated as 3.2 mm. for 150 kv. in the tube and 10 ma.

Graph III gives a further set of curves which indicate what thickness of lead will be necessary, with a current of 10 ma, in order that the tolerance dose may not be exceeded with focal distances ranging from 10 cm. to 20 m. It will be found, for instance, that with 200 kv. of current and a focal distance of 2 m. the requisite thickness of lead is 3.6 mm. The curves further show, for example, that, when the conditions remain unchanged (200 kv. and 10 ma) and 2 mm. of lead is used, the range of the injurious Roentgen radiation is about 8 m.

If it is desired to compare the results yielded by these curves with the specifications in the international or German regulations, this comparison cannot be directly effected, since, as already mentioned, the current is not stated and the regulations concerning focal distance are greatly lacking in precision. The international regulations, for instance,

¹ *Fortschritte Röntgenstr.*, 40, 504, 1929.

² *Fortschritte Röntgenstr.*, 42, 656, 1930.

state under Chapter III, 11: "An operator should place himself as remote as practicable from the X-ray tube". The German regulations provide that persons remaining in the treatment rooms must keep at a minimum distance of 1.5 m. for maximum voltages up to 125 kv. and at a minimum distance of 2 m. for maximum voltages above 125 kv.

Assuming a current of 5 ma and a focal distance of 1 m. we obtain the following table which enables comparisons to be made:

Tube voltage	Regulations		Values yielded by Graphs II and III
	International	German	
Up to 75 kv	1.0 mm. Pb	1.0 mm. Pb	1.1 mm. Pb
„ 100 „	1.5 „ „	—	1.5 „ „
„ 125 „	2.0 „ „	2.0 „ „	2.0 „ „
„ 150 „	2.5 „ „	—	2.3 „ „
„ 175 „	3.0 „ „	—	3.0 „ „
„ 190 „	—	3.0 „ „	3.5 „ „
„ 200 „	4.0 „ „	—	4.0 „ „
„ 220 „	—	5.0 „ „	4.9 „ „
„ 225 „	5.0 „ „	—	5.2 „ „
„ 300 „	—	—	10.3 „ „
„ 400 „	—	—	20.0 „ „

This table will show that the thicknesses of lead computed from the curves agree satisfactorily with current standards; what was said above must however be borne in mind where low voltages are concerned.

If the current in the tube is increased tenfold, the residual radiation on the far side of the protective material is of course ten times as great as before. If the thickness of the protective layer was calculated for 10 ma, the dose output of the residual radiation delivered at the point considered by 100 ma of current is thus no longer 10^{-3} r/sec. but 10^{-4} r/sec. The additional thickness necessary to make up for the difference can easily be computed from the attenuation formula ($D = D_0 \cdot e^{-\mu \cdot d}$); it works out at

$$d - d_1 = \frac{2.3}{\mu}$$

For radiation produced with a voltage of 100 kv., Graph I will show, for instance, that $\mu = 33.5$, which means that $d - d_1 = 0.7$ mm. In other words, if the dose output is multiplied by 10, the thickness of lead, with a voltage of 100 kv. must be increased by 0.7 mm.; similarly if the dose output is reduced to one-tenth, the thickness of lead can be diminished by 0.7 mm.

In general terms, the relation of the dose output to varying thicknesses d of lead can accordingly be expressed as follows:

$$\log (D/D_1) = 0.434 \cdot \mu \cdot (d - d_1).$$

If, for instance, with a voltage of 200 kv. ($\mu = 16.2$) the lead thickness of the protective material is changed by 1 mm. ($d - d_1 = 0.1$ cm.), then $D/D_1 = 5$, which means to say that, if the thickness of lead is increased from 4 to 5 mm., the dose output is reduced to one-fifth; if, on the other hand, the thickness of lead is reduced

from 4 to 3 mm. the dose output is multiplied by 5. The effect of a 1 mm. change in the thickness of lead increases with diminishing voltages.

The scant measure of subdivision in the graded series of lead thicknesses laid down in the German regulations is doubtless attributable to a statement by GLOCKER¹ who held a subdivision for 125, 150 and 175 kv. to be unnecessary owing to the small reduction of the coefficient of absorption between 100 and 200 kv. Subsequently, however, VAN DER TUUK and BOLDINGH² challenged this statement, and GLOCKER³, in a recent publication, has somewhat changed his view.

In my opinion, as will be gathered from what precedes, it is not sufficient merely to graduate the thicknesses in accordance with the voltage, and the series should at any rate be extended upwards, since it has latterly been possible to operate Roentgen tubes with 400 kv.⁴, 600 kv. and 750 kv.⁵ When 400 kv. is used, it will be seen, for instance, from Graph II that, with a current of 1 ma and 50 cm. focal distance, as much as 20 mm. of lead is necessary to reduce the dose output to the permissible value.

Since there may, in some cases, be considerable differences in the currents used in the tube, it is, in my opinion, necessary that the scope of the provisions should be suitably widened, or at any rate that the possibility of determining the necessary thicknesses of lead in each separate case should be left open.

6. Protection of Adjacent Rooms.

As regards the protection of adjacent rooms, this, of course, is only necessary if the tube holder does not already provide adequate protection; it is further assumed that the applied cone is also suitably screened. If the tube is not adequately protected, the determining factor will be the protective value of the partition walls, allowing for focal distance.

Graph III gives particulars of the reduction of the lead thickness (or lead value) required in the partition walls as the distance from the Roentgen tube increases. It will be seen that, for instance, with 200 kv. tube voltage, 10 ma current and a focal distance of 8 m., the thickness of the partition wall must be equivalent to 2 mm. of metallic lead.

As regards the protective value of current building materials and of special substances manufactured for protective purposes such as lead glass, lead rubber, baryta walls, etc., various studies have already been made, e.g., by KAYE and OWEN, by BERTHOLD, by BERTHOLD and GLOCKER, and, more recently by SIEVERT and THORAEUS; the last-named have collated the results obtained by the other authors mentioned⁶.

In the above example, 2 mm. of metallic lead would hence correspond to about 20 cm. of brick wall, that is to say, a wall with a thickness of one brick, assuming the size of a brick to be 6×12×25 cm. Under the conditions specified, such a thickness of wall thus affords adequate protection, even if the Roentgen tube is wholly unprotected or if direct radiation from the target impinges with its full intensity on the particular spot considered. Timbering of the same thickness naturally affords less protection, and the protective value of the partition wall must be ascertained in each separate case. Even where, under the conditions specified above, the focal distance is 20 m., it will be seen from the curves that lead protection of 0.8 mm. Pb., or a wall about half a brick thick is necessary.

¹ *Fortschritte Röntgenstr.*, 40, 501, 1929.

² *Ibid.*, 41, 965, 1930.

³ *Ibid.*, 41, 969, 1930.

⁴ HERRMANN and JAEGER, *Fortschritte Röntgenstr.*, 41, 426, 1930.

⁵ LAURITZEN and BENNETT, *Physic. Rev.*, 32, 850, 1928.

⁶ LAURITZEN et LARSEN: *Physic. Rev.*, 36, 988, 1930.

⁷ *Acta Rad.*, XI, 342, 1930.

Since the intensity of the radiation diminishes proportionately to the square of the distance, increasing the distance is a very effective means of protection from radiation. From the equation given above ($a = 316 \cdot \sqrt{D_0} \cdot e^{-\mu \cdot d}$) we obtain the ratio of two ranges — namely, $a/a' = \sqrt{D_0/D'_0}$. If, for instance, the range of the injurious radiation with a tube voltage of 180 kv and a current of 5 ma is to be determined for a protective wall of 2 mm. lead equivalent, Graph III will show the range to be 5 m. with 180 kv and 10 ma. For half that intensity (5 ma), the range thus equals $5\sqrt{2} = 3.5$ m.

Again, it is easy to ascertain what reinforcement of the lead protection is necessary if the dose output is raised. The above formula yields :

$$\begin{aligned} d - d' &= \frac{4.6}{\mu} \cdot \log (a/a') \\ &= \frac{2.3}{\mu} \cdot \log (D_0/D'_0) \end{aligned}$$

If, for instance, the voltage being 180 kv, the current is increased from 5 ma to 20 ma, then, in order that the protection from radiation may be the same — i.e., in order that the injurious radiation may have the same range — the thickness of the wall must be increased by $(2.3 \times 20) \cdot \log 4 = 0.07$ cm. = 0.7 mm. lead equivalent. If this reinforcement is not effected, the range increases from 3.5 m. to $3.5 \cdot \sqrt{4} = 7$ m.

In the manner indicated, the requisite protection can be determined for all the various conditions of operation that may occur.

The data given are also sufficient for extreme cases. HERRMANN and JAEGER¹, for instance, have taken direct measurements with a view to ascertaining what thicknesses of lead are necessary, given X-rays generated with 400 kv, to secure the same protection as is afforded, with 200 kv by 4 mm. of lead. No attention appears to have been paid in either case to the current in the tube ; the measurements indicated, however, the need for 14.5 mm. of lead with 400 kv and 0.5 ma. Graph II, on the other hand, gives, for 400 kv, 1 ma and 50 cm. focal distance, a lead thickness of 19.5 mm.; converting this into terms of 0.5 ma, we get 17.7 mm. Pb. and, reckoning 1 m. focal distance, we obtain the value of 14.1 mm. Pb. This satisfactory concordance with the value ascertained by direct measurement can be taken as confirmation of the fact that the data on which the curves have been constructed are adequate for practical purposes.

7. Protective Measures from the Gamma Rays of Radio-active Substances.

We must now enquire whether and, if so, how far, the curves given can be used for the gamma radiation of radio-active substances.

In order to establish a connection between gamma radiation and the radiation of an X-ray tube, we must return to the question of energy and determine the voltage and current at which a Roentgen tube would have to be operated in order to emit the same radiant energy as, say, 1 gramme of radium.

Consideration of the gamma rays will be based upon the most commonly used substance, RaC. This consists of several homogeneous groups of various wave lengths, of which the 0.02 Å. U. wave length is the most intense. Gamma radiation is thus also not homogeneous, but it is much more so than Roentgen radiation, even if the latter is very heavily filtered. By way of absorption measurements, we obtain an average wave

¹ *Fortschritte Röntgenstr.*, 41, 426, 1930, and 42, 115, 1930.

length which corresponds, according to COMPTON¹, to 0.016 Å. U. According to the Planck-Einstein law this would represent a voltage of 770 kv. If, however, a Roentgen tube is operated at this voltage, only the boundary wave length is at 0.016 Å. U., and the corresponding radiation has the intensity 0. Consequently, a higher voltage must be used, so that the wave length 0.016 Å. U. is located at the point of maximum intensity. According to DAUVILLIER,² this is effected if the voltage is raised in the proportion of 1.3. A Roentgen tube would thus have to be operated with $1.3 \cdot 770 = 1,000$ kv, to emit radiation of the average gamma-ray wave length.

As regards the coefficient of absorption of gamma rays for lead, the values ascertained have varied owing to their lack of homogeneity. According to experiments by Ishino³ it is 0.826, whereas, according to KOHLRAUSCH⁴ the coefficient of absorption decreases with increasing thicknesses of lead, and attains the constant value of 0.533 from 3.5 cm. of lead upwards. Graph I gives 0.55 for a tube voltage of 1,000 kv, thus agreeing satisfactorily with the above-mentioned result.

According to ELLIS and WOOSTER⁵, the energy of the gamma rays of 1 gr. of radium is equivalent to 8.6 gramme-calories per hour; this represents 10^5 ergs per second. This amount of energy is emitted into the room in the form of spherical waves; the amount of energy incident upon 1 sq. cm. at a distance of a cm. from the source of radiation being $\frac{10^5}{4} \cdot \pi \cdot a^2$ erg./sec. Expressed in r units this represents, as already demonstrated

in detail for X-rays, $\frac{10^5 \cdot 0.02}{4 a^2 \cdot 85} = \frac{1.88}{a^2} r/\text{sec.}$, taking the total mass absorption coefficient of the air to be 0.02. In this conversion, it is assumed that the value of 33 volts per pair of ions, which was determined in connection with X-rays, also applies to gamma rays. Strictly speaking, in this case as in that of X-rays, a homogeneity factor should be introduced. For gamma rays, it is, however, so small that it may be neglected.

A comparison with the energy output of a Roentgen tube shows that such a tube, operating with 1,000 kv voltage and powerful homogeneity, would require a load of about 0.02 ma to generate the same amount of radiation as the gamma radiation of 1 gramme of radium C. Since gamma radiation is given off without intermission, whereas Roentgen rays were assumed in the foregoing to be emitted for eight hours a day, the tolerance dose must be reduced to $1/3 \times 10^{-6} r/\text{sec.}$ The radiant energy of the gamma radiation of 1 gr. of radium is thus small compared with the radiation of a Roentgen tube operating under normal conditions. It follows that the range of the gamma rays (up to the allowable intensity of $1/3 \times 10^{-6} r/\text{sec.}$) is comparatively short, whilst their great power of penetration at short ranges makes very thick lead screening necessary.

Graph II will show that an X-ray tube operated with 1,000 kv and 1 ma would require to be protected with 17 cm. of lead if no injurious radiation is to be present at a distance of 50 cm. Since, according to what is stated above, the amount of gamma radiation given off by 1 gr. of radium represents about $1/50$ ma, the thickness should be reduced by $\frac{2.3}{\mu} \log 50 = 7.3$ cm. A protective casing about 10 cm. in thickness is thus required.

The international provisions lay down rules for protective measures in the case

¹ Cf. *Hdb. d. Physik*, published by Geiger and Scheel, Volume 23, page 425, 1926.

² R. LEDOUX-LEBARD et A. DAUVILLIER, *Physique des Rayons X*, Paris 1921, p. 20.

³ *Philos. Mag.* 35, 129, 1927.

⁴ *Probleme der Gammastrahlung*, published by Vieweg und Sohn, Brunswick, 1927, p. 104

⁵ *Hdb. d. Physik*, Volume 22, page 217, 1926.

of radio-active substances, but they give no information as to the distances at which the specified thicknesses of lead afford adequate protection.

Graph IV shows the ranges of gamma rays beyond lead screens of various thicknesses for quantities of radium ranging from 10 mg. to 10 gr. In accordance with what has been said above, the range is defined as the distance from the source of radiation at which the dose output of radiation begins to be smaller than $1/3 \times 10^{-4}$ r/sec. It is found, for instance, that, with a lead casing 5 cm. thick, the injurious radiation of 100 mg. of *Ra* element is operative within a radius of 64 cm. Without any protective screening, the gamma radiation of 100 mg. of *Ra* has a range of 2.40 m. in all directions. The normal filtering of the preparations has but little effect, since, in 1 mm. Pt. for instance, gamma radiation is only attenuated by approximately 9 per cent.

Whilst the radiation of a Roentgen tube, operating with 200 kv and 10 ma. and screened with 1 mm. Pb, has a range of about 20 m. (Graph III), the gamma radiation of 1 gr. of radium screened with 1 mm. Pb only has a range of about 7 m. ; if the screening of the Roentgen tube is brought up to 5 mm., the range is reduced to about 60 cm. in the case of 1 gr. *Ra*, on the other hand, the range is only shortened down to about 6.5 m.

If "absolute protection" is required — that is to say, if no injurious radiation is to be present even in immediate proximity to the protective casing — the thickness of the screen must be equal to the range. The corresponding thickness will be found, in Graph IV, along the practically horizontal curve *a-b* at the bottom. For instance, the Pb thickness required in such a case for 1 gr. *Ra* is about 14.8 cm., for 100 mg. it is about 11.5 cm. The range of 1 gr. of *Ra* on the far side of a 2.5 cm. protective screen is still about 4 m., whilst that of 100 mg. *Ra* is about 1.1 m. The best form of protection is hence distance from the source of radiation.

Comparison with the thicknesses of lead laid down in the international provisions shows that the latter provide for somewhat thicker screens:

Quantity of <i>Ra</i> element	International provisions	Values obtained from Graph IV
0.5 grms.	15 cm. lead	14 cm. lead
1.0 „	16.5 „ „	15 „ „
1.5 „	17 „ „	15 „ „
2.0 „	18 „ „	16 „ „

If, as was done above, the gamma-radiant-energy of 1 gr. of *Ra*, i.e., 8.6 calory hours, is taken as a basis, and if, the allowable residual of radiation being set at $1/3 \times 10^{-4}$ r/sec., it is desired to secure absolute protection in the sense already defined, values of lead thickness similar to those recommended in the international provisions will be obtained if an absorption coefficient of about 0.46 cm, is applied. So small a value could only apply to very hard components of the mixture of gamma rays, which are only present at low intensities; the regulations in the international provisions relate, however, to establishments for the extraction of emanation from radium solutions — that is to say, to fixed installations in which increased protection from radiation does not hamper the manipulative processes and can only be useful.

As regards the storage of radium salt, it is recommended, on the other hand, that the radium should be stored in a safe as distant as possible from the personnel. The radium tubes or applicators are, moreover, to be inserted into separate lead blocks giving a thickness of protective wall amounting to 5 cm. of lead per 100 mg. of *Ra* element. Graph IV indicates that the range of 100 mg. *Ra* screened with a protective wall of 5 cm. of lead is about 64 cm. If several such lead blocks, containing 100 mg.

of Ra each, are stored together, the reach is, of course, proportionately extended, so that, in an unfavourable direction, it is 90 cm. for 200 mg., and so on.

A separate room is to be provided for the "make up" of applicators. Lead screens of not less than 1 inch thickness are to be used (see above), and proximity to the radium is only to occur during actual work and for as short a time as possible. The measuring room is to be a separate room and should contain the radium only during its actual measurement. Assistants are not to remain in the same room as patients undergoing radium treatment. The persons engaged in "making up" applicators are not to be engaged on such work for periods exceeding six months.

Similar regulations will be necessary for institutes in which radium preparations are put up in containers, radio-active luminous paints are prepared, etc.

For the despatch of radium preparations by post regulations have also been laid down in the international provisions. It is stated that in the case of small quantities the container should be lined throughout with lead not less than 3 mm. thick and that it is more satisfactory to transport large quantities by hand in a suitably designed carrying-case.

In my opinion, 3 mm. of lead protection will serve no very useful purpose, since it attenuates gamma rays by 20 per cent at the outside. Better results would be secured if the preparations were placed, not only in a lead container of a thickness to be graduated according to the radium contained, but in the middle of fairly bulky packing so that a certain factor of distance would be introduced. In addition to that, a declaration of contents should be required, since it must be borne in mind that, apart from considerations of protection for the post office staff, other packages which may happen to be brought into proximity with radio-active substances are liable to be damaged thereby, e.g., photographic plates.

Precautionary regulations are especially necessary in connection with the use of emanation, since the gaseous emanation, on breaking down, leaves a radio-active deposit which may gradually exert destructive effects, on the skin for instance; the inhalation of large quantities is injurious, and premises, measuring instruments, etc., may be "infected" by emanation. The international provisions, therefore, specify that the radium solution should be stored in lead containers of the previously specified thickness in a special room which should only be connected with the pumping-room by a tube. Rooms should be ventilated with an exhaust fan, and rubber gloves should be worn.

So far as the protection of adjacent rooms is concerned, it can only be adequate in this case, as distinct from that of X-rays of normal hardness, if the twofold precaution is taken of maintaining an adequate distance from the source of radiation and of casing the latter in lead. Owing to the low lead equivalence of masonry, protection by the latter is hardly worth considering. Particulars of the distances that must be maintained in order to keep adjacent rooms free from injurious radiation will, again, be obtained from Graph IV.

8. Protective Measures in the Case of Other Kinds of Radiation.

Protection is also necessary against the beta rays of radio-active substances. The beta rays are endowed with considerable kinetic energy; their power of penetration is consequently small; and this is the reason why they are only able to produce very superficial, though very extensive, effects, on the human skin for instance. Owing to their low power of penetration, protection is comparatively easy to provide. We are only concerned, here, with very slightly filtered radio-active preparations, and with the naked glass capillary tubes loaded with emanation. The best form of protection,

here again, is the greatest possible distance. The preparations should therefore not be carried in the hand but should be manipulated with forceps, preferably made of wood, and carried from place to place in long-handled containers. The last-named precaution applies to gamma-ray preparations as well.

The cathode rays also fall under this heading, since they are similar in nature to beta rays and can now be produced with considerable energy values by high-output tubes with Lenard windows. Though their use for medical (therapeutic) purposes and in technical processes (e.g., sterilisation) is still in the initial stages, they may be utilised on a wider scale in the course of time. The cathode rays produced with high voltages approximate, in respect of their kinetic energy, to the beta rays of radio-active substances, and give extraordinarily powerful, even though comparatively superficial, biological effects. Owing to their low power of penetration protection is a comparatively simple matter — glass screens and the like, for instance, being sufficient. The simultaneously generated X-rays should, however, also be taken into account.

Special protective measures against alpha rays need hardly engage our attention, since they are absorbed by very thin casing and reach but a short distance through the air.

In the case of ultra-violet rays (artificial sunlight, analysis lamps, etc.) the precautionary measures may be limited to protection for the eyes; regulations concerning measurement and dosage would, however, be very welcome in the case of ultra-violet light as well, since, here again, injuries may be inflicted by overdoses.

9. *Protective Measures against Scattered X-Rays.*

So far, the observations made have reference to direct radiation, the primary radiation as it leaves the target of a Roentgen tube or a radio-active preparation. It is screened off so far as possible by the tube holders, protective cylinders, lead casings, etc., and narrowed down to the particular cone of radiation required for the purpose in view.

Apart from these casings, protection must hence also be provided to arrest the applied radiation after it has passed through the patient, through the product to be examined, etc. For this purpose, a protective screen must be mounted behind the radiated substance (behind the patient). In therapeutic radiation, sheet-lead is placed under the treatment bed, or the patient is laid upon a thick slab of lead rubber. In screening examinations, the fluorescent screen must be covered with lead glass of adequate protective value, whilst, in X-ray photography, the Roentgen cassette is usually provided with a metal bottom. The thickness of the protective material must be adjusted to the power and penetration of the rays.

All bodies on which short-wave radiation impinges are known, however, themselves to give off radiation consisting of electronic radiation, fluorescent radiation and scattered radiation. The first two kinds of radiation may be disregarded so far as protection is concerned. Not so, however, the scattered radiation, which may be quite considerable in certain circumstances. Scattered radiation must again be subdivided into two kinds, the classical, and Compton's scattered radiation. The former consists of primary radiation which has merely been deflected from its original path, the latter, however, of rays which have simultaneously undergone an increase of wave length. The classical scattered radiation predominates in the case of soft Roentgen-rays, Compton's radiation in the case of short-wave X-rays and gamma-rays. So far as protection against radiation is concerned, the increase of wave length may be disregarded.

The strength and power of penetration of scattered radiation depends upon the

intensity and quality of the primary radiation and on the nature and volume of the scattering substance; to this must be added a powerful directional factor which also varies with the quality of the primary radiation. The problem of scattered radiation is hence highly intricate and does not lend itself to mathematical treatment. Investigations must therefore be based upon the results of experiments carried out under suitably selected experimental conditions.

The dependence of scattered radiation on the quality of the primary radiation is of such a kind that, in the tissues of the human organism — which are the principal scattering medium concerned — the intensity of scattered radiation is at its maximum, more or less, in the zone of roentgentherapy radiation, whilst it drops appreciably both with very soft and very hard radiation, as has recently been demonstrated in some detail by GUNSETT and NOURETTINE O.¹ So far as the gamma rays of radium are concerned, scattered radiation is of minor importance, seeing the intensity of the gamma radiation is comparatively small. Discussion may therefore be limited to X-rays.

In this connection, we have the work of SCHLECHTER,² SCHEFFER,³ FRICKE and BEASLEY,⁴ JACOBSON⁵ BEHNKEN⁶ and my own measurements.

SCHLECHTER's investigations relate to medical X-ray diagnosis. He finds that, generally speaking, the secondary radiation, which originates in the patient's body, the walls and objects in the room, largely predominates over the primary radiation as attenuated by the usual protective casing of the tube. In the places where the doctor and the assistants usually stand during screening examinations, dose outputs rising to 50×10^{-5} r/sec. were found, whilst behind the tube the values ranged up to 800×10^{-5} r/sec. It is hence necessary, first, to surround the tube with a protecting cover which only allows a limited applied cone of radiation to emerge, and the thickness of which should be determined in accordance with the standards governing protection against direct radiation. Secondly, the patient must be screened off in all directions with strips of lead rubber curtain, which may be hung from the stand and the fluorescent screen, when the patient is in the standing position. By this means, the radiation in the doctor's position was reduced to less than 1×10^{-5} r/sec., whilst, at the back of the tube, the radiation emerging from the patient amounted, at a distance of 70 cm., to 8.15×10^{-5} r/sec. At a distance of 3 m., the radiation, in this place too, fell below 1×10^{-5} r/sec. In order to protect the examiner's legs and feet a further device is recommended, which is known in Germany as a "Schutzkanzel protective pew". The protective glass in front of the fluorescent screen must satisfy the requirements for protection against direct radiation.

In medico-diagnostic work, as already mentioned, the standards of protection to be laid down can be somewhat lowered because the apparatus is not in constant operation, intervals always occurring between periods of ray production. On the other hand, it must be remembered that, in X-ray photography, exposures are only very short, although admittedly high energy values are frequently employed. To this must be added that, in the case of photographs at a distance, long stretches of intervening air are irradiated, and even though the scattered radiation of the air is but small, yet it must not be disregarded in this connection.⁷ It will be desirable in any case, in medico-diagnostic installations, either to place the control table in a special room or to move it as far away as possible from the tube, behind a protective partition of about 1 mm. lead equivalent.

¹ *Journ. de Radiol.*, 14, 551, 1930.

² *Fortschritte Röntgenstr.*, 34, 946, 1926.

³ *Strahlenth.*, 22, 726, 1926.

⁴ *American Journal of Roentgenol.*, 18, 146, 1927.

⁵ *Ibid.*, 18, 149, 1927.

⁶ *Fortschritte Röntgenstr.*, 41, 245, 1930.

⁷ *BuMP : Fortschritte Röntgenstr.*, 38, 58, 1928.

Technical diagnostic work, the examination of materials and the like, differs in this respect from medical work, in that large quantities of energy are used for prolonged periods. In this case the conditions to be fulfilled must be those laid down for medicotherapeutic radiation.

In therapeutic Roentgen radiation (180 kv, 6 ma, 0.6 mm. Cu. filter, 10 × 15 cm. field, 40 cm. target-skin distance) with a protected tube and a phantom, SCHEFFERS (*op. cit.*) found, where the phantom is not enclosed and where no underneath lead protection is used, a dose output of 800×10^{-5} r/sec. on the floor directly below the patient — that is to say, directly in the cone of radiation — and 900×10^{-5} r/sec. in close proximity to the patient's side, whilst, when a belt-shaped lead protector of 3 mm. Pb is used, the corresponding values work out at 0.1 and 0.2×10^{-5} sec. respectively. Where no protective belt was used and the beam of radiation was not screened (no "cone" being mounted), the value at 1.5 m. distance from the cone of radiation was about 16×10^{-5} r/sec., whilst when a protective belt and a "cone" were used, it was about 0.4×10^{-5} r/sec.

BEHNKEN's measurements (*op. cit.*) relate to the Media-Metalix and the Metwa-Metalix protective tubes used in conjunction with a phantom. The Media-Metalix tube was operated with 75 kv, 4 ma and 0.5 mm. Al filter, that is to say, under the conditions of ordinary medical X-ray diagnosis. With an unenclosed phantom and no "cone", dose outputs of $15-20 \times 10^{-5}$ r/sec. were measured at a distance of 1.5 m. When the phantom was enclosed in 1 mm. of sheet lead, and a lead glass "cone" was used, the radiation dropped to about 0.2×10^{-5} r/sec. The Metwa-Metalix tube was operated under conditions (200 kv, 3.5 ma) corresponding to hard therapeutic radiation. With an unprotected phantom, but with a lead glass "cone" mounted, the dose output was $30-40 \times 10^{-5}$ r/sec. at a distance of 1 m. and, in the immediate vicinity of the phantom, as much as $1,000 \times 10^{-5}$ r/sec. It was found that adequate protection could be obtained even for persons remaining in immediate proximity to the phantom by using 2 mm. of lead protection.

The experiments so far described were all performed with the help of phantoms. I myself have taken a series of measurements during normal therapeutic radiation of patients. The Roentgen tube was surrounded with ray-proof casing on all sides (Wintz mounting). The conditions of operation were respectively 200 kv, 3 ma, 0.5 mm. Zn + 3 mm. Al filter on the "Symmetrie" apparatus, and 200 kv, 15 ma, 0.5 mm. Zn + 3 mm. Al filter on the transformer therapeutic apparatus. The patient was either not covered, or protected with a belt of lead rubber 6 mm. in thickness, which only exposed the field of radiation (abdomen). Experiments were carried out both with a radiation "cone" placed on the body and without such a "cone", at focal distances of 30 and 90 cm. The results are set forth in the following table :

Case	Tube current	Target-skin distance	Field	Protection of patient with lead rubber	" cone "	Dose output at a distance of 1 m. from the patient
1.	15 ma	90 cm.	15 × 15	Yes	No	$50 - 55 \times 10^{-5}$ r/sec.
2.	15 ma	90 cm.	15 × 15	Yes	Yes	$5 - 10 \times 10^{-5}$ r/sec.
3.	3 ma	30 cm.	8 × 8	Yes	Yes	$0.7 - 2 \times 10^{-5}$ r/sec.
4.	3 ma	30 cm.	8 × 8	No	Yes	$3 - 10 \times 10^{-5}$ r/sec.

The measurements were taken, with a special ionisation chamber, at a distance of 1 m. from the cone of radiation and at a height of 1 m. from the floor, both at the patient's head and feet and on both sides. The figures show that only in Case 3 — that is to say, where the lead-lined radiation "cone" is placed on the field of radiation and the patient is thoroughly covered with lead rubber, is it possible to remain continuously at a distance of 1 m. with the low tube current of 3 ma. A comparison between Cases 2 and 3 will show that, with 5 times the tube current, the scattered radiation is also about 5 times as great. Case 1 indicates the powerful scattered radiation which is given off backwards from the radiated field if a "cone" extending right down to the patient is not used ; in this case there is the added scattered radiation of the air. Case 4 shows, by comparison with Case 3, the scattered radiation which is given off sideways from the patient.

These experiments show the desirability, in all cases, of keeping the control table as far as possible from the tube and of placing it behind a protective partition. A calculation with $\mu = 20$ (see Graph I) shows that the most powerful scattered radiation measured can be reduced below 1×10^{-4} r/sec. by a protective partition of 2 mm. of lead ; to this must be added the effect of the distance, which is doubtless 2 m. at least in all cases. The protective value of a window in the lead partition must obviously be equivalent to that of the partition itself.

It might be objected that the tertiary scattered radiation engendered by the scattered radiation in the walls and floor of the room can get behind such a protective partition ; measurements showed, however, that in no case was a dose output of 1×10^{-4} r/sec. attained behind protective partitions of 2 mm. of lead. In order to minimise the radiation emitted by the partition, some regulations provide that the latter should be arranged as close as possible to the wall of the room. FRICKE and BEASLEY (*op. cit.*) and JACOBSON (*op. cit.*) found that even with tubes but inadequately protected with lead glass bowls, the dose behind a protective lead partition only had a conversion value of 1.3×10^{-4} r/sec., whereas the measurements taken in front of the protective partition gave $80-100 \times 10^{-4}$ r/sec.

The conclusion to be drawn from the above is that the requirement of a separate ray proof room for the service of the Roentgen apparatus in medical work can be dropped, provided the tube is enclosed in a ray-proof casing or affords adequate protection by itself. Even in unfavourable cases, a lead partition of 2 mm. thickness suffices to render harmless the scattered radiation given off by the patient. The presence of the X-ray assistant in the radiation theatre itself is desirable, not only on psychological grounds in the interest of the patient, but especially because much more reliable supervision of the protective screening is thereby secured. The placing of a ray-proof substance underneath the patient and the covering of the patient with lead rubber over a wide area round the field of radiation should always be made a rule in order to reduce scattered radiation.

If the regulations already issued in a number of countries are examined in the light of the above considerations, it will be found that measures have in some cases been demanded or recommended which must be regarded as extraordinarily far-reaching.

Where the tube is insufficiently protected, the operator's room had best be separated from the radiation theatre. The German regulations provide that, with tensions below 125 kv, persons may be employed in the theatre if a protective partition with side wings, measuring at least 2×2 m. (inclusive of the side wings) and having a lead equivalent of not less than 2 mm. is provided for their protection. The protective partition is to be placed as far away as possible from the tube (at least 1.5 m.) and as close as possible to one of the walls. Where the tension exceeds 125 kv and the tube protection is inadequate, all regulations doubtless provide for a separate operator's room

with suitable ray protection. To this, no objection can be raised but to stipulate, like the Russian regulations, for a protective cabin or separate rooms with walls of up to 6 mm. lead equivalent, where a built-in ray-proof tube is used, must be regarded as an exaggeration. In my opinion, as already explained, the presence of the assistants in the treatment room itself is indeed a desideratum, though of course they should only remain in places where complete protection from radiation is provided. If the tube is built in in such a way as to be ray-proof, such protection can be obtained, under ordinary conditions of radiation, by a protective partition of 2 mm. of lead at the outside.

10. Tests for the Soundness of Ray-proofing.

A method has been set forth in this survey whereby it is possible to determine from the sets of curves reproduced, whether, given the usual conditions in respect of tension, tube current, distance and thickness of protective material, a particular spot is a suitable place for the human organism to remain in indefinitely without fear of injury. Such curves offer a particularly suitable means of determining whether the proposed protective measures in new installations will be sufficient. In the case of existing establishments it is possible, on the other hand, to ascertain the dose delivered at a particular spot by direct measurement.

The methods of mensuration utilised for the purpose must be capable of detecting small amounts of radiation. Such methods involve the use of the photographic emulsion, the fluorescent screen and ionisation.

For this purpose, EGGERT and LUFT¹ have given particulars of a very handy Roentgen film-dosimeter that can be carried in the pocket, and contains a film. When the latter is developed, the quantity of Roentgen radiation to which the bearer has been exposed for a certain time can be inferred from the visibility of certain marks. The dosimeter has been designed for qualities of radiation such as occur in medical X-ray diagnosis; my experience has been, however, that it can also be used for deep therapy rays when suitably calibrated.

BOUWERS and VAN DER TUUK² have also developed a photographic method which is based, for soft rays, on the measurement of the blackening of a film, whereas, for hard rays, the different permeability of copper and aluminium is used as a criterion.

Another method, which has frequently been described, involves the use of a fluorescent screen (Willemite). In this connection the international provisions read as follows: "It should not be possible for a well-rested eye of normal activity to detect in the dark appreciable fluorescence of a screen placed in the permanent position of the operator". To this statement, BOUWERS and VAN DER TUUK (*op. cit.*) raise the objection that, according to experiments performed by them, the fluorescence of the screen at a distance of 1 m., with a tube current of 4 ma and lead protection corresponding to the specifications of the international provisions, does not necessarily prove that there is really any danger to be apprehended.

GLOCKER and REUSS³ reach a similar result, but state, in conclusion, that the fluorescent screen test can be used as a simple and expeditious method of approximation for the determination of the tolerance dose, provided that allowance is made for the considerable inherent margin of error (which resides mostly in the varying sensitiveness of the human eye). This presupposes that the allowable dose has been fixed at the same value both for diagnostic and therapeutic radiation; if, however, in

¹ *Röntgenpraxis*, 1, 188 and 655, 1929.

² *Fortschritte Röntgenstr.*, 41, 767, 1930.

³ *Fortschritte Röntgenstr.*, 42, 651, 1930.

accordance with the German rules for protection against radiation, a higher dose is allowed in diagnostic work than in therapeutic work, the fluorescent screen test can only be used in therapeutic establishments.

The most suitable method for exact measurement is undoubtedly the ionisation method, if allowance is made for the numerous sources of error attaching to this method as well. In this case, use is made of large-sized chambers permeable on all sides, as described, for instance, in cylindrical form by FRICKE and BEASLEY¹, and in spherical form by BEHNKEN.²

It would be desirable for X-ray establishments of all kinds to be subject, in regard to the adequacy of ray-proofing, to regular compulsory supervision, which might be entrusted to the institutions responsible for the standardisation of X-ray doses.

11. Dangers caused by Valve Tubes.

Incandescent valve tubes have latterly been used on an increasing scale for the rectification of the secondary voltage of transformers and induction coils. They are similar in design to the Coolidge tubes, with the sole difference that the concentration of the cathode rays on a more or less extensive focal spot of the anode is avoided. It is obvious that, in these tubes also, the impact of the cathode rays on the anode engenders X-rays; it is asserted, however, that the voltage drop in the valve is so slight, and that the Roentgen rays are consequently so soft, that they do not penetrate the glass wall of the valve. This is especially true if the heating of the incandescent cathode of the valve is adequate. This is the point to which the German regulations refer when they state that "care must be taken to comply with the particulars concerning heating as set forth in the manufacturer's instructions".

It has recently been found, however, that, when the Roentgen apparatus is connected up in certain ways to the valve tube, then, notwithstanding adequate heating of the cathode, a considerable loss of voltage occurs, which manifests itself in the glowing of the anode in the valve. In such a case considerably harder Roentgen rays are generated, which pass through the glass wall and may be dangerous to the persons operating the apparatus.

Whether 0.1 or 0.2 mm. Pb, as laid down in the Czechoslovak regulations, are sufficient to screen off this radiation, would appear doubtful. In this case, it would be desirable, as recommended by the Austrian proposals, to apply, *mutatis mutandis*, the regulations governing protection from direct radiation by the Roentgen tube.

The increase in the voltage drop of the valve tubes has been ascribed to the charging of the glass wall. By special designing it has been possible to eliminate this defect, which may affect the reliability of the voltage measurement and the dosage, by constructing the body of the valve of metal (Philips-Müller³ Metalix valve) or by surrounding the discharge chamber within the glass with a metal cylinder.⁴

In any case, it is desirable to make certain, by means of a fluorescent screen, used in the manner described above, that the valve is emitting no X-rays.

B. MEASURES FOR THE PROTECTION OF THE PATIENT.

Regulations designed to protect the patient from injury by rays must cover a multitude of different points. The object is not merely to provide protection against

¹ *American Journal of Roentgenol.*, 18, 146, 1927.

² *Fortschritte Röntgenstr.*, 41, 245, 1930.

³ VIERKÖTTEN : *Fortschritte Röntgenstr.*, 42, Congress Edition, 143, 1930.

⁴ HOFFMAN : *Ibid.*, 147, 1930.

inadvertent radiation, but also to safeguard the patient against an overdose of rays, and, finally, against inadequate radiation — that is to say, against unsuitable or injurious treatment. Generally speaking, the radiation concerned in this connection is that of X-rays.

1. *The Avoidance of Inadvertent Direct Radiation.*

Protection from inadvertent radiation is mostly a technical matter, and is closely linked up with the measures for the protection of persons employed in X-ray establishments. A distinction should, however, be made to this extent, that the patients usually remain (but for a short time) within range of the radiation. The primary object is to ensure that the patient's body is only exposed to the radiation at the places requiring to be radiated for purposes of examination or treatment. The remainder of the body must not be subjected to the rays to any appreciable extent, and certainly not to quantities of radiation exceeding those delivered by the applied cone.

Especially with the older type of narrow tube holders, which were made of wood and surrounded with lead rubber, it frequently happened that the protective material became split or torn, thus occasionally letting through unfiltered direct radiation which might impinge upon the patient's body. This produced strip-shaped burns. Such a defect can be easily detected. In order to test holders for the soundness of the protective material, I use a small fluorescent screen shaded from the light and mounted at the end of a Pertinax tube which is fitted with an eye-piece, a so-called fluorescent tube of the kind that can be used with advantage to determine the boundaries of the cone of radiation in distant field work.

The old tube holders referred to, as well as the lead glass bowls, allow unfiltered radiation to pass at the point where the arms of the tube emerge, and this may in some cases impinge upon the patient's body. It has therefore been laid down — as, for instance, in the German regulations — that such tube holders must be set in such a way that the longitudinal axis of the Roentgen tube is at right angles to the longitudinal axis of the patient's body. A fresh danger then arises, to be sure, in regard to the high voltage, since the patient is now able to grasp both ends of the tube simultaneously with his hands.

2. *Safety Measures in Connection with Filters.*

One mistake, which is difficult to deal with and has already been responsible for many an injury to patients, is the inadvertent omission of the filter or use of the wrong filter. Innumerable proposals have already been made as to the way in which such an oversight may be prevented, without any ideal solution having been devised.

It is comparatively easy to imagine devices which would prevent the omission of the filter. In primitive X-ray installations in which the high tension feeds are connected to the tube with simple hooks, both the end of the high tension lead to the anti-cathode and the electrode connection of the tube have been formed into a loop, so that they cannot be joined up without further ado. For this purpose a double hook is necessary, which is fixed by a tape to the filter. With the modern protective casings, this method can no longer be used, since the tube is not readily accessible. In this case, the filter safety device has been combined with an obturation shutter. The latter is non-permeable and closes the radiation aperture ; it is provided with a stop catch that can only be released by the insertion of a filter. The radiation aperture can hence only be opened if a filter is mounted.

Such devices doubtless provide against the omission of the filter but not against the use of the wrong filter. In order to prevent this, the several filters have been

provided with various projections operating an electrical indicator on the control table when the filter is inserted, so that the operator at the control table can see which filter is being used. The mechanism must, in the nature of things, be highly intricate and is hence liable to give trouble, apart from the fact that it does not prevent the administration of a dose incommensurate with the filtering used. In the case of incandescent cathode tubes, which are now used almost exclusively, the safety device can also be introduced into the filament circuit. Thus each filter may be connected by a tape to a plug which must be used to close the filament circuit before X-rays can be generated. In that case, each filter is attached to a specially shaped plug which can only be used if the doctor in charge has perforated a card in such a way that the plug belonging to the requisite filter can be inserted.

In my opinion, the simplest method is the best, since experience has shown that complicated equipment is not used in the long run. For years I have been using with great success small plates which are fastened to the filters by tapes ; a special colour is used for each filter metal (Cu. red, Zn black, Al white) and for each strength of filter a special shape of the plate (round, angular). In this way, it can be seen from a distance which filter is being used.

The best solution, as such, of this filter problem is that either the dose or the dose output should be simultaneously measured during radiation. For this purpose use may be made of dose-recording instruments such as Strauss's Mekapion or the Hammer dosimeter, and for the second type of measurement, the Siemens' Roentgen dosimeter or large-size chambers in the funnel with galvanometer reading. When dosimeters are used, an appliance can be fitted which switches off the tube as soon as the allowable dose has been administered. The method of dose recording has only been developed in recent years ; it remains to be seen whether the instruments will prove efficient in practice. The use of such an instrument involves a considerable complication of the X-ray apparatus, especially if no hard and fast method of radiation is adopted, but focal distance, size of field and " cone " are adapted to the requirements of each case. The usual consequence is then that the instrument is not used. In any case, even if a dose recorder is used, it is desirable that each filter and combination of filters should be provided with a distinguishing mark which is visible from afar.

At this point, a word may be said as to the protection of the patient from injury caused by the breaking of the Roentgen tube. So-called dry tubes are now being widely used, in which the Wolfram anti-cathode becomes white hot during operation. The glowing anti-cathode might hence possibly fall on to the patient, if the anti-cathode stem should break during radiation. For this reason, in the Norwegian regulations, for instance, a clause has been included providing for the insertion of an asbestos plate between the tube and the filter. Such an accident can only occur in very rare cases, and it is improbable that the anti-cathode could melt its way through an ordinary filter.

This precautionary measure, which was almost universally adopted at the time of the introduction of Coolidge tubes, has therefore since been dropped and may doubtless be regarded as superfluous. So far as the widely used plate-shaped anti-cathodes are concerned, their heat capacity being small and the stem in the tubes concerned being less brittle, such an accident is doubtless wholly impossible, provided always that a filter of some kind has been mounted. Where hot-water cooling is used, the breakage of the water jacket, which is frequently made of glass, may lead to the scalding of the patient ; the use of metal water jackets is hence recommended.

Formerly, the possibility of injury to the patient by the characteristic radiation of the copper or zinc filter was also feared. In order to obviate this danger, a combination with aluminium was used, that was fitted in front of the copper or zinc filter, in the

direction of the patient. The characteristic radiation of the heavy metals is thus absorbed by the aluminium, whilst the characteristic radiation of the aluminium itself is so soft as to be absorbed in a thin layer of intervening air. Latterly this precautionary measure has been largely dropped since the intensity of the characteristic radiation is very small, and since, in close-range radiation, a "cone" is commonly used, the bottom plate of which is sufficient to cut off such radiation.

3. *Reliability of the Measuring Instruments.*

In the majority of radiation establishments, the practice of dosing "by time" still prevails. In this case, the dose output or the dose under specified conditions of tube voltage, tube current, filtering, focal distance and size of field, is determined by preliminary calibration. From this, the length of exposure required for a particular case is computed, and the radiation itself is measured with a watch.

In order to deal exhaustively with this matter, it would be necessary to discuss the whole of the dosage problem; for present purposes, it will be sufficient, however, to deal with the major points so far as they lend themselves to regulation on general lines.

In radiation by time, it is necessary that the conditions under which the calibration took place should be reproduced during actual radiation. Reliable electrical measuring instruments must consequently be used. The measuring instruments concerned are the so-called kilovoltmeter (or tension meter) and a milliamperemeter, the former being used to determine the tube voltage, the latter the tube current.

As a rule, voltmeters are not used in the high tension circuit; the usual practice being to infer the tube voltage from the readings of a voltmeter which is placed at the ends of the primary winding of the transformer (or induction coil). Since the relation of secondary voltage to the primary voltage depends upon numerous factors and is particularly influenced (more especially in the case of induction coil apparatus and continuous current apparatus with condensers) by the load of current in the tube, and is liable, moreover, to be changed by spark gaps (rectifiers) or incandescent valves, careful calibration of the primary circuit voltmeter relatively to secondary voltage is essential — that is to say, the X-ray output or dose must be determined in relation to the deflection of the voltmeter needle at various loads, by calibration with a dosimeter. The voltmeters commonly used on the primary circuits are soft iron instruments; they are standard technical instruments with good damping. They rarely cause trouble.

The most important instrument in the high tension circuit is the milliamperemeter, which gives a direct measurement of the tube current. Revolving coil instruments with a special winding are used for this purpose. In certain circumstances, owing to the effects of the high tension, the winding may be burned out; in order to prevent this, a condenser is connected up in parallel. Since such defects may result in wrong readings, it is advisable to connect up two milliamperemeters, one behind the other; the German regulations, for instance, stipulate for this. Wrong readings may also be caused by electric charging of the covering glass. This must be prevented by covering the glass as adequately as possible with metal or wire gratings, rubbing in glycerine or the like.

In induction coil apparatus (especially where continuous current is used) the frequency of the interrupter must be tested and kept constant.

Special attention should be given to the measurement of time in radiological work. The old practice of using the cheapest alarm clocks must be deprecated. At least two reliable time-pieces should be used for every X-ray tube. They should, for preference, be fitted with a stop-watch device which can be easily operated and should be used during temporary interruptions of the radiation. The end of the period of radiation should be

recorded by a signal. Such chronometers can also be made to operate automatically and can be provided with a recording device; the switching off of the apparatus at the end of the period of radiation can also be effected by the chronometer. ¹ In addition to such an automatic chronometer, which may fail to act, a second watch should also be used.

Dose measurement during calibration is nearly always carried out with a stop-watch. Since the period of radiation is generally a high multiple of the time measured off in this way, it is important that the radiation chronometer and the stop-watch should be going at the same rate. Even where dosimeters are employed during the period of radiation, it is desirable to use a watch in addition.

All the instruments mentioned must be most carefully watched during the whole period of radiation. It is hence necessary to have, for every radiation theatre or for every radiation set, a properly trained staff to adjust the controls throughout the period of radiation; the operator should not be allowed to leave the control table until the Roentgen tube has been switched off and the watch has been stopped. The staff must not be allowed to engage in other occupations, such as reading and the like, whilst radiation is going on.

4. *Training of Medical Attendants and Assistants.*

Apart from the requirement that careless errors of dosing through the omission of the filter, or use of the wrong filter, through maladjustment of the testing instruments, through incorrect measurement of the distance, wrong time measurement or the like must be avoided; the most important stipulation for the protection of the patients in therapeutic work is that the right dose shall be administered. The patient is entitled to demand, not only that injury by overdosing shall be avoided, but also that he shall not be given too small a dose which would merely give him the illusion of effective treatment, and might, in certain cases, jeopardise his chances of a cure. In the outside world, to be sure, failure does not arouse so much attention as the infliction of burns.

The correct use of radiation can only be guaranteed if the practice of radiotherapy is only permitted to such qualified doctors as have undergone the necessary specialised training. In this connection, grave abuses still prevail in many countries, but a settlement of this question by general regulation is hardly practicable; in most cases, indeed, it is left to the representative bodies of the medical profession to determine what conditions must be satisfied by a radiological specialist.

In Germany, proposals on the subject have been drafted by the German Röntgen-gesellschaft, with the object of instituting general supervision of X-ray establishments by the health inspection authorities. These proposals stipulate that the use of Roentgen rays in all branches of medicine should only be permitted to X-ray specialists. By X-ray specialists is meant qualified doctors who can show that they have undergone three years' training under the direction of a recognised medical X-ray specialist. A twelve months' course would be required for training in particular branches of X-ray application and a six months' course for training in a narrowly circumscribed field of specialist work. Supervision would be exercised by the competent medical authorities. Recently, in an agreement concluded between the German Medical Association and the Federation of Sick Funds, it has been stipulated that any doctor using X-rays must bring evidence before a Commission that he has had suitable training in the whole branch or in the special branch of roentgenology in which he is working.

Another problem which has frequently been discussed (by HOLZKNECHT among others) but not yet solved, is the training of the medical student with a view to the

¹ E. H. MÜLLER, *Fortschritte Röntgenstr.*, 42, 657, 1930.

subsequent professional use of rays. Nowadays, there is probably no single medical man who does not, in some way or the other, have to deal with X-rays in his practice; but it happens only too frequently that he lacks the fundamental knowledge necessary for a proper understanding, not having acquired it in his student days. Lectures on the subject are, it is true, given at many universities, but experience shows that they are but poorly attended by medical students. The reason is simple, the medical student has already so much to do in his compulsory subjects that, only in the rarest cases does he feel any inclination to burden himself with further knowledge, the need for which is only realised later on. The references to the use of radiation, which usually occur as mere incidental allusions, in the medical lectures are generally but imperfectly apprehended, since the fundamental facts of roentgenology cannot be conveyed in this way, but must be assumed to be known. It is hence essentially desirable that the medical schools should give lectures and practical training in general radiology, and that this should be included in the examination subjects.

Once the foundations have thus been laid for a proper understanding of the action of short-wave rays, the dangers attaching to their employment and the precautionary measures to be taken, there will be an end of those cases — now so frequent and so widely feared — of incurable burns being inflicted at screening examinations through overstepping of the permissible dose. How often do we not find doctors who give therapeutic radiation, though incapable of carrying out a dose measurement themselves? There are also numerous instances in which radiation establishments, even in the larger hospitals, have the dose determined once and for all by a technical expert and then plunge forthwith into radiation on the basis of this one measurement. This shows a lack of understanding which can only be remedied by thorough training during medical studies.

This question of training in medical radiology was the subject of numerous reports to the Second International Congress of Radiology at Stockholm in 1928. No less than twenty-three countries took part in the discussion. The addresses given by their representatives have already been published as Supplementum IV of the *Acta Radiologica*, Stockholm, 1930, under the heading: "Teaching and Training in Medical Radiology". The general conclusion to be drawn is that, whilst the desire is everywhere felt to give the medical student a certain grounding in radiology as a *vade-mecum* in his practical work, so far the efforts made to that end have had but a very slight measure of success.

One of the countries which has advanced farthest in this direction would seem to be Sweden¹ where, since 1928, compulsory general courses of 20 hours' study in X-ray diagnosis have been given to candidates for medical degrees by a regular professor of medical radiology. The object of this compulsory course is to introduce students to the science of the structure of the human body as it appears under X-ray examination. Instruction is given in the form of lectures with lantern-slide and X-ray photograph demonstrations. No examination is held. In addition to this, optional post-graduate courses are given, with the object of conveying a general idea of medical radiology and of affording facilities for some practical exercises in X-ray diagnosis and X-ray technique. Finally, special training in diagnosis or therapy is afforded by two or three years' probationer work as medical assistant at the X-ray institute of the university or of the large hospitals. The full course of radiology covering the whole of the ground usually takes from four to five years.

For the protection of the patient, proper training of assistants is also required. The latter may not undertake medical examinations, make diagnoses, draw up

¹ FORSELL, *Acta Radiologica*, Supplement IV, 145, 1930.

radiation charts, determine the dose, etc.; this is solely the business of the qualified doctor and radiologist; the assistants must, however, have a general idea of the structure of the human body, they must master the physical basis of dose measurement, they must be able to compute the dose for a particular case and must have experience in the controlling and adjusting of the various apparatus. Only if they have undergone adequate preliminary training, will they be able to give valuable assistance to the doctor and possibly safeguard the patient against danger in certain cases.

The extensive training thus required can clearly be provided only in large establishments, such as universities for example. In Germany, suitable courses are given at approved institutes, which provide for eighteen months' practical and theoretical study, on the conclusion of which an examination is held under State supervision; there follows six months' practical work, after which the State diploma is granted. The standards set at the examination are extremely high; it is hence all the more necessary that the roentgenologist should himself be adequately trained in order that he may be in a position to supervise the work of the assistants.

5. Dosage Questions.

The most essential safeguard for the patient lies in correctly performed accurate dosage, which should extend also to the diagnostic use of rays. Owing to the introduction of the international unit, dose measurement has been placed on a very much sounder footing in recent years, although it must not be overlooked that the choice of an ionisation unit as a basis has introduced a number of difficulties into the problem.

The mode of expression used in r unit dose specifications lacks that direct appeal to sense perception which has made the skin unit dose so widely popular; r unit dosage also lacks that natural upper limit which is set to the skin unit dose by the capacity of the skin. Owing to the realisation of this fact, demands have recently been made (1930, Congress of the German Röntgengesellschaft) for a dose unit, apart from the r unit, which will be more readily understandable by doctors than a mere numerical value. If the advocates of this measure proposed the term "tolerance dose"¹ this really amounts to nothing more than what has previously been termed the skin unit dose; for, in the course of years, the latter term has lost its original meaning as a strictly defined amount of radiation, and has only retained its biological meaning as the limit of tolerance of the normal human skin. When expressed in r units, this limit is known to be variable and changes with the intensity of the radiation (biological additional dose, time factor), so that, as the intensity is reduced and as the period over which administration extends is prolonged, increasing r values correspond to the skin unit dose for one and the same effect.

A further complication arises out of the fact that, at the present moment, it must be regarded as questionable, to say the least, whether the dose giving a particular biological reaction corresponds to one and the same value in r units with different qualities of radiation. The underlying idea in the introduction of the ionisation unit as the basis of dose measurement was that, the mean atomic number of the tissue substances on the one hand and of the air on the other being practically identical, the absorption of rays, and thereby the effect, would be likely to vary in the same way when the quality of the rays changed. In other words, when the dose was measured in r units, the effect would be independent of the quality of the radiation. Apart from

¹ The expression "tolerance dose" is, as a matter of fact, already used to indicate a dose which can be absorbed indefinitely without injury.

the fact that, even theoretically, the mass unit absorption of air and tissue is not exactly the same and that the great difference in density must also be borne in mind, practical experience does not seem to bear out this view. For instance, in skin therapy, 600 *r* of primary radiation, which has been recognised as equivalent to the skin unit dose for purposes of deep therapy with medium qualities of radiation, is not commonly used. On the other hand, experience has shown that very hard Roentgen rays can be used in far higher *r* unit doses; and, where radium gamma rays are concerned, 500 mg.-element-hours at a distance of 1 cm. is almost universally regarded as equivalent to the skin unit dose (e.g., FRIEDRICH, MALLET and COLIEZ, GAUSS, WINTZ, GLASSER). Converted into terms of *r* units, this, however, works out at 2,000 *r* units, if the time factor is allowed for. On the other hand, attempts have, it is true, been made to prove by experiment that the same dose is necessary to produce a particular biological reaction whatever the quality of the rays; but these experiments have usually been performed only with small skin fields or small biological objects; it therefore looks as though the additional scattered radiation might be a factor of considerable importance.

These questions will doubtless be cleared up in the course of time; it would be desirable, however, that a decision be hastened by systematic enquiries carried on under a central authority.

A certain amount of confusion and difficulty in coming to a mutual understanding about dosage has, however, been caused by the introduction of the *r* unit, owing to the fact that the skin unit dose has been brought into relation with the corresponding output of (primary) radiation; thus in deep therapy radiation of medium quality, one skin unit dose = 600 *r*. The skin unit dose comprises, however, the additional scattered radiation for a specified size of field (6 × 8 cm.), so that the total amount of radiation which takes effect on the surface of the skin is really 800 *r*. Especially where the dose is measured with a dose-recording instrument (Hammer dosimeter, Mekapion) this frequently leads to underdosing.

Another controversial point is that of the unit of measurement or quality of radiation and homogeneity of radiation. The immediately intelligible unit of measurement for quality of radiation, which is indispensable to the practitioner, is the deep dose percentage, whilst more recently the half-value layer in copper or aluminium has been advocated. It would take us too far to go into the changes of quality which occur in the radiation, when the usual method of determining the half-value layer is adopted. Similarly, the ratio of two successive half-value layers, which has been proposed as a measure of homogeneity, is entirely unsuitable owing to the changes of quality involved.

All these questions might be suitably investigated by a central authority.

In any case, the introduction of an international dose unit has meant a considerable advance towards a general standardisation of dosage, and has thus brought the manifold problems of disease nearer a solution; we must, however, strive to ensure that every radiologist is compelled to employ the unit dosage. Very little has, however, been done as yet in this direction. Thus, in an agreement recently concluded between the German Medical Association (Hartmannbund) and the Federation of Sick Funds, the following passage occurs:

“Every deep therapy installation should have adequate measuring appliances which operate either on the ionisation or on the fluorescence principle. Sabouraud-Noiré dosage is out of the question in deep therapy.”

It is not enough, however, for a suitable measuring instrument to be available; it must also be used, and, above all, it must be reliably calibrated. This calibration, like the adjustment of balances, etc., must be regularly checked. For this purpose the

various countries have set up standard departments which are provided with calibrated and regularly verified instruments by a central authority, such, for instance, as the Physikalisch Technische Reichsanstalt in Germany.

6. Dosage in X-Ray Diagnosis.

In medical X-ray diagnosis, conscientious dosing is also absolutely essential, as already mentioned. The Roentgenologist must know how long he can prolong a screening examination, and how many photographs he may take without risk of injury to the patient. For this reason, time measurement is especially important in screening examinations¹. Experience shows that most of the burns sustained through the diagnostic use for X-rays are inflicted when the zest of observation leads inexperienced examiners to exceed the proper limit of time. The time-recording of an automatic watch shows, moreover, how quickly time may pass on occasions even for an experienced Roentgenologist when engaged in X-ray examinations. A time check is hence, in my opinion, absolutely essential. Regular dose measurement, properly so called, can, however, generally be dispensed with, since the conditions of radiation in screening examinations vary but little; instead of this, the dose specifications which occur in plenty in the literature on the subject can be taken as a basis. The time equivalent of these doses must be worked out subject to all the necessary precautions. The points to be borne in mind, in this connection, are: distance, filter and maximum allowable dose.

The patient should not be placed at less than a certain normal distance from the Roentgen tube. In the various provisions and proposals, 24-40 cm. is specified; 35 cm. is probably the current distance. By some mechanical means (e.g., by a wooden partition permeable to radiation, a frame covered with sail-cloth, or the like) provision must be made to ensure that the distance is not reduced below normal. By way of a filter for the screening of the softest components of the rays, 0.5 mm. of Al., which should be a fixture, is almost universally used. The German regulations further strongly recommend the use of an aluminium supplementary filter of not less than 1 mm. thickness in screen examinations with higher voltages, such as stomach and intestine examinations.

Finally, the determination of a maximum dose is a highly important point. It must be remembered that not only must injuries be avoided in screening examinations, but that, so far as possible, no cosmetic ill-effects must be caused. Consequently, the basic dose must not be the full skin unit dose, but merely a fraction thereof. If the skin unit dose is expressed in terms of r units, it must further be considered that the number of r units which is equivalent to a skin unit dose in medico-diagnostic radiation is, to say the least, uncertain as yet (see above). Consequently, in order to exclude every possibility of injury, about 100 r may be taken as the maximum dose. Under ordinary conditions this entails very short exposures.

On this subject, a great deal has been published. The German regulations recommend the use of the measurements taken by SAUPE² and by BRAUN, HASE and KÜSTNER³. The latter give, for instance, for a lung examination with 70 kv., 4 ma., 0.5 mm. Al. and 35 cm. target-skin distance, about 7 minutes, for a stomach examination, with a front diaphragm using 100 kv., 6 ma., 0.5 mm. Al. and 35 cm. target-skin distance, about 3 minutes, a time of exposure which is no doubt frequently exceeded in practice. In the latter case, the use of a thicker filter is strongly to be recommended

¹ E. H. MÜLLER, *Fortschritte Röntgenstr.*, 42, 657, 1930.

² *Fortschritte Röntgenstr.*, 37, 536, 1928.

³ *Ibid.*, 38, 385, 1928.

as already mentioned, since only a very small proportion of the softest components reach the fluorescent screen through the body. When a 2 mm. Al. filter is used, the permissible exposure may be increased to about 5 minutes. Such specifications regarding length of exposure can, of course, only possess a limited validity, seeing that the efficiency of ray output may vary considerably with different tubes and, in particular, that present practice in regard to the measurement of voltage still leaves much to be desired. A recommendation that can be more unhesitatingly and decisively made is that every single set of apparatus should be tested for dosage under the exact conditions of operation.

It is very important that the roentgenologist should not begin the examination until his eyes have thoroughly adjusted themselves to the darkness, and, further, that he should procure exact information as to whether, for any reason, such as previous X-ray examinations, sunburn, disease or the like, increased radio-sensitivity has to be allowed for.

The international regulations sum up all these various points in the statement that screening examinations should be conducted as rapidly as possible with minimum intensities and apertures. In my opinion these general directions require to be considerably supplemented.

In diagnostic X-ray photography of the human body, the conditions are generally more favourable than in screening examinations. The intensities used are commonly very high, it is true, but we have only to reckon with very short exposures, so that the total amount of radiation is small. Thus, for instance, very many lung photographs can be taken without risk to the patient; circumstances arise, however, in which the roentgenologist must carefully reflect whether he may take a further photograph; and this mostly occurs in those very cases of difficult photography which do not always yield a satisfactory result on the first attempt.

In gynaecological diagnosis, consideration must be given to the high radio-sensitivity of the ovaries; by way of upper limit of the dose delivered at the ovaries, I take 5 per cent of the skin unit dose ¹.

The skin load is particularly great where use is made of Raster diaphragms (BUCKY), which are designed to reduce the scattered radiation between the patient and the plate; in such a case, where lateral photographs of the lumbar region of the spine are taken, only two exposures are permissible.

To sum up, it may be said that greater care in the protection of the patient is required in the medico-diagnostic use of roentgen rays, and that a proper understanding of the dangers involved is indispensable for their avoidance.

7. Protective Measures in the Use of Gamma Rays, Corpuscular Radiation and Ultra-Violet Light.

When gamma rays are used, care must be taken, in the very first place, to ensure that only gamma rays are actually being administered — that is to say, that the filtering of the preparation is sufficiently powerful to provide practically complete absorption of the beta rays. This can only be effected with filters of 0.5 to 1 mm. thickness of the metals with very high atomic numbers, the most frequently used being platinum, gold or even silver. The thickness of the filter has much less influence on the intensity of radiation with gamma rays than with X-rays, since the above-mentioned metals only absorb about 1 per cent of the former per 0.1 mm. thickness of filter.

¹ *Fortschritte Röntgenstr.*, Volume 35, Congress edition, page 54, 1927.

The rays absorbed by the filters themselves excite secondary fluorescent (Roentgen) radiation, which is considerably softer than the gamma rays. In order to cut this off, an outer supplementary filter of about 2 mm. of brass is commonly used. In order, finally, to render harmless the fluorescent radiation engendered in the brass, the radiation may be further made to pass through a layer of rubber. The thickness of the rubber casing provides, at the same time, a means whereby the source of radiation can be set at a specified distance from the surface of the tissue to be radiated.

From what has been said above, it will have been seen that this distance is an essential factor in determining the surface dose, since gamma rays are only absorbed to a very small extent in the tissue and since distance is the main factor of attenuation in the close radiation with small preparations which is most frequently used. In view, however, of the short distances involved, the spatial extension of the source of radiation also plays a part, so that the law of inverse squares does not operate in this case, the reduction depending on the shape and extension of the preparation. This is especially true when a number of small sources of radiation are brought together in applicators.

Dose measurement in the strict sense of the term is not usually carried out in treatment with radio-active preparations; it may, moreover, be dispensed with once the intensity of radiation has been sufficiently accurately determined from the Radium element contents of the preparation, especially as the thickness of the filter is only of secondary importance. It applies, therefore, more especially to normal radium salt preparations. The unit of measurement commonly employed is the milligramme-element-hour or the number of transformed millicuries. As already mentioned, the maximum dose is usually set at 500 mg.-element-hours, with a well-filtered preparation at a distance of 1 cm. from the skin. The strength of the preparation also affects the necessary and permissible time of radiation, and this must be allowed for by means of a suitable time factor.

When very strong preparations are used, as in certain institutes, special measures must be taken to confine the radiation to the body area to be treated.

Beta rays are hardly ever used in medicine except in combination with gamma rays. The containers, in this case, are mostly thin metal and glass capillary tubes, which are loaded with radio-active salt or emanation and implanted into the tumour. Since, at equal energy values, the biological effect of beta rays may be estimated at 100 times that of gamma rays, whereas the depth of penetration is but very small, dosage becomes extremely difficult and is, even now, in a wholly empirical stage. These difficulties are further complicated by the comparatively rapid breaking down of the emanation.

Cathode rays, which are similar in nature to beta rays, and are nowadays produced in considerable quantities are, so far, not being administered to human beings. Here again there arise difficulties of dosage, since account must be taken of the simultaneously engendered Roentgen rays.

Alpha rays, which act about 100 times as powerfully as beta rays, but are absorbed in extremely thin layers, are not used for radiation purposes.

A very widespread form of irradiation is that of ultra-violet light, which is administered principally by quartz mercury lamps (artificial sunlight) and electric arc lamps with carbon, wolfram and other electrodes. The English regulations contain a certain number of provisions on this point. Special protection from radiation is required only for the eyes; they must be protected by goggles which do not allow shorter wave radiation than 3,800 Å.U. to pass through ; this must be spectroscopically tested. The dangers of wrong dosing are not as great as in the case of Roentgen and gamma rays; mercury lamps should, however, also be tested for ray output. Up to the present, no practical unit has been devised for this purpose. A point to be specially

remembered is that the ray output drops at first after the lamp is switched on, that it subsequently increases again and only reaches a constant value after 10-15 minutes. The radiation of patients should only begin after this time has elapsed.

To sum up, it may be said that the administration to human beings of other kinds of radiation as well as of X-rays requires special measures of protection for the patient, measures which relate mainly to dosage. Here again, apart from experience, an acquaintance with the principles of radiology is essential in order to avoid injury and

**C. TABULAR SURVEY OF THE REGULATIONS ISSUED UP TO THE PRESENT IN
VARIOUS COUNTRIES.**

1. Medical X-ray diagnosis :

- (a) Protection of the doctor ;**
- (b) Protection of the establishment staff ;**
- (c) Protection of the patient.**

2. Medical X-ray therapy. — Protection of the Establishment Staff.

1. MEDICAL X-RAY DIAGNOSIS — (a) PROTECTION OF DOCTOR.

	Tube holder	Tube diaphragm	Fluorescent screen	Protection from scattered radiation	Gloves	Apron	Goggles	Observations
<i>International Provisions</i>	Up to 75 kv. 1 ^{mm} Pb „ 100 kv. 1.5 ^{mm} Pb „ 125 kv. 2 ^{mm} Pb	—	Protective “surround” of the same protective value as the tube holder	By adequate arrangements	0.5 mm.	0.5 mm.	—	—
Austria	At least 2 mm. Pb	—	2 mm. Pb	—	To be tested for lead equivalence		—	—
Czechoslovakia	At least 1.8 mm. Pb	At least 2 mm. Pb	At least 1.8 mm. Pb	Protective curtain of 1.8 mm. Pb; if not protective “pew” (Schutzkanzel)	0.3 mm.	0.5 mm.	0.5 mm.	Adjacent rooms at least 2 mm. Pb.
Denmark	2 mm. Pb	2 mm. Pb	At least 1.8 mm. Pb	At least 1 mm. Pb laterally and 2/3 mm. Pb	At least 0.5 mm. Pb	At least 2/3 mm. Pb	—	With voltages up to 75 kv. the standards of the regulations may be lowered.
England	See International Provisions.							
Germany	Up to 75 kv. 1 ^{mm} Pb „ 125 kv. 1.5 ^{mm} Pb	Same as protection of tube	Up to 75 kv. at least 1 mm. Pb Up to 125 kv. at least 2 mm. Pb	At least 1 mm. Pb	At least 0.5 mm. Pb for palpat. 0.3 mm.	0.5 mm. Pb	—	Diaphragm filtering to catch all primary radiation.
Greece	At least 1.5 ^{mm} Pb	—	3 mm. lead glass	At least 2 mm. Pb	0.5 mm. Pb	2 mm. lead rubber	Glass	—
Hungary	3 mm.	—	1.8 mm.	Lead rubber projections of 1.8 mm.	0.5 mm.	1 mm.	—	—
Russia	4 mm. Pb	—	1 mm. Pb 30 × 40 cm.	Projective “pew” with 3 mm. Pb	Compulsory lead equivalence not stated		Or headmask	—
Sweden	1.5 mm. Pb	2 mm. Pb	At least 1.5 mm.	At least 2 mm. Pb wall	At least 0.5 mm. Pb	At least 1 mm. Pb	—	—
Switzerland	2 mm. Pb	3 mm.	2 mm.	Lead rubber plates; if not protective “pew”	0.5 mm.	0.5 mm.	—	Inside lining of gloves for protect. from secondary rays recommended
Madrid	5-6 mm. Pb	—	—	—	—	—	—	—
<i>Proposals.</i>	Protective value to be determined according to voltage, tube current, and distance	Same as tube protection	Protective value same as for tube holder	Cover of patient with 1 mm. lead equivalent	0.5 mm. Pb equivalent	1 mm. Pb equivalent	—	—

1. MEDICAL X-RAY DIAGNOSIS — (b) PROTECTION OF THE ESTABLISHMENT STAFF.

	Operator's position	Cabin	Lead Glass window	Valve tube	Adjacent rooms, walls, floor, ceiling
<i>International Provisions</i>	Protective wall of at least 1 mm. Pb Even slight fluorescence of the screen must not be discernible	—	Same value as the wall	—	Protection according to circumstances, if the protection of the tube falls short of the values given in the provisions.
Austria (Schönfeld)	Skin erythema dose only to be reached in 10,000 hours	Skinerythema dose only to be reached in 10,000 hours	—	Provisions concerning protection from radiation to be applied, <i>mutatis mutandis</i>	Skin erythema dose only to be reached in 10,000 hours.
Czechoslovakia	Protective wall at least 1.5 mm. Pb.	—	—	At least 0.1 mm. Pb	2 mm. if necessary.
Denmark	Protective wall at least 2 mm. Pb 2 × 2 m. as far as possible from the tube	—	—	—	Total protective value 2 mm. Pb.
England	See International Provisions.				
Germany	Protective wall at least 1 mm. Pb. Distance at least 1.5 m. as close as possible to wall of room	—	—	Indications concerning heating of filament to be complied with	<i>Photographs</i> : Primary radiation to be stopped by 2 mm. Pb <i>Screening examinations</i> : 0.5 mm. Pb
Greece	Protective wall : 2 mm. Pb in the form of a cabin	<i>Photographs</i> : at least 2 mm.	2 mm. Pb	—	At least 1.5 mm. Pb if walls do not consist of masonry at least 10 cm. thick.
Hungary	Protective wall : 2 mm. Pb 2 × 2 m.	Lead cabin (Ratkoczi) if occasion arises	—	—	No protection necessary.
Russia	Protective wall : of at least 4 mm. Pb. 2 × 1.5 mm.	3 mm. Pb if therapeutic work is simultaneously carried on	20 mm. lead glass	—	—
Sweden	Protective cabin : 2 mm. Pb	At least 2 mm. Pb	2 mm. Pb	—	Total protection at least 1.5 mm. Pb
Switzerland	Protective wall : 2 mm.	—	—	—	—
Madrid	—	—	—	—	—
<i>Proposals</i>	<i>If protection of tube is :</i> (1) Adequate : 1 mm. lead wall in front of control-table ; (2) Inadequate : separate rooms	—	Lead value same as that of wall	Must not emit X-rays, otherwise must be protected like X-Ray tube	Protective value to be determined according to : Voltage, tube current, distance and period during which operated.

1. MEDICAL X-RAY DIAGNOSIS — (c) PROTECTION OF THE PATIENT.

	Filter	Focal distance from the patient	Partition	Dosage	Permissible number of	
					Photographs	Screening examinations
<i>International Provisions</i>	Safety device	—	—	Screening examinations to be conducted as rapidly as possible with minimum intensities and apertures.		
Austria (Schönfeld)	Photographs : 0.5 mm. Al. Screening examinations : 1 mm. Al.	Not less than 24 cm.	—	Not more than 1 skin unit dose of photographic, radioscopic or therapeutic radiation in six weeks.		
Czechoslovakia .	1 mm. Al.	—	—	—	—	—
Denmark	Not less than 0.5 mm. Al.	—	—	Same as International Provisions		
England	See International	Provisions				
Germany	0.5 mm. Al. With high voltage : 1 mm. Al.	Not less than 35 cm.	At the fixed focal distance	Same as International Provisions		
Greece	0.5 mm. Al.	—	—	—	—	—
Hungary	0.5 mm. Al.	35 cm.	—	—	—	—
Russia	1 mm. Al.	—	—	—	—	—
Sweden	0.5 mm. Al.	—	—	—	—	—
Switzerland . .	0.5 mm. Al.	Not less than 40 cm.	Of the thickness of sail-cloth	(Watch for checking purposes.) Screening examinations to be as brief as possible. Records to be kept of screening examinations and photographs including unsatisfactory photographs. Warning against repeated photographs and screening examinations.		
Madrid	0.5 mm. Al.	—	—	—	—	—
<i>Proposals</i> . . .	Built in : 0.5 mm. Al. Supplementary filter up to 2 mm. Al. for photographs	35 cm.	At the fixed focal distance	To be checked by timing	To be determined by measurement.	

2. MEDICAL X-RAY THERAPY — PROTECTION OF THE ESTABLISHMENT STAFF.

2. MEDICAL X-RAY THERAPY. — PROTECTION

	Tube holder	Protective measures	
		With inadequately protected tubes	Against scattered radiation with adequately protected tubes
<i>International Provisions</i>	Up to 75 kv. 1 mm. Pb " 100 " 1.5 " " " 125 " 2 " " " 150 " 2.5 " " " 175 " 3 " " " 200 " 4 " " " 225 " 5 " "	Protection to be worked out according to circumstances	Protective wall of not less than 2 mm. Operator best stationed outside the X-ray room
Austria (Schönfeld)	Up to 150 kv. 3 mm. Pb Above 150 kv. 5 mm. Pb	The skin erythema dose must only be reached in 10,000 hours	
Czechoslovakia	Inadequately protected tube 2 mm. Pb. Completely protected tube : up to 125 kv. 2.5 mm. Pb " 165 " 3 " " " 220 " 4.5 " " Above 220 " 6 " "	Two rooms or cabin Up to 125 kv. 1 mm. Pb " 165 " 1.5 " " " 220 " 3 " " Above 220 " 4.5 " "	Underneath protection : up to 125 kv. 2.5 mm. " 165 " 3 " " " 220 " 4.5 " " Above 220 " 6 " " and protective belt of half thickness
Denmark . . .	Up to 130 kv. 2 mm. Pb	Cabin of 4.5 mm. Pb	Protective wall of 4.5 mm. Pb. Covering of the patient 2 mm. Pb.
England	See International Provisions		
Germany	Up to 125 kv. 2 mm. Pb " 190 " 3 " " " 220 " 5 " "	Up to 125 kv. 2 mm. lead equivalent Above 125 kv. separate rooms Wall : up to 125 kv. 2 mm. Pb " 190 " 3 " " " 220 " 4.5 " "	Covering of patient ; laterally : up to 125 kv. 0.5 mm. Pb " 190 " 1 " " " 220 " 1.5 " " Underneath patient : up to 125 kv. 2 mm. Pb " 190 " 3 " " " 220 " 5 " "
Greece	According to tube current ; not less than 2 mm.	—	—
Hungary		Partition 5 mm. Pb.	Wall of 4 mm. Pb 2 mm. Pb. under patient
Russia	Not less than 4 mm.	—	Separate rooms. Partition : up to 150 kv. 5 mm. above 150 " 6 "
Sweden	Not less than 2 mm. Pb	—	—
Switzerland . .	Not less than 4 mm.	Separation in space. Protective cabin with direct air supply	
Madrid	5-6 mm. Pb	—	2 mm. Pb under patient
<i>Proposals</i>	Protective value to be determined according to the voltage, tube current and distance	Separate rooms. Protective wall to be determined according to the voltage, tube current and distance	2 mm. lead wall in front of control table ; covering of patient with 1-2 mm. lead equivalent ; 3 mm. lead equivalent under patient

OF THE ESTABLISHMENT STAFF.

Lead glass windows	Distance from the tubes	Valve tubes	Adjacent rooms, floor, ceiling, walls	Observations
Lead value equivalent to that of screen or wall	Operator best stationed outside the X-ray room	-	Thickness of the lead equivalent depends on circumstances	Safeguards in regard to filtering required
-	-	Protective regulations concerning radiation to be applied, <i>mutatis mutandis</i>	Protection adequate if skin erythema dose is only reached after 10,000 hours	2 dosimeters prescribed. Asbestos filter, safety measures in regard to filtering.
Same lead equivalent as walls	-	0.2 mm. Pb	Up to 125 kv. 1 mm. " 165 " 1.5 " " 220 " 3 "	Masonry 50 cm. thick and concrete 25 cm. thick requires no special protection.
Protective value of the wall	-	-	Total protective value 4.5 mm. Pb	Safety measures in regard to filtering. Below 165 kv., 2 3 of protective values. Above 220 kv., 1.5 of protective values.
-	With inadequately protected tube : up to 125 kv. 1.5 m. above 190 " 2.0 m. With prot. tube : up to 125 kv. 1.5 m. above " " 2.0 m.	Indications governing heating of filament to be complied with	With inadequately protected tube : up to 125 kv. 2 mm. " 190 " 3 " " 220 " 4.5 "	Safety measures in regard to filtering recommended.
Same values as the walls	-	-	Not less than 3 mm. Pb	Dosimeter prescribed.
-	-	-	With an open tube holder 3 mm. Pb	-
20 mm. lead glass	-	-	Not less than 4 mm. Pb	-
Same lead equivalent as walls	-	-	At least 3 mm. Pb	Safety measures in regard to filtering. Dosimeter prescribed.
-	-	-	-	Dosimeter prescribed.
-	-	-	-	2 mm. Pb under the table or on floor.
Protective value equal to that of the wall	To be determined according to the voltage, tube current and protective value	Must not give off X-rays, otherwise must be protected like X-ray tubes	To be determined according to voltage, tube current and distance	Safety measures in regard to filtering. Calibrated dosimeter.

Chapter II.

PROTECTIVE MEASURES AGAINST ELECTRICAL ACCIDENTS IN X-RAY AND SIMILAR ESTABLISHMENTS.

1. *The Dangers of Current and Voltage.*

Apart from short-wave rays, the electric current is an important source of danger in X-ray and similar establishments. Extensive measures of protection have therefore been introduced to provide against this danger. The aspect of the matter usually considered, in this connection, is that of protection against high voltages, but it would be more correct to take the electric current as a basis since, apart from electric shocks, the intensity of the current in the human body determines the extent of the danger involved; high frequency currents are an exception.

The statements contained in the literature on the subject as to the amount of electric current which must be regarded as dangerous are widely divergent. According to BORUTTAU,¹ intensities of 20 ma. must be regarded as dangerous, and intensities of 100 ma. must be regarded as involving deadly danger; nevertheless, much higher intensities are not necessarily fatal, as we know from reports on execution by electrocution.

The voltage which is necessary to produce such intensities of current in the human body depends upon the resistance of the body, and this is liable to extraordinary variations according to external conditions.

If the person concerned is wearing leather footgear and has dry hands, the resistance (according to PERUSSIA) goes up to 50,000 ohms; with damp hands and feet it drops very considerably. If the extremities are immersed in water, according to NIXDORF and BRANDENBURG², the resistance to direct current is 1,000 to 3,000 ohms, whereas with alternating current it is 200 to 300 ohms. It follows from this, that in certain circumstances, dangerous intensities may be produced in the body even with very low voltages, such as are carried by electric light wires, for example. Cases have been known, for instance, in which persons have been killed through touching a defective light switch whilst in their bath. Even tensions as low as 40 volts can, according to PIETRUSKY,³ be fatal.

The behaviour of the tension in time also has an important bearing on the danger involved. Alternating current is far more dangerous than continuous direct current of the same voltage, more especially in the currently employed range of frequencies, for very high frequency currents, as is known, are not dangerous.

2. *The Dangers of X-Ray Apparatus.*

If Roentgen apparatus is considered in the light of the above, it will be found that the voltage operating in the Roentgen tube is always sufficiently high to produce deadly

¹ Quoted by BEHNKEN, *Hdb. d. Physik*, published by Geiger and Scheel, Volume 17, page 197, Berlin, 1928.

² Quoted by BEHNKEN. *Op. cit.*

³ *Med. Klinik*, page 339, 1930.

intensities of current in the human organism, for the voltages normally applied range from 8,000 to 250,000 volts. It must be borne in mind, however, that such intensities of current can only occur if the capacity of the apparatus is sufficient for the purpose. With many sets of Roentgen apparatus this is not the case, so that the danger of such apparatus depends directly on its capacity. On the same grounds, the high-power transformer apparatus of the kind now frequently used in medicine for X-ray diagnostic purposes is deadly dangerous, since it is capable of giving off currents of more than 100 ma. With therapeutic apparatus, on the contrary, the danger is much smaller, since they are usually not capable of any very great output. The dangers of therapeutic apparatus vary, however, according to design. The most harmless is the induction apparatus, since, when there is an appreciable outflow of current, the tension completely collapses. The transformer therapeutic apparatus with and without rectifiers, on the other hand, is far more dangerous, whereas the so-called constant potential sets with condensers approximate more to the induction coil sets.

A certain measure of automatic protection is afforded by apparatus working at high voltages owing to the fact that, on being approached, those parts which conduct the high tension make their presence felt through electric influence, since they cause hair to stand on end and clothes to lie flat against the skin, and since, finally, a spark will jump, which usually has no ill-effects. With apparatus operating at medium tensions from 8 to 80 kv., on the other hand, no such warning is given before actual contact occurs, since the sparking distance and the range of influence action are only small in this case. Hence it is that most of the accidents recorded occur with diagnostic apparatus.

A further point which has an important bearing on danger is the earthing of the apparatus. Technically speaking, such earthing is desirable at a point of the wiring where the voltage is normally nil, since displacements of potential are thereby averted ; from a protective standpoint, however, such earthing is wholly to be condemned. Indeed, if a conductor is touched in apparatus whose high tension circuit is well insulated from the earth in all parts, only a very brief discharge, which may be accompanied by a spark, will pass through the body, and this usually does no harm. If, however, the high tension circuit is earthed at one point, and contact is established at an unfavourable spot, the transformer is short-circuited through the body and the earth, so that a current corresponding to the capacity of the apparatus flows through the body. With the modern constant potential apparatus — which is specially feared owing to the occasional loudly detonating condenser discharges — the danger to life is, in my opinion, smaller than with simple transformer apparatus. This can be explained by the fact that, when there is a considerable outflow of current, here again the tension completely collapses ; thus with a " stabilivolt " apparatus with an earthed mid-point — that is to say, under specially unfavourable conditions — unipolar measurements towards the earth did not yield intensities beyond 10 ma. Animal experiments seem to confirm this, but it stands to reason that protective measures must also be taken with this apparatus, seeing that the shock effect of the jumping spark may in itself be dangerous.

The kind of floor covering also has a considerable influence on the intensity of current occurring when contact is established. Such materials as wood, cork, linoleum and rubber may be favourably considered, whereas stone, tiling or metal floor covering must be avoided. A wooden or similar floor certainly provides protection only against medium voltages but is particularly valuable for our purposes, owing to the highly dangerous character of that type of apparatus. The same applies to wall covering. Earthed metal pipes (water, gas, or heating) can also increase the danger and must be kept out of reach of the high tension.

3. *Protective Measures for the Primary Circuit.*

From what has been said, it will be seen that all X-ray apparatus may be more or less dangerous. Suitable protective measures must therefore be taken to ensure that current engineering standards for high-power equipment are applied so far as the primary circuit is concerned ; it must be borne in mind, in this connection, that, in induction coil sets, for example, the insulation must be tested for self-induction voltage which is considerably higher than the voltage of the mains. With the older type of apparatus, it still happens that regulating resistances and the like on the control table are entirely exposed and unprotected, whilst the protective metal casing of the control table is usually earthed. This may lead to very unpleasant electric shocks if the casing of the control table and the naked wire are simultaneously touched. Such installations are of course inadequate and unwarrantable.

4. *Protective Measures for the Secondary Circuit.*

The protective regulations for the secondary circuit must, on the other hand, be worked out *ad hoc*, since current engineering standards for high-powered apparatus are based upon quite different considerations. It would, for instance, be wholly contrary to those standards to place the Roentgen tube — which carries a high voltage — in immediate proximity (23 cm.) to a human being.

Whilst the international provisions only lay down a few general principles, more detailed regulations have been worked out in a number of countries, the most comprehensive being probably those issued by the German Röntgengesellschaft. Similar instructions have been given in the regulations of the Vienna Elektrotechnische Verein, which were drawn up in direct consultation with the standards department of the German Röntgengesellschaft.

The most essential requirement is that parts conducting high voltage should not be freely accessible. It is best for all these parts to be surrounded on all sides with earthed metallic casings, but this cannot be achieved in all cases. There are only small movable or portable apparatus for medical-diagnostic apparatus that satisfy these requirements, which means that the transformer, the Roentgen tube and the leads are completely surrounded with an earthed metal covering.

In the larger plants, the Roentgen apparatus is placed in a separate room and the high voltage is led off from this into the treatment room either through the wall or through the ceiling.* The apparatus room should not be immediately accessible. Some of the regulations recommend, in this connection, a device whereby the voltage in the high voltage generator is deadened when the door is opened. I do not consider this practicable, since it may interfere with the operation of the apparatus and since the said apparatus should be accessible for supervision, even whilst operating. In order to permit of this, the regulations of the Vienna Elektrotechnische Verein require that an enclosed inspection passage at least 1.5 metre in breadth should be provided. In my opinion this is going too far. It should be sufficient for the room to be kept closed and warning notices to be affixed to the door. The main purpose of the above-mentioned arrangement is to protect any person who may be engaged in repairing the apparatus from the risk of the high voltage being switched on unawares from the treatment room. An experienced fitter will, however, always safeguard himself by suitable measures (e.g., by taking out the safety fuses) against the switching on of the voltage from the control table.

From the apparatus room the high voltage conductors may then be taken into a metallic earthed casing which contains the X-ray tube and projects into the treatment room. This tube casing may be mounted in a laterally and vertically mobile cradle in the partition, such, for instance, as the S.R.V. gear of Messrs. Siemens-Reiniger-Veifa. Such equipment is, however, very expensive and somewhat clumsy.

Quite recently considerable improvements have been made in this connection, the Dutch firm of Philips having succeeded, by the use of compressed air, in producing a very small metallic earthed casing for Metalix tubes up to 200 kv., for the high voltage is, in this case, passed through wall ducts from the apparatus room to the treatment room, and the connecting leads are encased in earthed metal covers. In both cases complete protection from the high voltage is afforded in the treatment room, and, in the second, the Roentgen tube is also entirely mobile.

Another method also involves leading the high voltage conductors out of the apparatus room through wall or ceiling ducts ; but the high voltage conductors are not themselves encased in earthed metal coverings, the Roentgen tube being mounted in an earthed metal holder (e.g., Gaiffe oil tank) or in a voltage-proof holder of insulating material (e.g., Wintz gear). The mobility of the tube is very great in the latter case, but this method affords less protection from the high voltage than those previously described. The high voltage conductors must, in this case, be placed so high that they are not within direct reach of the hand.

In this connection, the German and Austrian regulations provide for a minimum height of 2.20 m. from the floor for voltages up to 75 kv., for 2.30 m. up to 130 kv. and for 2.50 m. up to 250 kv., whilst the Czechoslovak regulations lay down $205 + 2.5 \cdot \sqrt{\text{kv.}}$, a formula which yields practically the same height specifications. In my view, these minimum heights are not sufficient, especially for the lower voltages, which are particularly dangerous, as already explained ; a tall person can easily reach up to 2.20 metres with his hand. The Swiss regulations provide that, if the voltage does not exceed 200 kv., the conductors shall be placed at such a height that no part of the body may inadvertently be brought within 40 cm. of them : the conductors may consequently be placed within reach. On this point, the international provisions are to be preferred, since they stipulate for a uniform minimum height of 9 ft. (3 m.). A graded series of heights from 2.50 m. upwards might perhaps be even better.

At the present moment, there are still many X-ray installations in use, in which the apparatus stands in the treatment room itself and the Roentgen tube is mounted in an open protective container (lead glass bowl), from which the ends of the tube with the high voltage terminals protrude unprotected. In such a case it must be laid down that the apparatus should be surrounded with insulating material (wooden case) or with an earthed close-mesh metal grating, and that the high tension conductors, so far as they are fixed, should be laid at an adequate height. Open tube holders (except in induction coil sets, which are far less dangerous than transformer sets) should no longer be tolerated for therapeutic uses, since both high voltage poles can be simultaneously touched even by the patient. This is especially so when the tube is set at right angles to the longitudinal axis of the patient's body, as is required by the German regulations concerning protection from radiation, in order to avoid the direct radiation which emerges, with such a mounting, along the axis of the tube extensions.

With the modern ray-proof tubes which need no special protective container, this danger reappears, since both ends of the tube are simultaneously within reach of the patient's hands. The mounting of protective screens must therefore be prescribed, consisting either of earthed metal or, more simply, of Pertinax which is proof against perforation by discharge.

If the high voltage protection consists, not of earthed metal but of insulating material (Pertinax, rubber, wood), the latter must be able to withstand the so-called "sphere test" — that is to say, it must not be liable to be perforated by electric discharge when a sphere of 1 cm. diameter connected with the earth is placed against it for a full minute.

When open tube holders are used, transformer sets with earthing at one point of the secondary circuit are particularly dangerous, as already explained. The German regulations only permit the employment of such apparatus "if a device is fitted which switches off the high voltage in a sufficiently short time when parts conducting high voltage current are touched". A footnote to this passage adds: "Whether the cut-outs hitherto in use are able to switch off the current in a sufficiently short time has still to be determined by physiological tests". In my opinion, reliance should not be placed on such apparatus, but everything should rather be done to minimise the risk of contact. The only fitting which has given good technical results in this connection is the automatic overload circuit breaker, which is prescribed by most regulations, but does not afford absolute protection against accidents.

The earthing of the patient, which was formerly a common practice, is to be condemned, owing to the increased risk involved. At this point, it should be observed that, even where measuring apparatus is introduced into body cavities for dosage purposes, the patient is exposed to danger if the instrument is earthed; it is hence preferable to dispense with earthing in such a case, it being superfluous with a properly designed ionisation instrument. For the same reason, treatment tables for Roentgen therapy should be built of non-conducting material (wood), or should, at all events, be mounted on insulating legs. The connecting leads between the tube poles and the fixed high voltage conductors should, when not in use, be wound up on automatic cable drums fixed to the high voltage conductors, being drawn up sufficiently high to be out of direct reach from the floor. According to certain regulations the feed cable of a Roentgen tube should be connected up with a snap catch; this would, doubtless, prevent any unintentional disconnection, but such loose contacts should, in my view, be avoided in the high tension circuit, since they might lead to disturbances through high frequency phenomena; fixed clamp or screw terminals are decidedly preferable.

All high voltage conductors should be sufficiently stout (tubing) to prevent brush discharge; this applies also to the movable leads, which should therefore consist, for preference, of flexible metallic tubing. For the same reason edges should be avoided and corners should be rounded off with metal spheres.

As regards the laying of the conductors, it is usually stipulated that these should be kept at a distance equivalent to 1.1 mm. per kv. from adjacent metal parts; but the Czechoslovak regulations go further and provide for a distance of at least 1.2 mm. per kv., whilst the Austrian regulations require 1.3 mm. per kv. for voltages over 130 kv. The minimum distance from the patient must be 1.5 mm. per kv., which, with a voltage of 200 kv., would entail a focal distance of 30 cm., since the Roentgen tube itself must equally be regarded as a high tension conductor. I would recommend that these provisions be made somewhat less rigorous, seeing that the target-skin distance of 23 cm. which was mostly used in the past never to my knowledge caused any trouble, even with a voltage of 200 kv. With most of the modern protective mountings, the distance of 23 cm. can, it is true, no longer be used; with the latest slender ray-proof tubes, on the contrary, it can.

Special attention must be given to the design of the pedal controls such as are frequently used in diagnostic establishments. Special safeguards against inadvertent switching-on must be provided in this case.

Other safety devices are sound, and light signals which operate whilst the high voltage is in use, and, further, warning notices and the like.

All signalling apparatus, safety appliances, cable drums, earthing wires, etc., should be subject to frequent inspection. It would be desirable to provide that such supervision be carried out at regular intervals by specially empowered authorities.

Since, however, even in the best-equipped establishments, accidents may be caused at times by an unfortunate conjunction of circumstances, it is important that the whole of the employed staff should be trained in first aid for electrical accidents ; instructions on the subject should also be posted up in the working rooms. Similarly, all employees should be acquainted with the instructions for the operation of apparatus.

Chapter III.

HYGIENIC MEASURES IN RADIATION ESTABLISHMENTS.

A. FOR PERSONS EMPLOYED IN X-RAY AND SIMILAR ESTABLISHMENTS.

Apart from the injuries, burns and the like, which can only be caused by extreme incautiousness in the handling of Roentgen rays, etc., and which ought not to occur nowadays, there is a danger that persons constantly working in Roentgen establishments may gradually incur general injuries, consisting mainly of blood changes.

It is hence necessary, in the first place, to make the general external conditions as favourable as possible, in order to increase the powers of resistance of the body, and, secondly, to keep a constant check on the state of health of the staff by regular blood examinations.

1. *The Treatment Room.*

In the first place, the treatment rooms must be spacious and airy. Basements are to be avoided ; if only for the reason that the greater dampness of the air impairs insulation and thereby the efficiency of the X-ray apparatus ; moreover, when ionisation instruments are used for dosing, errors may occur through spontaneous discharge, if indeed the instruments do not completely fail to act.

For hygienic reasons, the use of small ray-proof cabins for the housing of the operator's controls are not to be recommended. Since the protective layer consists mostly of lead, lead vapours may be given off in such a confined space and may produce symptoms of poisoning. Every lead lining must therefore be proofed with a suitable coat of oil paint or the like, and the cabin must be well ventilated. For these reasons, as well as for those stated above, I consider it preferable for the control appliances to be placed in the radiation theatre itself ; adequate protection against radiation can always be secured by keeping them at a proper distance from the Roentgen tube and screening them with a simple protective lead wall.

There are yet other reasons why only spacious and airy rooms should be used. Owing to the effects of the high voltage, the air may be decomposed in such a way that nitrous fumes and ozone are produced which are not conducive to health and produce, moreover, a feeling of weariness. This decomposition of the air is caused more especially by open spark gaps such as occur in particularly large numbers in rotating rectifiers. Such machines must therefore be placed in a separate room or in a well-ventilated wooden housing. Open point-gap measuring instruments also decompose the air and may with advantage be replaced by sphere gaps. Furthermore, silent discharges, corona effects, such as occur at sharp corners and edges of thin conductors, must be avoided. The high voltage conductors must therefore be made of thick metal tubing (2 cm. diameter joined at corners by balls of at least 5 cm. diameter). The thin type of leads to the Roentgen tube which are most frequently used are also dangerous and must be replaced by thick rubber cables or by flexible metal tubing of about 2 cm. diameter. It is best, of course, for the treatment-room to be completely free of high voltage.

In order that deleterious fumes may be removed, good ventilation with a supply

of fresh air must be provided. Since the fumes are heavier than air, the most suitable method is to provide for a vacuum exhaust on the level of the floor.

The operation of mercury lamps (artificial sunshine) and open electric arc lamps also seriously vitiates the atmosphere ; here again provision for adequate ventilation should be made.

So far as possible, daylight and sunshine should have free access to treatment rooms. The darkening of the therapeutic radiation theatre is not necessary ; if in distant X-ray treatment, it is desired to ascertain by means of a fluorescent screen whether the cone of radiation covers the whole area of the irradiated field, this can easily be done in full daylight by the previously mentioned device of using a small fluorescent screen which is mounted at the end of a dark tube fitted with an eyepiece.

Both the floor and the walls of the radiation theatre must be smooth and easy to clean. Wood, with linoleum, for instance, is a suitable floor covering, since it is also conducive to protection from high voltage. Similar covering, or a coat of oil paint or the like, is also suitable for the walls ; light tints are most appropriate. For screening-examination rooms dark paint (red or green) is obviously to be preferred, but these rooms should not be kept completely dark.

The doctor and his staff of assistants must be protected from infection by special professional clothing, gloves and the like. In the case of screening examinations it is advisable to provide some protection for the examining doctor against the patient's expectoration, etc.

The international provisions specified 18° C. as a desirable temperature for the rooms ; I believe a somewhat higher temperature, say about 22° C. would be preferable, since the patient undresses in most cases for examination or treatment, and the assistants in the therapeutic installation frequently have to sit motionless for lengthy periods.

2. Hours of Work for Persons employed in Radiation Establishments.

The time allowed to the staff for purposes of recuperation must be measured in accordance with the heavy mental and physical strain involved by work in radiation establishments. An eight-hour day, which was taken, above, as a basis for regulations concerning protection from radiation, is probably the absolute maximum that could be contemplated. If work is carried on uninterruptedly for that length of time, the worker's power of concentration must finally be so reduced that the risks to the patient are increased. The international provisions and the regulations of various countries take the view that seven hours at the outside is permissible, whilst Russia even allows but four hours.

According to the international provisions, and according to the Russian regulations, the number of working days in the week should not be more than five, whilst the German regulations provide for 1-2 half-holidays in the week.

As regards annual holidays, the international provisions stipulate for at least one month, Russia two months and the German regulations four weeks.

It is important to make it a rule that persons doing full time in X-ray and similar establishments shall not be called upon for other hospital or similar duty and, in particular, that they shall not have to do night duty.

All employees should be subjected on appointment and at regular intervals thereafter, to careful blood examinations, in order that physical unsuitability may be quickly detected and a change of occupation recommended. I have found that, where the best possible protection is used, a seven- to eight-hour day, from one to two free afternoons per week, and four weeks' annual holiday is a satisfactory system ; the blood examination is made at the time of appointment and, thereafter, at intervals of two months, the findings being recorded on each occasion.

3. Hygienic Measures in Other Radiation Establishments.

Measures corresponding to the particulars given above should be taken in industrial establishments where X-ray apparatus and tubes are manufactured or used for examinations, etc.

As already mentioned — when protection from radiation was discussed — special arrangements should be made in places where work is carried on with radio-active substances. In the handling of radium salts and in the filling of emanation containers, rubber gloves must be used ; in the latter case, the air in the room must be continually renewed by exhausters. Recently cases have been reported in which female workers engaged in laying on luminous colours containing radium injured themselves by moistening the brush with their lips.

It sometimes happens with mercury lamps (artificial sunshine) that the mercury container bursts and splashes the mercury about ; a fitting should therefore be mounted to catch the mercury, since mercury poisoning may otherwise gradually occur. The same danger also arises with the type of burner in which the electrodes are not fused in and thus made airtight, but are merely cemented in ; here again the heat may cause the mercury to be expelled and to evaporate.

B. HYGIENIC MEASURES FOR THE PROTECTION OF THE PATIENT.

1. General Remarks.

The existing regulations also need to be supplemented in the matter of hygienic measures for the protection of the patient from injury.

The treatment beds for patients must always be covered with clean sheets. In X-ray therapy, special attention must be given to the cleanliness of the radiation “ cone ” and to the protective covering material. Compressor “ cones ” which (even in photography) come into direct contact with the skin must be of suitable, easily disinfected material, and be cleaned on each occasion after use. The lead plates which are used as covering round the edge of the field may, with advantage, be provided with linen covers, which should be regularly washed ; lead rubber covers should be constantly disinfected.

The preliminary treatment and after-treatment of patients subjected to therapeutic radiation may also be included among hygienic measures. For instance, the inunction of the radiated areas of skin, which, as experience has shown, may appreciably reduce the risk of injury, is of outstanding importance. In a general way, all patients undergoing X-ray treatment should be provided with a set of rules of conduct, calculated, if observed, to avert late injuries.

In diagnostic establishments as well, all objects with which the patient comes into direct contact should be made of suitable, easily disinfected, material and should be kept spotlessly clean. Such are : the wall in front of the X-ray tube against which the standing patient leans in screening examinations and X-ray photography, the radioscopy, or photography, table, the back of the fluorescent screen, rubber gloves or instruments used for palpation, the lid of the Roentgen cassette, the diaphragms for scattered rays, the compressor “ cone ”, etc.

As regards X-ray diagnosis, it would also be desirable to have regulations concerning the testing and use of opaque substances which must not be deleterious.

In the use for radio-active substances, too, the utmost cleanliness is required for the protection of the patient. This applies, for instance, to applicators, which come into

direct contact with the patient's skin ; but radium preparations themselves, and their filtering containers, which are introduced in certain cases into body cavities, must be sterilisable. It would be best if the preparations could be boiled as they are.

In radiation with open electric arc lamps, white-hot particles may be thrown off and injure the patient. Precautions must be taken against this as well as against injuries caused through the bursting of quartz burners.

2. Measures for the Avoidance of X-Ray Sickness.

At this point, a word may be said as to the measures required for the prevention of X-ray sickness, that unwelcome accompanying phenomenon of deep X-ray therapy, which is apparently due to a combination of several factors. The underlying causes may be the effects of the X-rays, or of the high-frequency oscillations produced by the high voltage, or the vitiation of the air by the high voltage.

The effects of the X-rays themselves can, of course, not be eliminated ; they should, however, be confined strictly to the area to be radiated. This is almost completely achieved, with the modern ray-proof tube holders for instance, and with the ray-proof tubes. Since they have been in use, cases of X-ray sickness have become much less frequent than they were when the old open tube cases were employed. It has been thought that the sickness should be ascribed to the more intense general radiation involved in the latter case. Endeavours must therefore be made, for the patient's sake as well, to fit the protective material to the X-ray tube itself.

The effects of the electric high voltage are due, *inter alia*, to the high frequency oscillations which are concurrently produced when the X-ray tube is in operation. It has been found that such electric fields are injurious to small animals, when they are sufficiently strong, and it may be assumed that they can also do damage to the human organism. If the high voltage conductors are properly laid, in accordance with the rules set forth above, or if, indeed, the treatment-room is completely free from high voltage, this factor must disappear.

Finally, the fact that the vitiation of the air through the production of ozone and nitrous fumes may have injurious effects on the weakened organism of the patient is enlightening. By suitable arrangements, such as have been discussed above, this factor, too, may be eliminated.

Experience has confirmed that, when all requisite measures in respect of protection from radiation, protection from high voltage, and ventilation, are taken, X-ray sickness becomes much less frequent and is limited thereafter to exceptional cases.

C. TABULAR SURVEY OF THE REGULATIONS HITHERTO PUBLISHED IN VARIOUS COUNTRIES.

HYGIENIC MEASURES IN RADIATION ESTABLISHMENTS

	Hours of work	Holidays	Medical examination and blood-composition test	Other work	Protection from infection	Observations
International provisions	Maximum of 7 hours 5 days	At least one month per annum	—	Night duty prohibited	—	Holidays to be spent so far as possible in the open air
Austria . . . (Schönfeld)	—	—	—	—	Objects coming into direct contact with patient to be capable of easy disinfection	—
Czechoslovakia	—	—	—	—	—	—
Denmark. . .	—	—	—	—	—	—
England . . .	See international provisions					
Germany. . .	Maximum of 7 hours, free Sunday and 2 half-holidays recommended	4 weeks per annum	At least once a year. Findings to be recorded	Prohibited	—	Examination before appointment
Greece. . . .	Maximum of 8 hours, with break of 2 hours	At least 6 weeks. Aft. 5 years at least 2 months	Regularly twice a year. Examination of urine	—	—	Desirable that employees should not work on Sundays and holidays
Hungary. . . .	Not more than 6 hours at a stretch	4 weeks in summer, one week in winter	Once a year	—	—	One free day per week
Russia	4 hours	Two three-weekly periods per annum	Every six months	—	—	For female workers, 8 weeks, maternity leave before and after confinement
Sweden	Maximum of 8 hours, with break of 2 hours	Six weeks, in two periods. After 5 years, at least 8 weeks	Twice a year	—	—	Desirable that Sundays and bank holidays should be free
Switzerland. .	—	—	—	—	—	—
Madrid	—	—	—	—	—	—
Proposals . . .	7 to 8 hours, daily; 2 free afternoons per week	One month per annum	On appointment, and every 2 months	Prohibited	Professional clothing	—

Chapter IV.

PROTECTIVE MEASURES AGAINST THE DANGERS OF X-RAY FILM FIRES.

1. Nitro-cellulose and Acetyl-cellulose Films and Their Properties.

For the purposes of medical X-ray diagnosis, films are nowadays used almost exclusively as supports for the photo-sensitive layer, such films being of the double-coated type.

So far as the danger involved is concerned, stress must be laid on the great difference between a cinematographic and a Roentgen film.

For the material of the Roentgen film, two substances of different chemical composition are used, the ordinary film, consisting of nitro-cellulose, and the so-called safety film which is made of acetyl-cellulose. The first double-coated Roentgen film was made in Germany by Dr. Max Levy, in Berlin, as far back as 1897. ¹

Numerous tests have latterly been made in authoritative quarters to work out reliable standards by which the dangers attaching to both kinds of film can be gauged. LEHMANN ² (Photo-technical Institute of the "Technische Hochschule", Berlin) found, for instance, that samples of films in the condition in which they are used, i.e., with a developed layer of emulsion, caught fire at the following temperatures : nitro-cellulose films 175-180°, Agfa safety films 400-405°, Kodak safety films 440-445°, Pathé films 440-445°. The inflammability was tested on horizontally stretched lengths of film 3.5 cm. broad and 20 cm. long. Complete combustion took not more than 15 seconds with nitro-cellulose films ; the Pathé film ceased to burn as soon as the flame was removed ; the Agfa film flared up more fiercely, but only went on burning for a few centimetres. The Kodak film burned more slowly, but usually right to the end and took at least 50 seconds. In the case of double-coated X-ray films, conditions are not more unfavourable.

When nitro films burn rapidly with an adequate supply of oxygen, only harmless gases such as carbon dioxide and nitrogen are given off, whereas, with incomplete combustion, carbon monoxide, nitrous oxides, and small quantities of prussic acid are given off, 1 kg. of celluloid being able to produce about 600 litres of gas. The safety films shows, however, no tendency to smoulder; smouldering only takes place if the air is cut off and the film is sufficiently heated. The process of flameless combustion, such as occurs in nitro films could not be induced in safety films by tests at the "Chemisch-technische Reichsanstalt" ³. When acetyl-cellulose films are made to smoulder by artificial means, they give off, like nitro films, small quantities of prussic acid. But this can never give rise to any serious danger. Under favourable conditions the nitro film, once it has caught light or has been sufficiently heated, easily passes over into a process of flameless combustion. The resulting gases are inflammable and even

¹ WERTHEIMER *Über die Röntgenfilmaufbewahrung*, "Strahlentherapie", Volume 36, 1930, p. 573.

² *Fortschritte Röntgenstr.* 41, 989, 1930.

³ *Fortschritte Röntgenstr.* 41, 991, 1930.

explosive if mixed with the right quantity of air. The fumes of the nitro film are in part highly toxic (see hereafter).

The great inflammability of the ordinary cinematographic film and the dangerous nature of the fumes given off on slow combustion have long been known. The dangers connected with Roentgen films were pointed out by WERTHEIMER as far back as 1924 when the double-coated X-ray film was introduced in Germany. For this reason, in Germany, for instance, the Ministry of the Interior, in a memorandum of December 27th, 1928, on the storage of X-ray, etc., celluloid films used in hospitals, issued instructions the observance of which should greatly reduce the dangers attaching to X-ray films.

2. Accidents caused by the Burning of X-Ray Films.

In May 1929, there occurred in Cleveland, Ohio, a fire disaster of such magnitude that it appeared urgently necessary to revise the existing regulations and to expedite their enforcement in practice. Now, to be sure, we are threatened with regulations which, in the opinion of experts, overshoot the mark.

Whilst in other cinematographic film fires, which have been fairly numerous, no deaths were reported which could be ascribed with certainty to the inhalation of poisonous gases, in Cleveland 125 fatal casualties occurred, all of which were caused by gas poisoning. The enquiry showed that the disaster only reached such proportions owing to an unfortunate chain of circumstances.

The film store, which contained from 3 to 4 tons of films, was in itself fire-proof ; it was in the basement and had no connection with the outside air ; it was shut off by a fire-proof iron door. In close proximity to the upper film rack, a large steam-heating pipe ran through the room. This was examined for a defect on the day of the disaster, and stripped for that purpose of the insulating lagging. As a result of this, it is presumed that overheating occurred, leading to the internal decomposition, and consequent flaring, of the nearest films. When an attempt was made to extinguish the fire, an explosion occurred which spread the fumes all over the establishment through a ventilation duct and the staircase shaft. Owing to the lack of air, the fire could only smoulder slowly, so that the production of fumes by the internal decomposition of the nitro-cellulose was stimulated,

On the scene of the disaster, many of the victims were found dead sitting at their desks, etc., and the cause of sudden death was taken to be prussic acid poisoning. Chemical experts, however (KNUTSSON ¹), contested this, saying that 1 kg. of celluloid can only produce 5 litres of prussic acid, and that prussic acid loses its toxicity in the air in a few minutes. It was therefore suggested that other poisonous gases might have contributed ; for instance, that phosgene was formed by burning chloroform fumes which may have been evolved in the *pharmacy*, which was also involved in the fire.

A thorough enquiry into the Cleveland disaster was made by a Commission of the American Chemical Warfare Service, and the findings recorded in an elaborate report ². The large number of casualties which occurred even among persons who only came in for a moment is ascribed to the gases given off during the fire — namely, carbon monoxide and nitrous fumes — coupled with the lack of oxygen. The nitrous fumes involved in this case are : NO, NO₂ and N₂O₄. According to the tests performed, the inhalation of the nitrous fumes in a concentration of 0.6-1 mg. per litre of air (0.029-0.049 per cent by volume) is immediately fatal, whilst carbon monoxide, in a concentration of 12.5 mg.

¹ *Acta radiolog.*, Volume 10, 566, 1929.

² *The Disaster at the Cleveland Hospital Clinic*, Government Printing Office, Washington, 1929.

per litre of air (1 per cent by volume) can only be tolerated for 4-6 minutes. (It nevertheless remains a puzzle how the fitter who was repairing the heating can have escaped with his life, as apparently he did, although, in the attempt to extinguish the fire, he came within close range of the conflagration, whilst, a short time afterwards, numerous persons were being instantly killed in remote parts of the building.)

Quite recently a film fire was reported¹, which broke out in the University of California Hospital and involved the destruction of 500 lb. of nitro-cellulose film. In this case only three firemen and a few nurses sustained mild gas poisoning, which took the form of a temporary indisposition. The fire would probably have been confined entirely to the film store had there not been a fanlight one foot high over the door, through which the flames found an exit.

3. Regulations for the storage of X-ray films.

As a result of these and other film fires, regulations for the storage of X-ray films have recently been issued, which take into account the results of tests undertaken by the competent authorities in conjunction with the firms concerned.

The following may be mentioned :

1. Regulations for the Storage and Handling of X-ray Films in Medical Establishments, published by the German Roentgensgesellschaft².

2. Regulations for the Storage and Handling of Photographic and X-Ray Nitro-cellulose Films, published by the American Roentgen Ray Society³.

Both sets of regulations agree in stating that no special precautionary measures are required when so-called safety films of acetyl-cellulose (cellulose acetate) are used. This view has, it is true, not passed unchallenged in the literature on the subject (HERRNKIND⁴ and C. M. WOOD⁵), it having been pointed out that prussic acid is evolved by smouldering acetyl-cellulose. The above-mentioned detailed investigations of the "Chemisch Technische Reichsanstalt", show, however, that the gases evolved by the incomplete combustion of safety films (prussic acid and sulphuretted hydrogen) can never give rise to any serious danger, since flameless decomposition does not occur with safety films, and smouldering, just like dry distillation, can only be maintained by a constant supply of external heat and by cutting off the air. In such circumstances, even wool, hair, feathers, and so on, give off prussic acid and sulphuretted hydrogen in addition to carbon monoxide. The storage of safety films, therefore, entails no other dangers than that of paper, documents, etc., to which no special regulations apply.

According to the German regulations, a film is to be regarded as an X-ray safety film when a strip 3.5 cm. wide and 20 cm. long, which is held on edge in a horizontal position, and lit from underneath at one end with a match, either does not continue to burn after the removal of the match or requires more than sixty seconds for complete combustion. Safety films must be indelibly marked as such, the mark to be affixed on each single film and on the packing.

The American regulations strongly recommend the general and exclusive use of safety films; it is pointed out, however, from other quarters, first, that safety films are more expensive than ordinary films, secondly, that safety films can only be stored for

¹ *Acta radiolog.*, Volume 10, 566, 1929.

² DIN-Roentg., 3, Beuth. Verlag G.m.b.H., Berlin, page 14.

³ *American Journal of Roentgenol.*, 23, 81, 1930.

⁴ HERRNKIND : *Röntgenpraxis*, p. 649, 1929.

⁵ C. M. WOOD : *The Modern Hospital*, No. 3, page 78, 1929.

a limited period, and, finally, that it is uncertain as yet, whether the finished photographs of safety films may not undergo changes in course of time.

The difference in price of about 20 per cent is in itself sufficient to make the not inconsiderable cost of fire-proof equipment for the storage of ordinary films less great in some cases than the extra outlay entailed by the constant use of safety films. There being, moreover, some uncertainty as to the durability of the latter, regulations exclusively authorising the use of safety films would encounter considerable opposition. The raising of the safety film to the same level as the nitro-cellulose film, in respect both of price and quality, must, however, continue to be our objective.

Owing to the comparative harmlessness of the safety film, the provisions concerning storage relate only to nitro-cellulose films.

The quantity of film to be stored or accumulated has, of course, an important bearing on the nature of the protective measures required. Generally speaking, it is advisable to discard all films the storage of which is not necessary. Such films should, however, not be disposed of by burning, since this, too, will give rise to dangers demanding special precautionary measures; they should rather be sold to buyers of such material.

The number of finished X-ray photographs which may have to be dealt with varies considerably according to the number of patients attending the institutes. In the larger hospitals, 100 photographs per diem should be allowed for — that is to say, given 300 working days, 30,000 films a year. In Germany (a decision not having yet been given by the Reichsgericht) photographs must be kept for a number of years, so that a quantity of 300,000 films would accumulate. As the larger sizes of about 30×40 cm. are the most frequently used, this would mean about thirteen tons of film, assuming a weight of 375 gr. per sq. m.

Since the storage of so large a quantity in a single room is highly dangerous, it is advisable to subdivide it. A clear distinction between a so-called reference library (*Präsingbibliothek*) and X-ray film archives was first made by WERTHEIMER.¹ Since, moreover, there is no need for all X-ray photographs to be immediately available, a provision may be separately made for a small store for current use, a medium-sized store which is easily accessible and a large store for films which have been filed away but might in certain circumstances be required again.

By way of daily supply for the small store, the German regulations provide for not more than 10 kg. net weight (i.e., about 52 dozen 18×24 cm. films, or 18 dozen 30×40 cm. films) of unexposed films in their original packing. The stored films should be kept at an adequate distance from radiators and fires. Furthermore, the regulations provide for not more than 5 kg. (i.e., 308 films of 18×24 cm. or 110 films of 30×40 cm.) of developed film, which should be kept at an adequate distance from radiators and fires in boxes of hard wood or other material which does not readily conduct heat or burn.

According to the American regulations, undeveloped films must be kept in metal boxes — which may be lead-lined — on racks two feet above the floor, or in tested double-sided vented cabinets. The negatives should be stored in sets of not more than six, in thick paper covers, or in sets of not more than twenty-five in cardboard boxes.

The idea of subdividing the films by means of paper pockets or cardboard boxes, which finds expression in these regulations, proved satisfactory in the combustion tests that were performed (EFFENBERGER²), although it would seem that smouldering and the consequent fuming of the celluloid is facilitated, and burning with open flame

¹ WERTHEIMER : *Strahlentherapie*, Volume 36, page 580, 1930.

² EFFENBERGER : *Röntgenpraxis*, I, 643, 1929.

reduced. In the tests, such packets of films were only burnt at the edges and the production of fumes was small; it would seem that the application of intense heat for a considerable period of time — such as is not likely to occur in fires — would be necessary to cause such packets to smoulder right through.

The German regulations define as a medium-sized store one in which up to 150 kg. net weight (i.e., about 9,240 films of 18×24 cm. or 3,300 films of 30×40 cm.) are kept in a single room. This must have fire-proof walls and at least a fire-resistant ceiling as well as fire-resistant doors; the latter must be smoke-proof and self-closing and may only give on to a landing. (Hard-wood doors or ordinary soft-wood doors covered with tinfoil on all sides are regarded as fire-resistant; such doors must of course have no lights.) The room must have a window of thin glass, not less than 0.5 sq. m. in area, giving on to the open; in addition, a ventilation duct communicating with the open air must also be provided, which is automatically opened by an excess pressure of 6 kg. per sq. m., and must have an area in cross section of at least 0.25 sq. m. No open flames or inflammable materials must be kept in the room. Heating pipes and the like must be provided with a protective covering so shaped that films cannot be laid on them. The films themselves must be placed in a safe which fulfils certain conditions (see below). Where considerable quantities are involved, a separate room must be used for each 150 kg. net weight of film; these rooms must not be inter-communicating.

The American regulations, on the other hand, prescribe the use of cabinets of not more than 30 cubic ft. content, which must be in communication with the open air. When the weight of film to be stored exceeds 200 lb., two separate cabinets must be used. Cabinets with a capacity of more than 100 lb. must be fitted with an automatic sprinkler, unless each compartment contains less than 30 lb. of film and the cabinet is so designed that fire cannot spread from one compartment to the other. The opening communicating with the outside air must have an area in cross section of at least 1 sq. in. per cubic ft. of room. No special stipulations are made as to the fire-proofing of the place in which the cabinets are stored.

The German regulations define as a large store one in which more than 150 kg. net weight of film are kept in a single room. A room of the large store should not contain more than 4,000 kg. net weight of films (i.e., about 246,000 films of 18×24 cm. size, or 88,000 films of 30×40 cm. size). Where the quantity to be stored is greater, several completely separated rooms must be used. In dwelling-houses, large stores may only be installed in the lofts. The walls and the floor must be fire-proof. The room must have a window, giving on to the open, glazed with thin glass, provided with protection against sunshine and having an area equivalent to 5 per cent of the floor area and in no case less than 0.5 sq. m. When the store is installed, special care must be taken to ensure that the fumes given off in the event of a fire could not gain access to the landings or to the staircase shafts; the latter must be fitted at the highest point with a vent, at least 0.5 sq. m. in area, that can be operated from the ground floor. Large stores must have no heating apparatus; if heating pipes are carried through, special conditions must be fulfilled, and this applies also to electric light equipment. If the large store is installed outside in a special small building, this must be so situated that neighbouring inhabited houses will not be involved in any fire. As regards the manner in which the films are to be kept in the large store, no special regulations have been laid down, but the use of the original cardboard packing is recommended.

The American regulations mention special fireproof materials for the construction of storage rooms. The rooms should be provided with self-closing fire protection doors and should have no fan lights. For every 64 sq. ft. of floor area an automatic sprinkler must be provided; this may only be dispensed with if the storage room is installed

under the roof and if no danger to the building can arise through fire or fumes. The room must be connected with the open air by an opening having an area in cross section of at least 1 sq. in. per cubic ft. of content; this connection with the open air can also be secured by means of reliable automatic appliances which open the windows in the event of fire. Heating must only be effected by hot water or low pressure steam; radiators and pipes must be suitably protected. Special regulations have also been laid down concerning electric light; it is specially emphasised that no plug connections for portable lamps must be fitted. The protective measures may be relaxed if the films are kept in separate shipping containers; in this case storage is permitted up to 500 cubic ft. without sprinklers, the corresponding limit without such shipping containers being but 250 cubic ft. When the volume stored without shipping containers exceeds 1,000 cubic ft. the regulations governing storage-rooms apply.

General provisions in the German and American regulations have reference to fire extinction apparatus, the prohibition of smoking, the display of warning notices, etc.

The German regulations further contain provisions specifying the conditions to be fulfilled by the safety cabinets. These must be tested by the "Chemisch-Technische Reichsanstalt" and must satisfy the following requirements. When the room is burning fiercely, the contents of the closed cabinets must not begin to smoulder or burn before the lapse of half an hour. A cabinet must not contain more than 150 kg. net weight of film in the customary protective cover, and must be fitted with compartments each with a capacity of not more than 40 kg. These separate compartments should only pull out one at a time, and the cabinet must be so built that the fire cannot pass from one compartment to the other. No excess pressure must occur inside the cabinet when the contents are in process of flameless decomposition.

4. Conclusions.

If these regulations are reviewed, it will be seen that the experience gained in the Cleveland disaster has been largely turned to account. The most essential point is doubtless that rooms in which large quantities of film are stored should be shut off by fire-proof material from the inside of dwelling-houses, that good connection with the open air should be provided and especially that there should be no possibility of the fumes caused by smouldering spreading to the rest of the building.

When the German and the American regulations are compared, the reader is immediately struck by the fact that the latter provide compulsorily for the extensive use of sprinkler apparatus, whereas the former contain no reference to this. Tests have shown, it is true, that, when sprinkler apparatus is used, a fire may in some cases be quickly extinguished, since the cooling down of the films is specially effective as a means to that end; to this must be added the circumstance that the toxic nitrous fumes are readily soluble in water and can to some extent be rendered harmless by this means. On the other hand, such equipment involves considerable complications, and it is not impossible that the plant, like any automatic appliance, may break down in an emergency. VON FEILITZEN¹ has, however, pointed out that sprinkler equipment might conceivably prove a double-edged sword, preventing the free burning of the film and bringing about, instead, an incomplete form of combustion which would be conducive to the production of poisonous gases.

The American regulations only allow large stores to be installed without sprinkler equipment if the premises are in the lofts. Similarly, the German regulations only permit the installation of large stores in dwelling-house immediately under the roof. In

¹ *Brandskydd, Svenska Brandskyddsforeningenstidskrift, Okt. 1929.*

practice, difficulties will, however, frequently be encountered, since the structure of the roof usually consists of wood and the temperature under roofs may rise very high in summer.

KNÜTSSON¹ has given a detailed description of the equipment of a large store of the "Svensk Film Industri", which was constructed after careful tests, and has a capacity of 28,500 kg.

In order to provide against the destructive effects of explosions of film gas, the German regulations regard to some extent as safety valves openings of at least 0.5 sq. m. glazed with thin glass which is smashed by excess pressure on the inside. The American regulations, on the other hand, require, for large stores, openings of at least 0.5 sq. in. per cubic foot of room; they may be closed by windows which open automatically on the outbreak of fire; here again, it should be borne in mind that every automatic appliance is liable to fail on occasion.

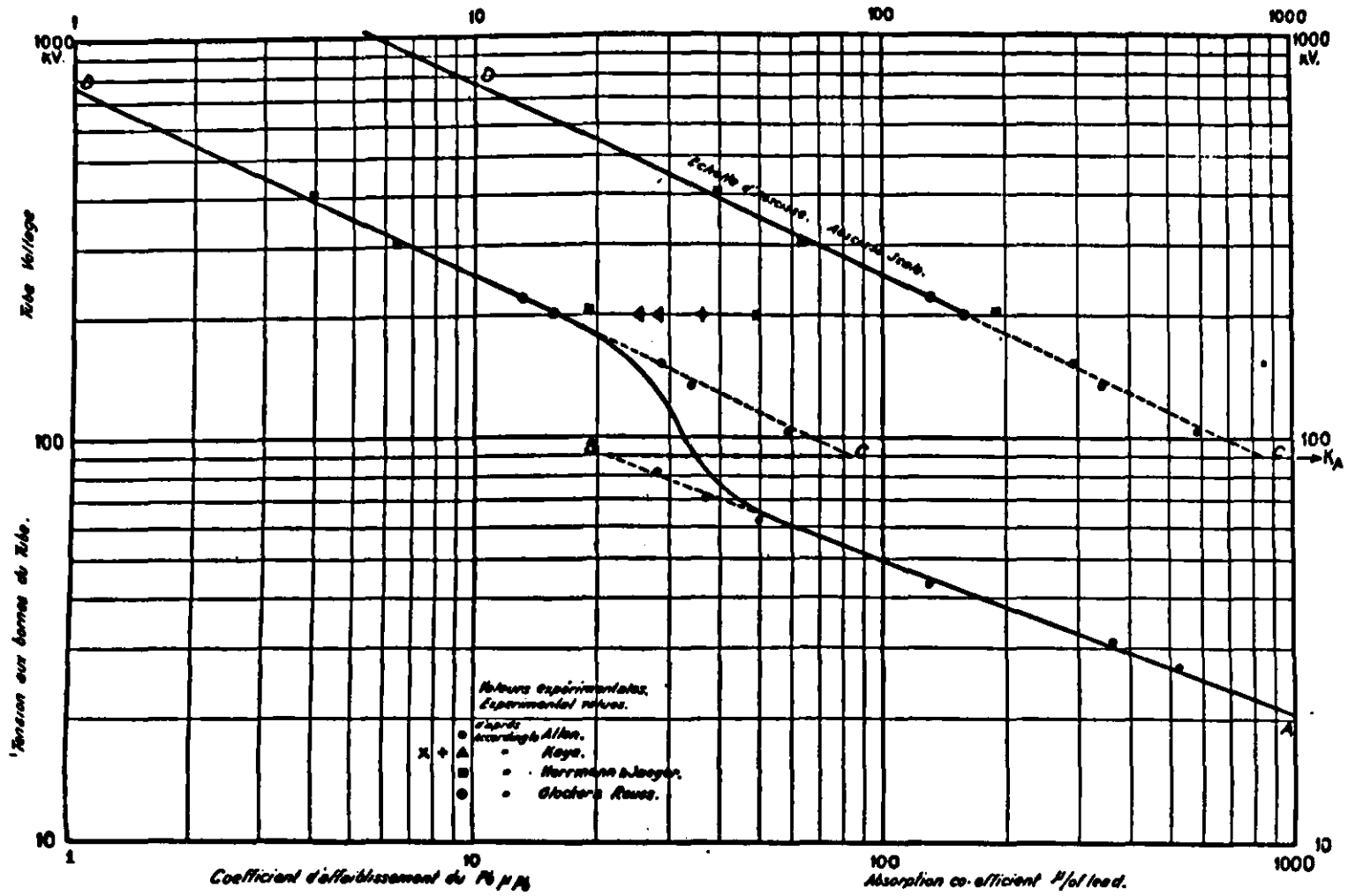
If these regulations for the storage of X-ray films are compared with those previously in force, it is hard to resist the impression that, owing to the dreadful disaster at Cleveland, regulations have been issued which can scarcely be complied with by a large number of X-ray institutes. The German regulations, in particular, go far beyond the requirements that the average institute can satisfy, since the installation of a fireproof room in the cases specified involves special structural alterations. I consider, moreover, that the capacity of the "medium-sized store", which is set at 3,300 films of 30 × 40 cm. size, is not sufficient even for smaller institutes.

In my opinion the instructions issued on December 28th by the German Ministry of the Interior are fully adequate, providing, as they do, that fireproof safes should be used for storage, and laying down no special requirements in respect of the fireproofing of the storage-room, so far as smaller stores of up to 15,000 films are concerned. The stipulation that the separate compartments in the safe shall be so interlocked that only one compartment can be opened and drawn out at a time is moreover a complication that must greatly increase the price of the safes if the mechanism is to be reliable.

In my opinion much more importance should be attached to proper instruction in the handling of X-ray films, and on this point strict regulations should be issued, for 5 kg. of film, when incautiously handled, are just as capable of causing a dangerous fire as a larger quantity. Suitable rules of conduct should, however, be worked out for cases in which a film fire has actually started — an accident that may be brought about by an unfortunate combination of circumstances, even with the strictest storage regulations. Similarly, all members of the staff should have training in first aid for gas poisoning, a point on which the report of the Chemical Warfare Services, for instance, contains recommendations.

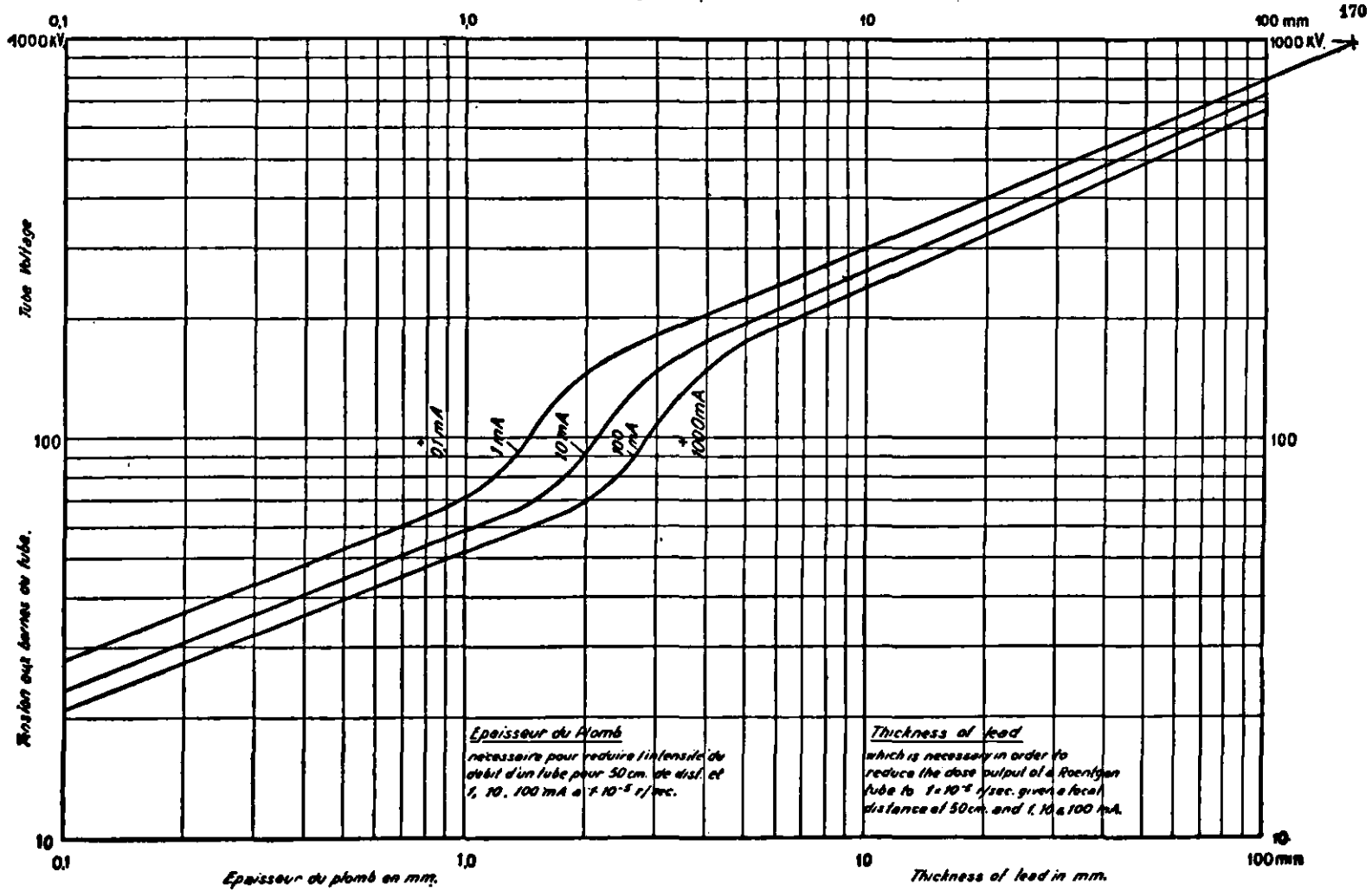
¹ *Acta radiol.* 10, 566, 1929.

Protection from Radiation



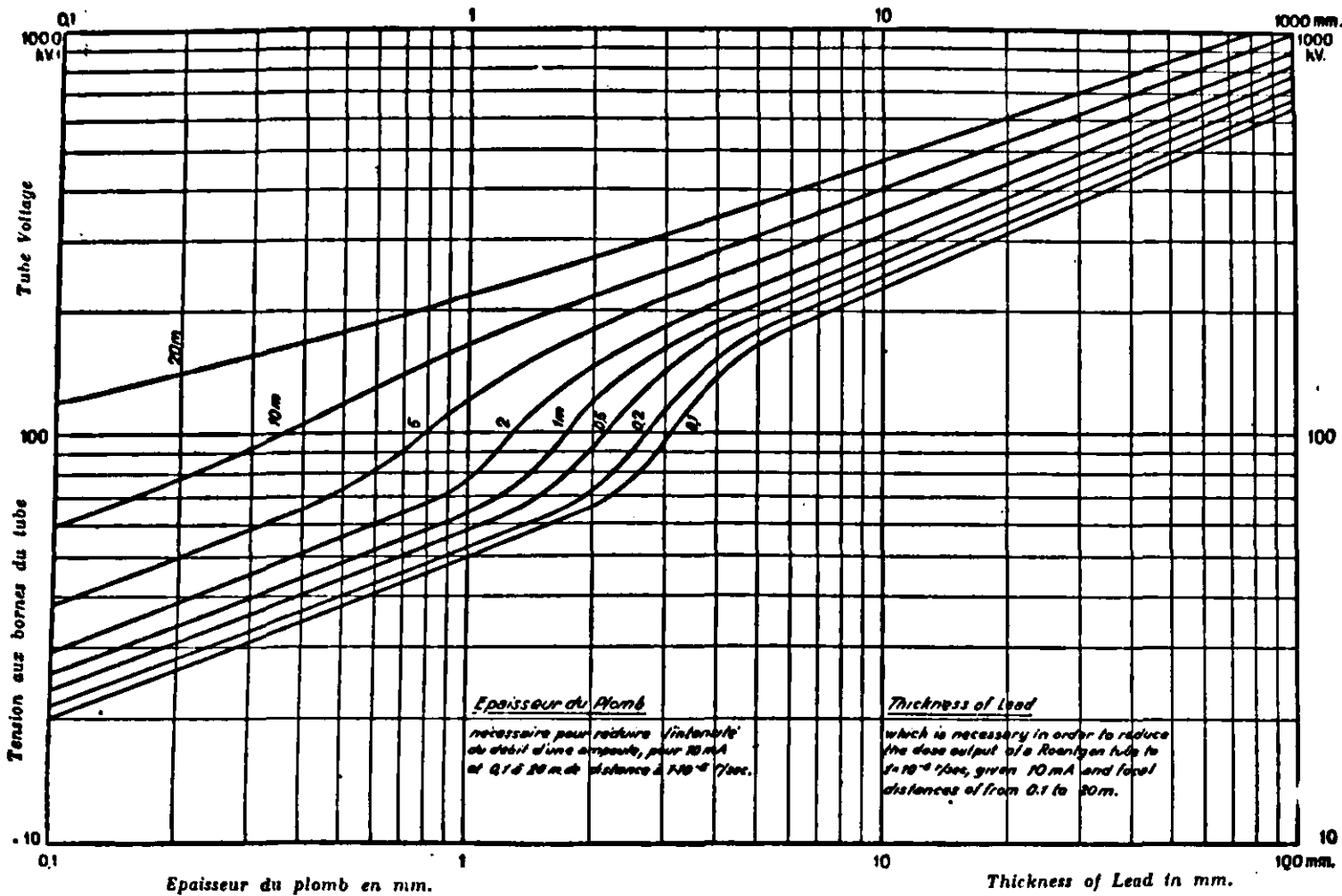
GRAPH. I.

Protection from Radiation



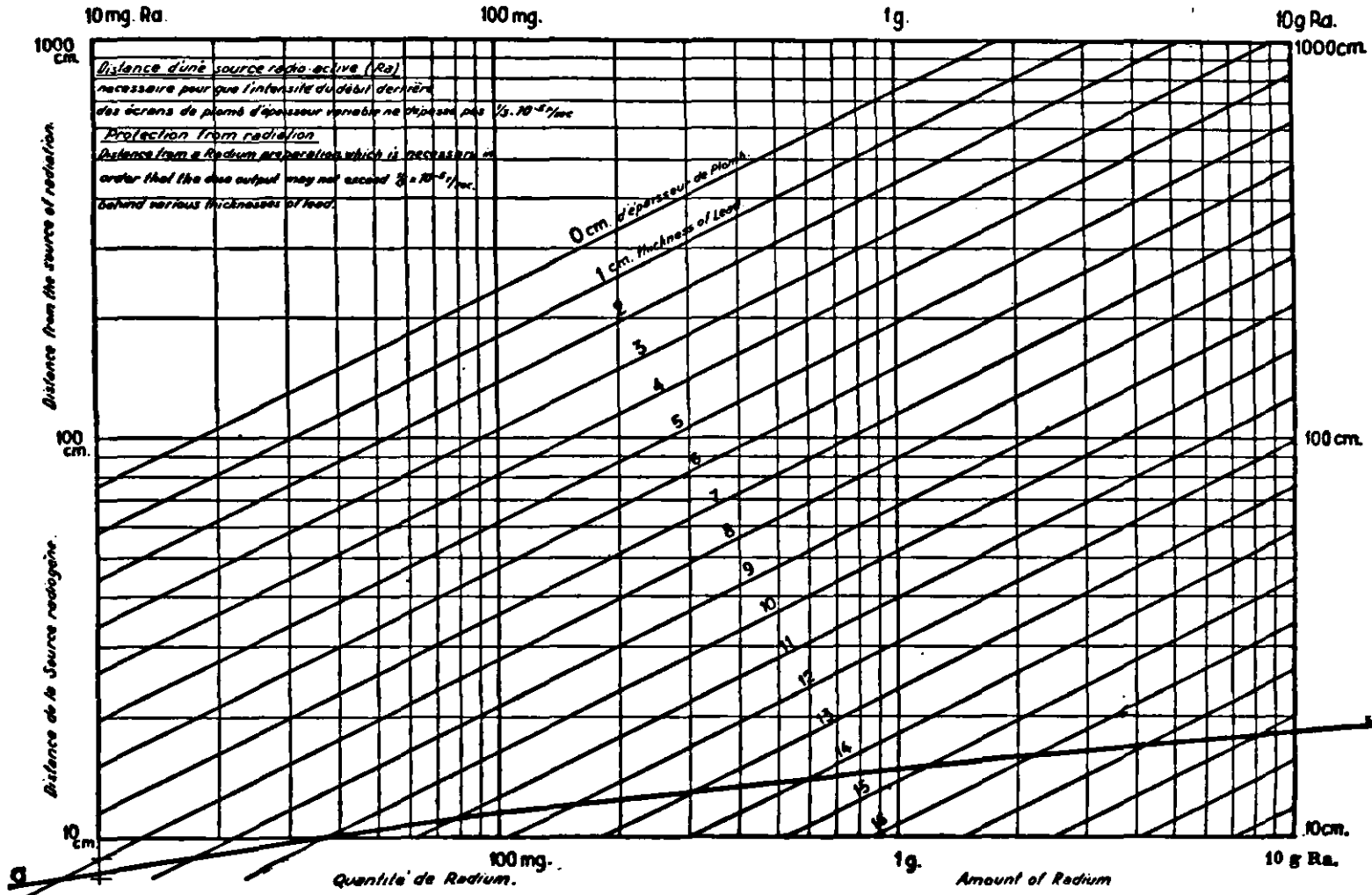
GRAPH. II.

Protection from Radiation



GRAPH. III.

Protection from Radiation



GRAPH. IV.

BIBLIOGRAPHY.

I. Protection against Danger of Radiation.

“ Richtlinien der Internationalen Röntgenstrahleneinheits-Kommission ”, angenommen von dem Internationalen Radiologenkomitee am 26. Juli und Genehmigt von dem Zweiten Internationalen Radiologenkongress am 27. Juli 1928.

Acta Radiologica, Supplementum III, Pars I, p. 61, 1929.

“ Internationale Richtlinien für Röntgenstrahlen- und Radiumschutz ”, angenommen von dem Zweiten Internationalen Radiologenkongress in Stockholm am 27. Juli 1928 auf Grund des Vorschlags der Sektion für Radio-Physik.

Acta Radiologica, Supplementum III, Pars I, p. 66, 1929.

Fortschritte auf dem Gebiete der Röntgenstrahlen, Vol. 39, p. 343, 1929.

Strahlentherapie, Vol. 32, p. 606.

Austria.

SCHÖNFELD, A. : “ Schutzmassnahmen im Röntgenbetrieb (*De lege ferenda*). ”

Wiener medizinische Wochenschrift, Nos. 35, 36, 37, 38, 1929.

Czechoslovakia.

“ Vorschriften des Čechoslowakischen Elektrotechnischen Verbandes für elektromedizinische Anlagen ”. Chapter XVIII of the regulations ESC 1930 ¹.

Genehmigt von den čechoslowakischen Ministerien für öffentliche Gesundheitspflege. Herausgegeben beim “ Elektrotechnický svaz čechoslovenský ”, Prag XII, Vocelova 3 in čechischer Sprache und in deutscher Uebersetzung.

Denmark.

“ Betaenkning fra det af Ministeriet for Sundhedsvaesen under 24. August 1927 nedatte Røntgenudvalg. ”

København, Trykt hos J. H. Schultz A/S, 1928.

England.

X-Ray and Radium Protection Committee.

Revised Report No. 1 (Dec. 1923).

Revised Report No. 2 (1925).

Abgedruckt in den Mitteilungen des National Physical Laboratory, Juni 1925.

Radiology, III, p. 171.

The British Journal of Radiology, 282, p. 19.

¹ Předpisy elektrotechnického suazu československého 1930. Část XVIII. Elektrická ařízení lékařská.

England.

Third Revised Report, May 1927.

British Journal of Radiology, Vol. 32, No. 326, p. 330, 1927. (Enthält Schutzmassnahmen gegen die Gefährdung durch ultraviolette Strahlung.)

“ Proposals from the British X-Ray and Radium Protection Committee to be submitted for International Approval by the Second International Congress of Radiology designed to unify Protective Measures and to improve the Working Conditions in All Countries. ”

Stockholm, 1928, A.B. Hasse w. Tullbergs Boktryckeri.

France.

Article 16 of the Law of November 30th 1892. (Punishment of unlawful practice of medicine), amended, March 29th, 1929.

Germany.

“ Merkblatt der Deutschen Röntgengesellschaft über den Gebrauch von Schutzmassnahmen gegen Röntgenstrahlen vom Jahre 1926. ”

Fortschritte Röntgenstrahlen, Vol. 34, p. 848, 1926.

Strahlentherapie, Vol. 23, p. 193, 1926.

“ Vorschriften für die Erreichung und den Betrieb von medizinischen Röntgenanlagen zur Vermeidung von Schädigungen durch Röntgenstrahlen und chemische Wirkungen. ” (DIN-Röntgen-Normen.)

Vorschlag I. Einspruchsfrist bis 1. September 1928.

“ Betriebsvorschriften für medizinische Röntgenanlagen. ”

Normenstelle der Deutschen Röntgengesellschaft.

Fortschritte Röntgenstrahlen, Vol. 39, p. 744, 1929.

Normenstelle der Deutschen Röntgengesellschaft, Arbeitsgruppe II, “ Strahlenschutz ”; Bericht über die 1. und 2. Sitzung (2. Dezember 1927 und 20. Januar 1928).

Fortschritte Röntgenstrahlen, Vol. 38, p. 141, 1928.

Bericht über die 3., 4. und 5. Sitzung.

Fortschritte Röntgenstrahlen, Vol. 39, p. 733.

Bericht über die 6. Sitzung.

Fortschritte Röntgenstrahlen, Vol. 41, p. 90, 1930.

“ Vorschriften über den Strahlenschutz in medizinischen Röntgenanlagen. ” (DIN-Röntgen-Normen.)

Endgültige Fassung. Beuth-Verlag, Berlin, SW. 14, Dresdener Str. 97.

Fortschritte Röntgenstrahlen, Vol. 41, p. 86, 1930 (Vollständiger Wortlaut.)

Strahlentherapie, Vol. 36, p. 393, 1926.

Normenstelle der DRG. Arbeitsgruppe VI, “ Röntgenröhren ” : Bericht über die 1. Sitzung (23. März 1928).

Fortschritte Röntgenstrahlen, Vol. 37, p. 919, 1928.

Bericht über die 2. Sitzung.

Fortschritte Röntgenstrahlen, Vol. 40, p. 540, 1929.

Bericht über die 3. Sitzung.

Fortschritte Röntgenstrahlen, Vol. 40, p. 1123, 1929.

Germany.

Bürgerliches Gesetzbuch, § 618.

Greece.

Memorandum of the Greek Ministry of Public Health appointed to study the Legislative Measures to be taken for Protection against the Dangers of X-Rays and Radium.

Submitted to the Health Organisation of the League of Nations. (League of Nations, document C.H.827.)

Hungary.

RATKOCZI, Budapest : " *On Injuries in X-Ray Laboratories and Protective Measures. Proposals for Legislation providing for the following Protective Measures.*

League of Nations, document C.H.775.

League of Nations. Minutes of the meeting of the Health Committee, documents C.245.M.79.1928.III ; C.3.M.3.1929.III ; A.8.1929.III (C.H.783) ; C.246.M.85.1929.III.

LEVY-DORN : *Gesetzliche Bestimmungen zur Ausübung des Röntgenverfahrens im Auslande.*

Referat aus dem Sonderausschuss für die Beurteilung von Röntgenschädigungen und zum Studium ihrer Verhütung. 27. April 1927.

Fortschritte Röntgenstrahlen, Vol. 36, p. 410.

Italy.

Communication of the Director-General of Public Health in the Ministry of the Interior, March 1929.

Norway.

Duties and Rights of the Physicians and Dentists. Law of January 1st, 1928.

Spain.

A yuntamiento constitucional de Madrid, Capitulo IXbis. " Instalaciones de electro-radiologia medica. "

Gaceta de Madrid, Núm. 219, 1927.

Sweden.

" *Proposals from the Swedish X-Rays and Radium Protection Committee.* " Second International Congress of Radiology. Stockholm, 23rd-27th of July 1928.

Kungl. Boktryckeriet. P. A. Norstedt & Söner.

Switzerland.

" *Instructions pour l'Etablissement et la Direction d'Installations Radiologiques (Rayons Roentgen).* "

Société Suisse de radiologie, 1928.

The Netherlands.

JITTA, N. M. et VAN DER PLAATS (Utrecht) :

L'emploi des rayons X et le danger qui peut en résulter.

Mémorandum adressé à l'Organisation d'hygiène. (Société des Nations, document C.H.174.)

Union of Soviet Socialist Republics.

Verfügung des "Volkskommissariats der Arbeit" der Räterepublik vom 9. September 1925. Nos. 233/389 betreffs des Arbeitsschutzes der in Röntgenkabinetten tätigen Arbeiter.

Fortschritte Röntgenstrahlen, Vol. 35, p. 781, 1927.

Annales de Roentgenologie et Radiologie, Vol. II, p. 148, 1926.

United States of America.

Chicago, III. Prescriptions for Laboratories. Amendments for the Chicago Code of 1911. Ords. April 7th, 1920, and April 8th, 1921.

New York. Amendments to the New York Regulation (concerning X-Ray Laboratories). July 24th, 1923, and February 26th, 1926.

Porto Rico. Act. No. 62 approved May 1st, 1928 (X-Ray Laboratories).

* * *

ALBERS-SCHÖNBERG : " Institute und Laboratorien, ihre Organisation, Leitung und Verwaltung. "

Aus Albers-Schönberg, *Röntgentechnik*. III. Auflage, p. 280, 1910.

ALBERS-SCHÖNBERG und LORENZ : " Die Schutzmittel für Ärzte und Personal bei der Arbeit mit Röntgenstrahlen. "

Deutsche medizinische Wochenschrift, No. 11, 1915.

ALLEN, S. I. M. : " Die Absorption der Röntgenstrahlen bis herab zu den Wellenlängen von 0,08 AE. "

Physical Review, 24, 1 (1924); 27, 266 (1926) ; 28, 907 (1926).

ALTSCHUL, W. : " Internationale Strahlenschutzbestimmungen. "

Strahlentherapie, Vol. 24, p. 766.

ARNELL, S. : " A Plastic Means of Protection for the X-Ray Treatment. "

Acta Radiologica, III, p. 66, 1924.

" Arrangements for Protection in Roentgen and Radium Work. "

Acta Radiologica, III, p. 422, 1924.

BAASTRUP, Chr. J. : " Einige Bemerkungen über die Bedingungen röntgenologischer Tätigkeit in Dänemark. "

Ugeskrift for Laeger, 1927, p. 87.

BACHEM : " Der gegenwärtige Stand des Problems der Röntgenstrahlendosierung. "

Arch. of Physical Therapy, X-Ray, Radium, Vol. 7, p. 151.

- BAENSCH, W. : " Besserer Strahlenschutz für die Hände des Röntgenologen. " *Röntgenpraxis*, Vol. III, chap. 6, p. 286, 1931.
- BARCLAY, A. E., and COX, Sidney, (übersetzt von Otto Risse, Stuttgart) : " Die Strahlengefährdung des Röntgenologen. Ein Versuch, die in der Diagnostik verwendeten Röntgenstrahlenmengen zu messen und ihre Gefahren abzuschätzen. " *Fortschritte Röntgenstrahlen*, Vol. 38, p. 311, 1928.
- BARCLAY, A. E., STEAD, G. and COX, S. F. : " A Source of Error in the Measurements of Dosage. " *British Journal of Radiology*, II, p. 401, 1929.
- BÉCLÈRE, A. : " Sur l'unification internationale des mesures de dosage en roentgentherapie. " Premier Congrès international de radiologie, Londres, 1925. *Journal de Radiologie*, t. X, p. 125. *Strahlentherapie*, Vol. 21, p. 468, 1928. (Übersetzt von Dr. G. Wittigslager-Bremen.)
- BÉCLÈRE, A. : " La discordance des mesures pour l'évaluation de l'unité de dose radiothérapique en Allemagne et aux Etats-Unis. " *Journal de Radiologie*, t. XI, p. 535.
- BEHNKEN, H. : " Zur Frage der Röntgendosiseinheit. " *Strahlentherapie*, Vol. 29, p. 192.
- " Dosimetrische Untersuchungen über Röntgenstrahlenschutz und Strahlenschutzröhren. " *Fortschritte Röntgenstrahlen*, Vol. 41, p. 245, 1930.
- BEHNKEN, H., und JAEGER, R. : " Die Standardisierung der Röntgenstrahlendosis. " *Radiology*, Vol. X, p. 275, 1928. Ref. *Zentralbl. Radiologie*, Vol. V, p. 322.
- BEHNKEN, H. : " Die Absolutbestimmung der Dosiseinheit ' 1 Röntgen ' in der Physikalisch-Technischen Reichsanstalt. " *Strahlentherapie*, Vol. 26, p. 79, 1927.
- BELOT, J. : " Paravent protecteur du docteur J. Belot. " *Bul. Soc. Radiol. méd.*, France, XVIII, 120-124. Ref. *Zentralblatt für Radiologie*, IX, 15.
- BELOT, M. J. : " Sur les cupules protectrices pour radiothérapie pénétrante avec tubes dans l'air. " *Journal de Radiologie*, VIII, p. 363.
- BELOT, J. : " Apparat zum Schutz bei der Durchleuchtung bei vertikaler Körperstellung. " *Acta Radiologica*, Vol. X, p. 221.

BELOT, J. : " Ein Apparat mit ' vollständigem Schutz ' bei röntgenologischen Untersuchungen in aufrechter Stellung. "

Arch. electr. méd. Mars-Avril 1929, 545, p. 125.
Ref. *Fortschritte Röntgenstrahlen*, Vol. 40, p. 709.

BENNER, Sven : " Über die Schwächung der Radiumstrahlen durch die Wände und die Fussböden in Gebäuden. "

Acta Radiologica, Vol. XI, p. 310.

BERNSTEIN, A. und KLOSE, Wilhelm : " Schutz gegen Röntgen-Nebenstrahlung bei Röntgendurchleuchtungen. "

Fortschritte Röntgenstrahlen, Vol. 38, p. 107.

BERTHOLD : " Über die Wirkung von Röntgenschutzstoffen. "

Strahlentherapie, Vol. 16, p. 147, 1924.

BERTHOLD und GLOCKER : " Über die Strahlenschutzwirkung von Baustoffen. "

Strahlentherapie, Vol. 16, p. 507, 1924.

" Berufung eines Physikers auf die Lehrkanzel für Röntgenologie " (mit Bemerkungen HOLZKNECHTS).

Fortschritte Röntgenstrahlen, Vol. 33, p. 841.

BOUCHACOURT et MOREL-KAHN : " De quelques points fondamentaux, concernant la protection des personnes utilisant les rayons X. "

Bulletin et Mém. de la Soc. de radiol. méd. de France, année XVI, p. 59, 1928.
Ref. *Zentralbl. Radiologie*, V, p. 201.

BOUCHARD : " Bericht betreffend die gesetzliche Regelung der medizinischen Anwendung der Röntgenstrahlen. "

Arch. d'Electr. méd. No. 264.
Ref. *Fortschritte Röntgenstrahlen*, Vol. XIV, p. 221.

BOUWERS, A. : " A New X-Ray Apparatus with Complete X-Ray and Electrical Protection. "

Acta Radiologica, Vol. IX, p. 600, 1929.

" Eine Metallröntgenröhre mit drehbarer Anode. Mit Aussprache. " Deutsche Röntgengesellschaft, Wien, 1929.

Fortschritte Röntgenstrahlen, Vol. 40, Kongressheft p. 102.

BOUWERS, A. und VAN DER TUUK, J. H. : " Strahlenschutz. "

Fortschritte Röntgenstrahlen, Vol. 41, p. 767.

BOWEN : " Über Bleigummischürzen. "

American Journal of Roentgenology, Vol. XVI, p. 473, 1926.

BOWES, Phyllis K. : " Notes on X-Ray Protection. "

The British Journal of Radiology, No. 296, XXX, 1925.

BRAUN, R., HASE, H., und KÜSTNER, H. : " Über die in der Röntgendiagnostik verabfolgten Dosen in R-Einheiten. "

Fortschritte Röntgenstrahlen, Vol. 38, p. 385, 1928.

CARELLI, H. H., und VIERHELLER, Fr., (Buenos Aires) : " Vergleich zwischen deutschen und französischen Einheiten. "

Strahlentherapie, Vol. 21, p. 468.

CHANTRAINE, H., und PROFITLICH, P. : " Über den Schutz des Arztes und seiner Gehilfen vor den Röntgenstrahlen. "

Fortschritte Röntgenstrahlen, Vol. 38, p. 121.

" Über die Messung der Spannung bei ganz hohen Milliampère-Zahlen. "

Fortschritte Röntgenstrahlen, Vol. 41, p. 44.

CHARLIER, A. : " La protection contre les rayons X. "

Bull. et Mém. de la Soc. de Radiologie Méd. de France, Année XVI, p. 65, 1928.
Ref. *Zentralbl. Radiologie*, V, p. 291.

COMPTON, *Handbuch der Physik*.

Herausgegeben von Geiger und Scheel, Vol. 23, p. 425.

CRAMER, H., und BORM, A. : " Das neue Bestrahlungsgerät der Metalix-Therapieröhre Filmvortrag, gehalten auf dem Röntgenkongress in Wien. "

Strahlentherapie, V. 33, S. 156.

DAUVILLIER, A. : " Le dosage des rayons X. "

Journal de Radiologie et d'Electrologie, Vol. XI, p. 149, 1926.

Le Cancer, IV^e année, N^o spécial, p. 168, 1927.

Ref. *Zentralbl. Radiologie*, IV, p. 564.

DAUVILLIER, A., LABORDE, A., et SAGET, J. : " Sur la réalisation de l'unité r internationale et l'étalonnage absolu des dosimètres radiologiques. "

Journal de Radiologie, XIII, p. 433.

DESJARDINS, A. U. : " Protection against Radiation. "

Radiology, I, p. 221.

DIETERICH, W. : " Fehlerquellen in der Apparatur und Dosimetrie und ihre praktische Auswertung. "

Fortschritte Röntgenstrahlen, Vol. 36, p. 183, 1927.

DIETLEN, H. : " Vorschlag zur Einschränkung der Gefahr von Röntgenschädigungen und zur Gewinnung eines einheitlichen Dosierungsverfahrens. "

Münchener Med. Wochenschr., 1920,, p. 1355.

“ Diskussion über Standardisierungsfragen. ” I. Internationaler Röntgenkongress. London, 1925.

Ber. Geb. u. Gyn., XII, p. 744.

EDER und FREUND : “ Ein neues Schutzmittel gegen Lichtschäden. ”

Wiener klinische Wochenschrift, 1922, p. 681.

EGGERT, J., und LUFT, F. : “ Ein neuartiges Filmdosimeter. ”

Röntgenpraxis, Vol. I, p. 187, 1929. II. Mitt. p. 655.

ELLIS und WOOSTER : *Handbuch der Physik*, herausgegeben von Geiger und Scheel. Vol. 22, p. 217, 1926.

ENGELBRECHT-ERLANGEN : “ Ein strahlensicheres Kompressionsstativ ” (Wintz-Kanone). Filmvorführung. Röntgenkongress, 1924.

Fortschritte Röntgenstrahlen, Vol. 32, Kongressheft, p. 218.

ERNST, E. C., GLASSER, O., STENSTROM, W., DORSEY, N. E., HUNT, F. L., CHAMBERLAIN, W. E., ERSKINE, A. W. : “ Preliminary Report of the Committee on Standardisation of X-Ray Measurements. ”

Radiology, Vol. VI, p. 191.

FORSSELL, G. : “ Barium Porcelain ; a New Protective Material against the Röntgen Rays. ”

Acta Radiologica, III, p. 249.

FOVEAU DE COURMELLES : “ Radioanaphylaxie. ”

Arch. d'Electr. Méd. et de Physiothérapie, No. 482, Nov. 1922, p. 327.

Fortschritte Röntgenstrahlen, Vol. 31, p. 129.

“ Pour les victimes des radiations. ”

Gazette des hôp. civ. et milit., XCIX^e année, p. 1483, 1926.

Ref. *Zentralbl. Radiologie*, Vol. IV, p. 357.

FRICKE, H., and BEASLEY, I. E. : “ Measurement of the Stray Radiation in Roentgen-Ray Clinics. ”

Ref. : *American Journal of Roentgenology and Radium Therapy*, Vol. XVIII, p. 146, 1927.

FRIED, Carl : “ Ein neues Bestrahlungsgerät in Verbindung mit der Metalix-Therapie-röhre. ”

Strahlentherapie, Vol. 33, p. 160.

FRIEDRICH, W., und GLASSER, O. : “ Untersuchungen und Betrachtungen über das Problem der Dosimetrie. ”

Strahlentherapie, 1923, Vol. 14, p. 362.

FRIESLEBEN, M. : “ Röntgenschädigungen beim Hilfspersonal. ”

Deutsche medizinische Wochenschrift, p. 1680, 1929.

FRIK, K. : “ Filterbemessung bei Röntgendurchleuchtungen und -aufnahmen. ”

Fortschritte Röntgenstrahlen. Vol. 34. n. 180

- FRIK, Karl, und LEVY-DORN, Max : " Die beim Arbeiten mit Röntgenstrahlen auftretenden Gefahren und ihre Verhütung. "
- Deutsche Zeitschrift für öffentliche Gesundheitspflege*, 3rd Year, p. 147, 1927.
- FRITSCH, E. : " Dosierungsfehler bei Röntgenbestrahlungen infolge Falschzeigens des Milliampereometers und deren Vermeidung. "
- Strahlentherapie*, Vol. 24, p. 719.
- FÜRST, W. : " Zur Sicherung des Bedienungspersonals von Röntgenapparaten gegen tödliche Unfälle und zur Frage der Verantwortlichkeit. "
- Strahlentherapie*, Vol. 21, p. 508, 1926.
- " Aus einem Gutachten über die Notwendigkeit der Anschaffung eines Dosimeters "
- Röntgenpraxis*, II, p. 908, 1930.
- GAUSS, C. J. (zu Strahlenschutz) : *Lehrbuch der Strahlentherapie*. Herausgegeben von H. Meyer und C. J. Gauss, Vol. IV, 1, p. 374.
- GLASSER, O. : " Die Absolutbestimmung der Doseinheit " 1 Röntgen " in der Eichstation der Cleveland Clinic. "
- Strahlentherapie*, Vol. 27, p. 160.
- " Einige Betrachtungen zum Problem der Strahlendosimetrie. "
- Strahlentherapie*, Vol. 27, p. 740, 1928.
- GLASSER, O., and PORTMANN, U. V. : " The Standardisation of the Roentgen-Ray Dose. "
- The American Journal of Roentgenology and Radium Therapy*, Vol. XIX, p. 47, 1928.
- GLOCKER : " Über den Strahlenschutz. "
- Die Naturwissenschaften*, 12th Year, p. 169.
- GRASHEY und MITARBEITER : *Irrtümer der Röntgendiagnostik und Röntgentherapie, der Lichtbehandlung und der Radiumtherapie*.
- Verlag G. Thieme, Leipzig, 1924.
- GLOCKER, R. : " Über den Strahlenschutz. "
- Die Naturwissenschaften*, 12th Year, p. 169.
- Strahlenschutz und Anlage von Röntgenabteilungen. Ergebnisse der medizinischen Strahlenforschung*.
- Herausgegeben von H. Holfelder, H. Holthusen, O. Jüngling, H. Martius, H. R. Schinz. Vol. I, p. 365.
- " Internationale Strahlenschutzbestimmungen. "
- Strahlentherapie*, Vol. 22, p. 193.
- Fortschritte Röntgenstrahlen*, Vol. 34, Kongressheft.
- " Zur Frage der ' Bleischuttdicken ' in den internationalen und in den deutschen Strahlenschutzvorschriften. "
- Fortschritte Röntgenstrahlen*, Vol. 41, p. 967.

- GLOCKER, R., und REUSS, A. : " Strahlenschutzmessungen.
Fortschritte Röntgenstrahlen, Vol. 40, p. 501, 1929.
" Strahlenschutzmessungen II. "
Fortschritte Röntgenstrahlen, Vol. 42, p. 651.
- GLOCKER, R., und KAUPP, E. : " Über den Strahlenschutz und die Toleranzdosis.
Strahlentherapie, Vol. 20, p. 144, 1925.
- GRAF, H. : " Was muss der Arzt über die Auswirkung der neuen Hochspannungs- und Strahlenschutzvorschriften wissen ? "
Medizinische Welt, p. 1228, 1930.
- GREBE : " Die energetische Bedeutung der R-Einheit. "
Strahlentherapie, Vol. 22, p. 438.
- GREBE, L., und MARTIUS, H. : " Die Standardisierung der Röntgenstrahlenmessung. "
Deutsche medizinische Wochenschrift, p. 1156, 1926.
- GREBE, L., und GAERTNER, O. : " Die absolute Herstellung der R-Einheit im Bonner Röntgeninstitut. "
Strahlentherapie, Vol. 27, p. 728, 1928.
- GREBE, L., und MARTIUS, H. : " Zur Standardisierung der Röntgenstrahlenmessung. "
Deutsche medizinische Wochenschrift, p. 1156, 1926.
- GUNSETT, A., und NOURETTINE O, C. : " Etudes ionométriques sur la dose additionnelle de diffusion. "
Journal de Radiologie, Vol. 14, p. 551, 1930.
- HABS, H. : " Die Gefahr des Palpierens mit der ungeschützten Hand. "
Fortschritte Röntgenstrahlen, Vol. 42, p. 779.
- HASE, H., und KÜSTNER, H. : " Über die Wahrung der R-Einheit. "
Strahlentherapie, Vol. 29, p. 745, 1928.
- HEIMROTH, Otto : " Über die zweckmässige Einrichtung von Röntgenanlagen unter besonderer Berücksichtigung des Röntgenschutzes für das Bedienungspersonal. "
Deutsche zahnärztliche Wochenschrift, p. 632, 1930.
Zentralblatt Radiologie, Vol. IX, p. 351.
- HEITZ : " Zur Filtersicherung. "
Strahlentherapie, Vol. 15, p. 684, 1923.
" Beitrag zur Filtersicherung. "
Fortschritte Röntgenstrahlen, Vol. 36, Supplement, p. 104, 1927.
- HERRMANN, H., und JAEGER, R. : " Über eine Röntgenapparatur für ca. 400 kV Röhrenspannung. "
Fortschritte Röntgenstrahlen, Vol. 41, p. 426.
" Bleiabsorptionsmessungen an extrem harten Röntgenstrahlen. "
Fortschritte Röntgenstrahlen, Vol. 42, p. 115.

- HALBERSTAEDTER, L., und TUGENDREICH, J. : " Die Bedeutung der die Röntgenröhre rückwärts verlassenden Strahlung und die Notwendigkeit einer geeigneten Schutzvorrichtung. "
- Med. Klinik*, No. 9, 1921.
- HEUSER, C. : " Regeln für den Schutz gegen Röntgenstrahlen. "
- Semana méd.*, 33rd Year, p. 362, 1926.
Zentralbl. Radiologie, Vol. III, p. 303.
- HOFFMANN, W. : " Über Augenschutz bei Anwendung von Röntgen- und Radiumstrahlen. "
- Strahlentherapie*, Vol. 36, p. 105.
- HOLFELDER, H. : " Ein neues strahlensicheres Bestrahlungsgerät für die Tiefentherapie. "
- Fortschritte Röntgenstrahlen*, Vol. 34, Kongressheft, p. 178.
- HOLFELDER, H., und KÖRTE, W. : *Das Röntgeninstitut der chirurgischen Universitäts-Klinik im städtischen Krankenhaus Sachsenhausen in Frankfurt/M. 1929.* (Im Buchhandel.)
- HOLMSEN, R. : " The Need of Some Simple Uniform Safety Regulation for the Installation of Röntgen Plants. "
- Acta Radiologica*, Vol. IV, p. 6.
- HOLTHUSEN, H. : " Über die Standardisierung der Röntgendosismessung. "
- Fortschritte Röntgenstrahlen*, Vol. 34, Kongressheft, p. 156.
- " Der derzeitige Stand der physikalischen Messmethoden. "
- Strahlentherapie*, Vol. 22, pp. 1-37, 1926.
- HOLZKNECHT, G. : " Schutz der Umgebung der Bestrahlungsfelder bei der Röntgenbehandlung. Leuchtendes Blei. "
- Fortschritte Röntgenstrahlen*, Vol. 34, p. 169, 1926.
- " Schädigungsprophylaxie. "
- Strahlentherapie*, Vol. 24, p. 385.
Wiener med. Wochenschrift, No. 42, 1927, p. 1419.
- " Zur Frage der gesetzlichen Sicherheitsbestimmungen für die Anwendung von Röntgenstrahlen. "
- Fortschritte Röntgenstrahlen*, Vol. 37, p. 82. *Berichtigung*, p. 266. *Wiener klin. Wochenschr.*, 1926.
- HUNT, F. L. : " Barium Sulphate as a Protective Material against Roentgen Radiation. " (National Bureau of Standards.)
- The American Journal of Roentgenology and Radium Therapy*, Vol. XIV, p. 524.
- HUNT, F. L., and TEMIN, Morris : " X-Ray Protective Plasters. "
- Radiology*, February 1927, p. 117.
- IMMELMANN, X. : " Vorschriften für Röntgenhilffinnen zur Vermeidung von Röntgenschädigungen. "
- Röntgenhilfe*, 1921, 1st Year, No. 1.

- IRLE und BERGERHOFF : " Selbsttätige elektrische Sicherung gegen Verwechseln und Vergessen der Strahlenfilter (D.R.P.a). "
- Strahlentherapie*, Vol. 22, p. 562, 1926.
- " Vereinigte Filtersicherung and Röntgenapparaten mit vereinigttem Filterwähler und Zeitwähler (D.R.P.a). "
- Strahlentherapie*, Vol. 23, p. 181, 1926.
- IRLE : Aussprache, Röntgenkongress 1926.
- Fortschritte Röntgenstrahlen*, Vol. 34, Kongressheft, p. 182.
- ISHINO : *Philosophical Magazine*, Vol. 35, p. 129, 1917.
- JACOBSON, L. E. : " Measurement of Stray Radiation in Roentgen-Ray Clinics of New York City. "
- Amer. Journ. of Roentg. and Radium Ther.* Vol. XVIII, p. 149, 1927.
Internationale Radiotherapie, Vol. III, p. 743.
- JÄRNH, B. E. : " Eine neue Schutzkappe für Tiefentherapie. "
- Acta Radiologica*, Vol. VII, p. 6, 1926.
- JAECKEL, G. : " Über den Strahlenschutz bei Röntgenstationen. "
- Fortschritte Röntgenstrahlen*, Kongressheft, Vol. 34, p. 179, 1926.
- JAEGER, R. : " Zur Frage der Röntgendosiseinheit ' R ' in der Therapie. "
- Internationale Radiotherapie*, II, p. 770, 1927.
- " Die Bedeutung der Röntgendosiseinheit ' R ' für die Therapie. "
- Internationale Radiotherapie*, Vol. I, p. 807, 1926.
- JANKER, R. : " Eine einfache Massnahme zur Verhütung von Überdosierungen bei Durchleuchtungen, besonders bei Magen-Darmuntersuchungen. "
- Röntgenpraxis*, I, p. 46, 1929.
- JANUS, F. : " Können aus Glühventilröhren unter Umständen Strahlen austreten, die einen besonderen Schutz notwendig machen ? "
- Fortschritte Röntgenstrahlen*, Vol. 35, p. 381, 1926.
- JAULIN : " Rapport sur les dangers des rayons X et des substances radioactives pour les professionnels ; moyens de s'en préserver. "
- Journal de Radiologie*, Vol. XI, p. 193.
- JERMAN, E. C. : " Protection from an X-Ray Standpoint. "
- Radiology*, Vol. V, p. 430.
- JONA, M. : " Das Problem der Dosierung in der internationalen Röntgen- und Radiumtherapie 1924 bis Mitte 1926. "
- Internationale Radiotherapie*, Vol. I, p. 812.
- KAYE, G. W. C. : " Discussion on X-Ray and Radium Protection and Appliances. X-Ray Protective Measures. " First International Congress of Radiology, London, June 30th-July 4th, 1925.

British Journal of Radiology (Journal of the Röntgen Society), Vol. 23, No. 91, pp. 155, 168, 1927.

“ Schutz und Arbeitsbedingungen in Röntgenabteilungen. ”

Brit. Journ. Radiol. (new series), Vol. I, 9, p. 295.

Fortschritte Röntgenstrahlen, Vol. 39, p. 187, 1929.

“ Grundlegende Betrachtungen über Röntgenstrahlen und über den Strahlenschutz für den Röntgenoperator. ” (“ Some Fundamental Aspects of Roentgen Rays and the Protection of the Roentgen-Ray Worker. ”)

American Journal of Roentgenology and Radium Therapy, Vol. XVIII, p. 401, 1927.

Zentralblatt Radiologie, Vol. V, p. 291.

KIRCHBERG : “ Die Pflichten der Krankenhausdirektoren gegen ihre Röntgenassistenten und Angestellten. ”

Fortschritte Röntgenstrahlen, Vol. IX, p. 307.

KIRCHNER : “ Allgemeine Physik der Röntgenstrahlen. ”

Handbuch der experimentellen Physik, Vol. 24, p. 113.

KOCH und STERZEL, A.-G. : “ Filtersicherungen für Röntgeneinrichtungen. DRP., 452, 292, 1927. ”

Zentralblatt Radiologie, Vol. IV, p. 564.

KÖHLER, Alban : “ Zur Verantwortung des Vorgesetzten für den Schutz seines Röntgenpersonals. ”

Deutsche medizinische Wochenschrift, No. 43, 1912.

KOHLRAUSCH : *Probleme der Gammastrahlung.*

Verlag Vieweg und Sohn, Braunschweig, 1927.

KRAUSE, P. : “ Wie schützt der Arzt bei Durchleuchtungen seine Kranken und sich selbst vor Schädigungen durch Röntgenstrahlen ? ”

Münchener Medizinische Wochenschrift, p. 985, 1923.

KRUCHEN, C. : “ Filtersicherung. ”

Strahlentherapie, Vol. 19, p. 741.

KUPFERBERG : “ Die Technik der Radiumstrahlung. Selbstschutz des Therapeuten. ”

Lehrbuch der Strahlentherapie, Vol. IV, Part I, p. 507, 1929.

KÜSTNER, H. : “ Die Absolutbestimmung der R-Einheit mit dem grossen Eichstandgerät. ”

Strahlentherapie, Vol. 27, p. 331.

LAMMERS, H. A. M. M. : “ Über die der Strahlenbehandlung anhaftenden Gefahren. ”

Nederl. Tijdschr. v. Geneesk. 1924, I, p. 2790.

Ref. : *Zentralblatt für Innere Medizin*, p. 801, 1924.

LANDAUER, R. S. : “ Die Anwendung von Zahnfilmen zur Bestimmung von Streustrahlen. ”

Radiology, Vol. VII, p. 512. *Fortschr. Röntgenstr.* 36, p. 1319, 1927.

LAURITSEN und BENNET : *Physical Review*, Vol. 32, p. 850, 1928.

- LAURITSEN und CASSEN : " High Potential X-Ray Tube. "
Physical Review, Vol. 36, p. 988, 1930.
- LEDoux-LEBARD et DAUVILLIER : *Physique des rayons X*. Paris, 1921.
- " Leitsätze für das Arbeiten mit Röntgenstrahlen gemäss Beschluss der Deutschen Rönt-
gengesellschaft vom 28 April 1924. "
Deutsche Zeitschrift für die gesamte gerichtliche Medizin, Vol. 4, chap. 3, 1924.
- LEVY-DORN, M. : " Wie lange dürfen einem Arzt Durchleuchtungen mit dem Fluores-
zenzschirm zugemutet werden ? "
Röntgenhilfe, 1922, No. 6.
- LEWIN, H. : " Schutzvorrichtung gegen Streustrahlen. "
Fortschritte Röntgenstrahlen, Vol. 36, p. 144, 1927.
- LOREY, A. : " Der Röntgenstrahlenschutz. "
Lehrbuch der Strahlentherapie, Vol. I, p. 1101, 1925.
- LOSSEN, H. : " Entstehung und Verhütung der Unfälle und Schäden in medizinischen
Röntgenlaboratorien. "
Monatsschrift für Unfallheilkunde, 1926, Nos. 8 and 9.
Ref. *Zentralblatt Radiologie*, Vol. II, p. 797.
- LUNDQVIST, A. : " Über eine besondere Schutzmassregel für die Manipulation mit
Radiumpräparaten. "
Acta Radiologica, Vol. IX, p. 119, 1929.
- MARAGLIANO : " Schutz bei Durchleuchtung. " Ital. Röntgenkongress 1926 (Bericht).
Fortschritte Röntgenstrahlen, Vol. 36, p. 181, 1927.
- MARKOVITS : " Röntgenschutz. "
Medizinische Klinik, p. 866, 1923.
- MARTIUS, H. : " Die Röntgenstrahlenmessung in R-Einheiten. "
Acta Radiologica, Vol. VII, p. 193, 1926.
- MEYER, P. S. : " Über Schutzmittel gegen Ultraviolettlicht und Röntgenstrahlen. "
Zschr. f. physikalische Therapie, Vol. 30, p. 261, 1925.
- MEYER und GLASSER : " Erythemdosen in absoluten Einheiten. "
Radiology, Vol. VI, p. 320, 1926.
- MIESCHER, G. : " Strahlenschutz und Lichtgewöhnung. "
Klinische Wochenschrift, p. 840, 1929.
- MOSES, P. : " Bemerkung zu der Arbeit Chantraine und Profitlich : " Über den Schutz
des Arztes und seiner Gehilfen auf dem Gebiete der Röntgenstrahlen ", Vol. 38,
Chap. I.
Fortschritte Röntgenstrahlen, Vol. 38, p. 698, 1928.
- MÜLLER, E. H. : " Zur Frage der Zeitkontrolle im medizinischen Röntgenbetrieb ".
Fortschritte Röntgenstrahlen, Vol. 42, p. 657.

- MURDOCH, J., und STAHEL, E. : " Vergleichende Studie von zwei dosimetrischen Röntgeneinheiten — das französische R (Solomon) und das deutsche R (Behnken) ".
Strahlentherapie, Vol. 27, p. 561.
Archives d'Électricité Médicale et de Physiothérapie du Cancer, Vol. 35, N° 525, mars-avril 1927.
- MUTSCHELLER, A. : " *Physical Standards of Protection against Roentgen-Ray Dangers* ".
The American Journal of Roentgenology, Vol. XIII, p. 65.
" Further Studies of Physical Standards of Protection against Roentgen-Ray Dangers ".
Radiology, Vol. VI, p. 314.
" Safety Standards of Protection against X-Ray Dangers. "
Radiology, Vol. X, p. 468.
" Niederösterreichische Statthalterei : Verordnung, betreffend die Bedingungen für die Errichtung und den Betrieb von Instituten für Radiographie und Radiotherapie. "
Münchener Medizinische Wochenschrift, p. 208, 1900.
- NEEFF, Th. : " Über den Strahlenschutz und die Verbesserung seiner Wirkung. "
Strahlentherapie, Vol. 24, p. 161, 1926.
" Über Strahlendosen in der Diagnostik. "
Internation. Radiologenkongress, Stockholm, 1928.
Acta Radiologica, Suppl. III, Part II, p. 197, 1929.
Fortschritte Röntgenstrahlen, Vol. 41, p. 414 (ausführlich).
- NEUGEBAUER, F. : " Sicherungsschloss gegen Filterverwecheln. "
Fortschritte Röntgenstrahlen, Vol. 35, p. 975, 1927.
- NÖLKE, W. : " Gefahren in Röntgenbetrieben durch falschanzeigende Messinstrumente. "
Röntgenpraxis, Vol. I, p. 271.
- Norway. — " Protection Committee of ' Norsk Forening for Medicinsk Radiologi '.
Arrangements of Protection in Röntgen and Radium Work. " Sitzungsbericht.
Internationale Radiotherapie, Vol. I, p. 69.
- PAGENSTECHER : " Über neue Röntgenschutzmittel. "
Fortschritte Röntgenstrahlen, Vol. 36, p. 719, 1927.
- PFAHLER, G. E. : " The Dangers in Roentgenology and Radium Therapy ".
The American Journal of Roentgenology and Radium Therapy, Vol. XIII, p. 276, 1925.
Radiology. Vol. II, p. 106 (Editorial).
" A Device to prevent the Omission of a Filter in Deep Roentgen Therapy ".
The American Journal of Roentgen Therapy, Vol. X, p. 562, 1923.
- PILON, H. : " Discussion on X-Ray and Radium Protection and Appliances. Protection in Radiotherapy ". First International Congress of Radiology, London, 1925.
Brit. Journ. of Radiology (Journal of the Röntgen Society), Vol. 23, p. 164, 1927
Ref. *Zentralbl. Radiologie*, Vol. III, p. 358.

PLAATS, B. J. VAN DER, und VAN DER PLAATS, G. J. : " Strahlenschutzröhren bei der Durchleuchtung. "

Fortschritte Röntgenstrahlen, Vol. 39, p. 496.

POHLE, E. A. : " Begrenzte Exposition in der Strahlenuntersuchung. "

Radiology, Vol. IX, p. 64. Ref. *Fortschritte Röntgenstrahlen*, Vol. 36, p. 1314.

POLGAR, F. : " Tödlicher elektrischer Unfall in einem Röntgenlaboratorium. "

Med. Klinik, p. 453, 1926.

" Protection of X-Ray Workers "

British Journal of Radiology (Journal of the Röntgen Society), Vol. 22, p. 45, 1926.
Ref. *Zentralblatt Radiologie*, Vol. I, p. 781.

PUGNO-VANONI, E. : Röntgenschutzschirme ohne Eigenstrahlung. "

La Radiologia Medica, Vol. 14, p. 782, 1927.

Ref. *Fortschritte Röntgenstrahlen*, Vol. 37, Chap. 1.

" Radiologues. Pathologie professionnelle et hygiène. " (Die berufliche Pathologie und Hygiene der Radiologen.) Nach einem Originalbericht von Prof. E. Perussia-Mailand.

Hygiène du Travail, N° 131.

RAJEWSKY, B. : " Zur Frage der Dosierung von Röntgenstrahlen. Die Standardisierung der Dosismessung. "

Fortschritte Röntgenstrahlen, Vol. 34, p. 62, 1926.

RAVENEL, L. J. : " A Revolving Filter for Use in Roentgen Therapy "

American Journal of Roentgenology and Radium Therapy, Vol. XXII, p. 171.

" Regulativ für Röntgenlaboratorien von dem Röntgenkomitee einer medizinischen Gesellschaft eines Bezirks (County). "

Radiology, Vol. VIII. March, 1927.

Ref. *Fortschritte Röntgenstrahlen*, Vol. 35, p. 1344, 1927.

REICH : Über Schäden und Unfälle in Röntgenbetrieben.

Wiener klinische Wochenschrift, p. 61, 1929.

REINBERG und KUPRITZ : " Gewerbliche Schädigung bei der Herstellung von Röntgenröhren in der (Leningrader) Elektrovakuumanstalt. "

Gigiena truda, Nos. 7/8, p. 59.

Ref. *Internationale Radiotherapie*, Vol. II, p. 59.

REINIGER, GEBBERT und SCHALL: " Sicherheitseinrichtung bei Röntgenanlagen. " DRP., 450, 993, 1927.

Zentralblatt Radiologie, Vol. IV, p. 564.

" Report of the Committee on Standardisation of X-Ray Measurements of the Radiological Society of North America. "

Radiology, Vol. X, p. 313, 1928.

- RIGELE, H. : " Technik des Strahlenschutzes in Therapie und Diagnostik. "
Strahlentherapie, Vol. 24, p. 762.
- RIGLER, L. G. : Beschreibung einer Methode zum Schutz gegen die Strahlen. "
Acta Radiologica, Vol. IX, p. 117.
- ROCCHI, G. : " Mezzi di protezione contro le radiozioni nella radium e roentgen-
terapia. "
Archivio di Radiologia, I, p. 410, 1925. •
- LA ROCHE, O. : " La protection contre les rayons X et l'électrocution. " (Film der Firma
Gaiffe, Gallot et Pilon).
Bull. Soc. Radiol. méd. France, XVIII, 164.
Zentralblatt Radiologie, Vol. IX, p. 16.
- ROENA, A. : " El empleo de masa plastica protectora en la terapeutica roentgenologica. "
Revista de Radiologia, II, p. 9.
- ROLLESTON, H. : " Über die Wirkungen der Bestrahlung auf Patienten und Rönt-
genologen und über Schutzmassnahmen. "
British Journal of Radiology (Roentgen Society Section), 1927, Vol. 32, No. 93,
p. 266.
Ref. *Fortschritte Röntgenstrahlen*, Vol. 37.
" Über die Wirkungen der Röntgenstrahlen auf Kranke und Röntgenologen, und
über Schutzvorrichtungen. "
British Medical Journal, 1927, 3469, p. 9.
- ROSENZWEIG, B. K. : " Berufliche Erkrankungen der Röntgenologen und ihre Pro-
phylaxe. "
Fortschritte Röntgenstrahlen, Vol. 36, p. 778, 1927.
- RUMP, W. See under WINTZ.
" Energiemessungen an Röntgenstrahlen. "
Zeitschrift für Physik, Vol. 43, p. 254, 1927.
" Die Streustrahlung der Luft. "
Fortschritte Röntgenstrahlen, Vol. 38, p. 58, 1928.
- SAGET : " De la protection en radiothérapie profonde. "
Journal Belge de Radiologie, Vol. XII, p. 76.
- SALIS, H. VON : " Über Röntgenschutzstoffe. "
Fortschritte Röntgenstrahlen, Vol. 34, p. 317.
- SALVATORI, G. B. : " Diagnostik-Selbstschutzröhre. "
Archivio di Radiologia, III, p. 455, 1927.
Ref. *Fortschritte Röntgenstrahlen*, Vol. 36.
- SANTE, L. R., and HINKLEY, Tracey : " Barium Sulphate Plaster for Protection against
200,000 Volt Roentgen-Rays. "
The American Journal of Roentgenology, XIII, p. 383.

SAUPE, E. : " Über die bei diagnostischen Arbeiten verabreichten Röntgenstrahlendosen in R-Einheiten. "

Fortschritte Röntgenstrahlen, Vol. 37, p. 536, 1928.

SCHALL, W. E. : " Some Engineering Lessons from Stockholm. "

British Journal of Radiology, II, p. 74, 1929.

Zentralblatt Radiologie, Vol. VII, p. 93.

SCHECHTMANN, J. : " Ergebnis der I. allrussischen Konferenz für Organisationsfragen des Röntgenwesens. "

Vestnik rentgenologii i. radiologii, Vol. V, p. 405, 1927.

Zentralblatt Radiologie, Vol. V, p. 241.

" Zur Frage der Festsetzung einer Standardmethode der Dosimetrie. "

Fortschritte Röntgenstrahlen, Vol. 37, p. 916, 1928.

" Die Anwendung des Aspirationsgerätes nach Ebert zur Prüfung des Röntgen-schutzes in den Röntgenabteilungen. "

Fortschritte Röntgenstrahlen, Vol. 42, p. 645.

SCHIEFFERS, H. : " Raumstrahlung in den Bestrahlungsräumen für Tiefentherapie. "

Strahlentherapie, Vol. 22, p. 726, 1926.

" Strahlenschutz bei Therapie. "

Fortschritte Röntgenstrahlen, Vol. 34, Kongressheft, p. 178, 1926.

SCHINZ, FÜRST, MIESCHER : " Referate über Röntgen- und Radiumschädigungen. " Thesenvorschlag.

Gesellschaft der Ärzte in Zürich. Ref. *Schweizer Medizinische Wochenschrift*, 1927, p. 601.

Fortschritte Röntgenstrahlen, Vol. 36, p. 948, 1926.

SCHLECHTER, E. : " Streustrahlenschutz in der Diagnostik. "

Fortschritte Röntgenstrahlen, Vol. 34, Kongressheft, p. 178, 1926.

Ebenda, p. 946.

SCHMITT : " Schwere Röntgenverbrennungen. "

Münchener Medizinische Wochenschrift, p. 1200, 1922.

SCHNELLER, P. " Über unsere Erfahrungen mit einer Röntgentherapieanlage mit Müller-Metwa-Metalix-Therapieröhre, Deckenstativ und Hammer-Dosimeter. "

Röntgenpraxis, Vol. II, p. 855, 1930.

SCHÜRMYER : " Die Schädigungen durch Röntgenstrahlen und die Bedeutung unserer Schutzvorrichtungen. Röntgenverbrennungen und das theoretische Sachverständigengutachten. "

73. Versammlung Deutscher Naturforscher und Aerzte. Hamburg, September 1901.

Fortschritte Röntgenstrahlen, Vol. V, p. 44, 1901.

SCHÜTZ, M. : " Technische Neuheiten auf dem Gebiet der Medizin, öffentlichen Gesundheitspflege und Krankenpflege. "

Deutsche Medizinische Wochenschrift, pp. 1848 and 1934, 1928.

SCOTT, S. G. : " Schutz bei Schirmuntersuchungen. "

British Journal of Radiology (B. I. R. Sect.), Vol. 32, p. 327. *Fortschritte Röntgenstrahlen*, Vol. 36, p. 1319.

SHEARER : " Possible Dangers in Connection with the Use of X-Rays and how to avoid them. "

The Amer. Journal of Roentgenology, Vol. X, p. 240, 1923.

Sicherheit im Röntgenbetrieb.

Lancet, Vol. 210, p. 295.

Ref. : *Zentralblatt Radiologie*, Vol. I, p. 57.

SIEMENS-REINIGER-VEIFA : Gesellschaft für medizinische Technik m. b. H. " Erwiderung auf die Mitteilung der Herren B. J. van der Plaats und G. J. van der Plaats über ' Strahlenschutzröhren bei der Durchleuchtung ' in Band 39, H. 3, S. 496 dieser Zeitschrift. "

Fortschritte Röntgenstrahlen, Vol. 39, p. 905.

SIEMENS-REINIGER-VEIFA : " Filtersicherung für Röntgenröhren. " DRP., 450, 994, 1927.

Zentralblatt für Radiologie, Vol. IV, p. 564.

SIEVERT, R. M. : " Einige Untersuchungen über Vorrichtungen zum Schutz gegen Röntgenstrahlen. "

Acta Radiologica, Vol. IV, p. 61.

" A Circulating Physical Department for standardising the Roentgen Radiation used in Therapy. "

Acta Radiologica, Vol. V, p. 457.

SIEVERT, R., und THORAEUS, R. : " Experimental Measurements of the Lead-Equivalence of Various Building-Materials. "

Acta Radiologica, Vol. XI, p. 331.

SINGER, S. : " Über eine neue Methode der Filtersicherung und einer Ventilation der Röntgenröhre bei therapeutischen Bestrahlungen. "

Fortschritte Röntgenstrahlen, Vol. 35, p. 240.

SIPPEL : " Die Gefahren der modernen Röntgenbestrahlung und ihre Verhütung. "

Zeitschrift für Geburtshilfe und Gynäkologie, Vol. 86, p. 656.

SOILAND, A. : " Protective Factors in Modern High-line X-Ray Work. "

The American Journal of Roentgenology, Vol. X, p. 394, 1923.

" Further Remarks on Protective Measures with Special Reference to the High Voltage. "

Radiology, Vol. II, p. 22.

SOLOMON, I. : *Précis de Radiothérapie profonde*. Masson & C^e, Editeurs, Paris, 1926.

" Recherches sur la valeur des moyens de protection contre l'action à distance des rayons de Roentgen. "

Journal de Radiologie, t. VIII, p. 62, 1924.

Bulletin de l'Académie de Médecine de Paris, t. 110, p. 182, 1923.

- “ Sur le choix d'une unité quantitométrique internationale. ”
Journal de Radiologie, t. X, p. 155, 1926.
- “ Vergleichende Studie zwischen der französischen und der deutschen 'R-Einheit'. ”
Internationale Radiotherapie, Vol. III, p. 779.
- “ La notation de la quantité de rayonnement en unités R. ”
Bulletin de la Société de Radiologie Médicale, Nov. 1927, No. 143, p. 301. *Journal de Radiologie*, t. XII, p. 145.
- “ Vergleichende Studie von zwei dosimetrischen Röntgeneinheiten — das französische R (Solomon) und das deutsche R (Behnken). ” — Erwiderung auf die gleichnamige Arbeit von J. Murdoch und E. Stahel, Brüssel, in Vol. 27 dieser Zeitschrift *Strahlentherapie*, Vol. 29, p. 199, 1928.
Hierzu Erwiderung von H. Behnken.
Ebenda, p. 201.
- SPIEGLER : “ Eine Schaltanordnung zum Schutz von Röhre und Patient. ”
Zentralblatt Radiologie, Vol. I, p. 457.
Fortschritte Röntgenstrahlen, Vol. 34, Kongressheft, p. 182, 1926.
- STRAUSS, O. : “ Über Richtlinien für eine behördlich zu regelnde Konzessionierung der Röntgenbetriebe. ”
Fortschritte Röntgenstrahlen, Vol. 37, p. 524.
- TANDOJA, P. : X-Ray and Radium Protection : Council on Physical Therapy.
Journal Americ. Med. Assoc., Vol. XCII, p. 1428, 1929.
- TAYLOR, L. S. : “ Roentgen-Ray Protection ”.
American Journal of Roentgenology, Vol. XXII, p. 45.
- TEN DOORNKAAT KOOLMAN : “ Wirkung der in der Diagnostik verabfolgten Röntgenstrahlenmengen. ”
Klinische Wochenschrift, No. 4, p. 169, 1929.
- THORAEUS, R. : “ How far can Ordinary Milli-Ammeters be used for reading Short-Time Currents ? ”
Acta Radiologica, Vol. XI, p. 321.
- “ Todesfall infolge Überdosierung bei einer Röntgenbestrahlung. ”
Ärztliche Mitteilungen von und für Baden, 1924, No. 1.
Ref. *Fortschritte Röntgenstrahlen*, Vol. 31, p. 823.
- TUUK, J. H., VAN DER, und BOLDINGH, W. H. : “ Die Bleischuttdicken in den deutschen Strahlenschutzvorschriften. ”
Fortschritte Röntgenstrahlen, Vol. 41, p. 965.
- Vienna Letter : “ Prophylactic Measures for the Elimination of Dangers incident to the Use of Roentgen-Rays. ”
American Journal of Roentgenology, Vol. XXII, p. 267, 1929.

- VIOL, Ch. V. : " Protection of Technical Assistants and of those handling Large Quantities of Radium or Radon. "
The American Journal of Roentgenology, Vol. XV, p. 345.
- VOLTZ : " Strahlenschädigungen und Strahlenschutz. " Denkschrift, vorgelegt der Hygieneabteilung des Völkerbundes.
- VOLTZ, F. : " Ein Zeitregistriergerät für Bestrahlungszwecke. "
Strahlentherapie, Vol. 24, p. 564, 1927.
- WALCH, H., DEN HOED, D., und KOOPMAN, L. J. : " Vergleich der absoluten R-Einheit mit der französischen R-Einheit. "
Strahlentherapie, Vol. 29, p. 524, 1928.
- WALTER, B. : " In welcher Zeit wird die Erythemdosis unter einem Schutzhandschuh erreicht ? "
Fortschritte Röntgenstrahlen, Vol. 33, p. 231.
- WATTERS, R. A. : " Röntgenstrahlenschutz. "
Arch. Physic. Therapy, Vol. 9, p. 553, 1928.
- WEBER, E. : " Schädigung des Kranken und des Personals im Röntgenbetriebe und deren Prophylaxe. "
Fortschritte Röntgenstrahlen, Vol. 34, p. 728.
- WETTERSTRAND, C. A. : " A Roentgen Accident with a Fatal Result through the Short-Circuiting of the Secondary Current. "
Acta Radiologica, Vol. V, p. 105.
- WINTZ, H. : " Röntgenschädigungen in der Tiefentherapie (Kombinationsschäden). "
Verhandlungen der Deutschen Röntgengesellschaft 1922.
Fortschritte Röntgenstrahlen, Vol. 30, Kongressheft, p. 133.
- " Zur internationalen Standarddosierung. " I. Internationaler Röntgenkongress, Juli 1925. Verhandlungen der Dosierungskommission.
British Journal of Radiology, 1926.
- " Aussprache zu dem Vortrag von Haudek (Gefährlichkeit der kleinen Dosen). "
Fortschritte Röntgenstrahlen, Vol. 35, Kongressheft, p. 54.
- " Methodik der Röntgentherapie. Strahlenschutz. "
In *Lazarus, Handbuch der gesamten Strahlenheilkunde, Biologie und Pathologie*, Vol. II.
- WINTZ, H., und RUMP, W. : " Messungen an Röntgenstrahlen. "
Fortschritte Röntgenstrahlen, Vol. 29, p. 671, 1922.
- " Über die Tiefenwirkung der Röntgenstrahlen bei homogenen und inhomogenen Körpern. "
Fortschritte Röntgenstrahlen, Vol. 29, p. 580, 1922.
- " Die physikalischen und technischen Grundlagen der Röntgentherapie. "
Lehrbuch der Strahlentherapie, Vol. IV, 1, 1929.

- “ Gynäkologische Röntgentherapie. ” Part I : “ Die physikalischen und technischen Grundlagen. ”
Veit-Stoeckel : *Handbuch der Gynäkologie*, Vol. IV, 1, Hälfte, p. 196, 1930.
- WHITTINGTON : “ Some Experiments in X-Ray Protection. ”
The Journal of Radiology, Vol. V, p. 347, 1924.
- WITHERS, Sanford : “ Coolidge-tube Protection. ”
Radiology, June 1925, p. 502.
- WÖLFFLIN, E. : “ Über eine neue Schutzprothese zur Verhütung von Röntgenschädigungen des Auges. ”
Fortschritte Röntgenstrahlen, Vol. 40, p. 943.
- ZAKOVSKY, J. : “ Röntgentechnik und Schädigungsprophylaxe. ”
Sammelbericht Röntgenpraxis, I, p. 97.
- ZOLLINGER, F. : “ Die von der Schweizerischen Röntgengesellschaft vorgesehenen Schutzmassnahmen. ”
Röntgenpraxis, Vol. II, p. 613, 1930.

Training of Physicians.

- ALTSCHUL, W. : “ Unterricht und Ausbildung in medizinischer Radiologie in der Tschechoslovakei. ”
II. Internationaler Röntgenkongress, Stockholm, 1928.
Acta Radiologica, Supplementum IV, p. 103, 1930.
- BARDEEN, Ch. R. : “ The Use of Radiology in teaching Anatomy. ”
Radiology, Vol. VII, p. 384.
- BELOT, J. : “ L'enseignement de la radiologie médicale en France. ”
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 17.
- BÉNARD-GUEDES, F. : “ Der Unterricht in klinischer Röntgenologie in Portugal. ”
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 108.
- BLAINE, E. S. : “ The Teaching of Roentgenology to Undergraduates. ”
Radiology, Vol. VIII, p. 374.
- CALM, A. W. : “ Die Röntgenologie im Rahmen der Gesamtmedizin. ”
Strahlentherapie, Vol. 25, p. 353, 1927.
- CARMAN : “ The Future of Radiology. ”
Radiology, Vol. II, p. 41.
- CARTY, John R. : “ The Position of Roentgenology in the Undergraduate Medical Curriculum as seen by Recent Graduates. ”
American Journal of Roentgenology, Vol. XXIII, p. 521.

- CLARK, J. : " Undergraduate Instruction in Roentgenology. "
Radiology, Vol. VIII, p. 394.
- DARLING, B. C. : " Financing the Clinico-Pathological and X-Ray Laboratory in the Hospital, and also conserving the Professional and Economic Interests of its Medical Personnel. "
Radiology, Vol. VI, p. 127.
- DAVID, O. : " Irrwege moderner Röntgenologie, Zentralisation-Dezentralisation. "
Deutsche Med. Wochenschrift, p. 758, 1927.
- DEBICKI, K. : " Unterricht in der Röntgenologie und medizinisches Studium. "
Polska Gazeta Lekarska, 1928, p. 32.
Internationale Radiotherapie, Vol. III, p. 141.
- DEMPSTER, J. H. : " The Teaching of Radiology to Undergraduates. "
Radiology, Vol. III, p. 325.
- FORSSELL, G. : " Teaching in Medical Radiology. "
Acta Radiologica, Vol. IV, p. 638, 1925.
" Unterricht und Ausbildung in medizinischer Radiologie, mit besonderer Berücksichtigung der in Schweden gewonnenen Erfahrungen. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 145, 1930.
- FRANK, L. : " The Relation of the Roentgenologist and his Work to the Surgeon. "
Radiology, Vol. VI, p. 187, 1926.
- GARDNER, R. A. : " The Organisation of the Teaching of Medical Radiology in Egypt. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 112.
- GASSUL, R. : " Über Unterricht und Ausbildung in der Röntgenologie. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 240.
- GAUSS, C. J. : " Zur Frage des radiologischen Unterrichts. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 235.
- GROEDEL : " Über Stand und Möglichkeiten der röntgenologischen Ausbildung der deutschen Ärzte und Studenten. "
Münchener Medizinische Wochenschrift, p. 310, 1925.
- GRUDZINSKI, Z. : " Contribution à la question d'enseignement de la radiologie médicale en Pologne. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 233, 1930.
- HAUDEK, M., HOLZKNECHT, G., KIENBÖCK, R., WEBER, E. : International Association of University Lectures of Radiology.
The Journal of Radiology, Vol. VI, p. 347, 1925.

- HEUSER, C. : " Radiology in the Argentine Republic. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 116.
- HEYERDAHL, S. A. : " The Instruction in Medical Radiology in Norway. "
Acta Radiologica, Vol. IV, p. 639, *Acta Radiologica*, Suppl. IV, p. 119, Stockholm, 1928.
- HICKEY, P. M. : " The Teaching of Roentgenology in the University of Michigan. "
Radiology, Vol. VI, p. 125, 1926.
" Postgraduate Instruction in Roentgenology. "
Radiology, Vol. VIII, p. 379.
" The Teaching in Roentgenology in America. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 34.
- HOLITS, R. : " Unterricht der medizinischen Radiologie an den Universitäten in Ungarn. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 123.
- HOLTHUSEN, H. : " Die Stellung der Röntgenologie innerhalb der Medizin. "
Deutsche Medizinische Wochenschrift (Præmedicus), pp. 857, 939, 1029, 1929.
- HOLZKNECHT, G. : " Ärzteausbildung in der Röntgenologie. "
Müncher Medizinische Wochenschrift, p. 233, 1925.
" Special Training for Physicians in Roentgenology. "
Radiology, Vol. VI, p. 181.
" Über den Studentenunterricht in der medizinischen Anwendung der Röntgenstrahlen. "
Acta Radiologica, Suppl. IV, p. 5, 1930.
- International Association of University Lecturers of Radiology.
Radiology, Vol. VI, p. 265.
- KARPLUS : " Die Organisation des Unterrichts in der Röntgenologie und elektrophysiologischen Medizin in Frankreich. "
Deutsche Medizinische Wochenschrift, p. 759, 1927.
- KNOX, R., and SCALES, Sh. : " The British Institute of Radiology : its Influence upon the Teaching of Radiology and Electrology. "
The American Journal of Roentgenology, Vol. XVI, p. 175, 1926.
- " Leitsätze für die Anstellung selbständiger Röntgenärzte an Krankenanstalten. "
Fortschritte Röntgenstrahlen, Vol. 31, p. 146, 1923. (Zusammengestellt von der D.R.G. gelegentlich ihrer Tagung in München vom 15.-18. April 1923).
- LINDSAY, G. A. : " Studies in the Physics of X-Rays for Students in Medicine. "
Radiology, Vol. VIII, p. 387.

- MEYER, K. : " Communication sur l'enseignement théorique et pratique de la radiologie médicale. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 125, 1930.
- MEYER, H. : " Über den Unterricht in der Roentgenologie in Deutschland. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 48.
- MELVILLE, St. : " Education in Radiology. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 41.
- MURDOCH, J. : " L'enseignement de la radiologie médicale en Belgique. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 55.
- " Nachweis über Erfahrung und Befähigung zur Bedienung der Röntgenapparatur (Gesundheitsamt New York.) "
Münchener Medizinische Wochenschrift, p. 807, 1926.
- NAKAIDZUMI, M. : " Über Unterricht und Ausbildung in medizinischer Radiologie in Japan. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 128.
- NEGRU, D. : " L'enseignement de la radiologie médicale en Roumanie. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 130.
- NEMENOW, M. I. : " Über Ausbildung und Unterricht in der Radiologie in der U.S.S.R. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 61.
- PANNER, H. J. : " The Instruction in Medical Radiology in Denmark. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 136.
- PERUSSIA, F. : " La legge sugli specialisti. "
Radiologia med., XVI, 1929.
" L'enseignement de la radiologie médicale dans les universités italiennes. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 68.
- PHYSIKER. " Berufung eines Physikers auf die Lehrkanzel für Röntgenologie (mit Bemerkungen Holzknichts). "
Fortschritte Röntgenstrahlen, Vol. 35, p. 841.
- PLASENCIA, T. H. : " Un programme pour l'enseignement de la radiologie. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 242.
- RATERA, J. : " Evolution historique et organisation de l'enseignement de la radiologie en Espagne. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 73.
- RÉCHOU et MATHEY-CORNAT : " L'enseignement de l'électro-radiologie médicale à l'université de Bordeaux. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 237.

- ROBINSON, I. : " Zur Methodik des Röntgenunterrichts und über die Erschliessung ausserklinischer Unterrichtsstätten. "
Röntgenpraxis, Vol. I, p. 934.
- " Roentgenology in the Medical Curriculum. "
The American Journal of Roentgenology, Vol. XIII, p. 274, 1925.
- SCHINZ, H. R. : " Unterricht und Ausbildung in medizinischer Radiologie an den schweizerischen Hochschulen. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 79.
" Zur Spezialarztfrage in medizinischer Radiologie. "
Röntgenpraxis, Vol. II, p. 1009, 1930.
- SCHREUS, H. Th. : " Über die Stellung der Röntgenologie in der Medizin und Gesetzgebung und die Notwendigkeit eines Ausbaues besonderer Vertretung an den Universitäten. "
Strahlentherapie, Vol. 20, p. 432, 1925.
- STENHUIS, D. J. : " Über den Unterricht der medizinischen Radiologie in Holland. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 99, 1930.
- TODD, W. : " The Rôle of Roentgenology in Medical Education. "
American Journal of Roentgenology, Vol. XVI, p. 355.
- WEBER, E. : " Über den Stand des Studentenunterrichts in der medizinischen Röntgenologie in Lettland. "
Stockholm, 1928. *Acta Radiologica*, Suppl. IV, p. 142.

Training of Personnel.

- American Registry of Radiological Technicians.
Radiology, Vol. II, p. 51.
American Journal of Roentgenology, Vol. XI, p. 367.
- GÄRTNER : " Zur Frage der technischen Assistentinnen. "
Deutsche Medizinische Wochenschrift, p. 313, 1924. (Enthält den Erlass des Preussischen Ministers für Volkswohlfahrt vom 26. August 1921.)
- GOLDSTEIN : " Die Ausbildung der technischen Assistentin an Medizinischen Instituten. "
Deutsche Medizinische Wochenschrift, p. 1481, 1927.
- GROEDEL, F. M. : " Reformpläne zur Ausbildung der Röntgengehilfinnen. "
Fortschritte Röntgenstrahlen, Vol. 35, p. 1303, 1927.
" Zur Prüfungsordnung für technische Assistentinnen an medizinischen Instituten. "
Deutsche Medizinische Wochenschrift, p. 463, 1922.
- HILGERS, W. E., und WOHLFEIL : " Zur Frage der Ausbildung von technischen Assisten-

- tinnen an medizinischen Instituten." (Erfahrungen mit der psychotechnischen Eignungsprüfung.)
Deutsche Medizinische Wochenschrift, p. 535, 1928.
- HOFFSTAEDT, E. : " Die Ausbildung der technischen Assistentinnen an Medizinischen Instituten. "
Deutsche Medizinische Wochenschrift, p. 888, 1927.
- HOING, Margarete : " Case Management in Radiotherapy. "
Radiology, Vol. XII, p. 249, 1929.
- HOLZKNECHT, G. : " Über die Stellung der Röntgenassistentin. "
Röntgenpraxis, Vol. II, p. 481.
- JOSSELAND, P. : " Unzuträglichkeiten bei Ausübung der Röntgenologie durch Kurpfuscher. "
Arch. d'électr. méd. No. 268.
Ref. *Fortschritte Röntgenstrahlen*, Vol. XIV, p. 226.
- KIONKA, J. : " Zur Ausbildung der technischen Assistentinnen. "
Deutsche Medizinische Wochenschrift, p. 109, 1928.
- LAQUERRIÈRE, A. : " Bericht über die Ausübung der Elektrotherapie und der Röntgenologie durch nicht approbierte Personen. "
Arch. d'électr. méd. XIV, No. 199.
Ref. *Fortschritte Röntgenstrahlen*, Vol. X, p. 381.
- LAQUEUR, A. : " Zur Ausbildung des Hilfspersonals in der Physikalische Therapie. "
Zschr. f. physikalische Therapie, Vol. 39, p. 155, 1930.
- " Report of American Registry of Radiological Technicians. "
Radiology, Vol. IV, p. 150.
- " Technicians. " *The Journal of Radiology*, Vol. IV, p. 280, 1923.
" A Course for Radiological Technicians. " (Editorial.)
Radiology, Vol. V, p. 35.
A Letter from the American Registry of Radiological Technicians to those who contemplate offering Courses to Prospective Technicians.
Radiology, Vol. VI, p. 343.
" Roentgenoscopy by Technicians. " (Editorial.)
American Journal of Roentgenology, Vol. XXI, p. 74.
- WOLFF, E. : " Zur Frage der technischen Assistentin. "
Erwiderung auf den Aufsatz Prof. Gaertners in der *Deutschen Medizinischen Wochenschrift*, No. 10, p. 313, und *Zeitschrift für Röntgenologie*, No. 4, 1924. *Zeitschrift für Röntgenologie*, p. 125, 1924.

II. Protective Measures against Electric Accidents in X-Rays and Similar Establishments.

“ Internationale Richtlinien für Röntgenstrahlen und Radiumschutz. ”

Acta Radiologica, Suppl. III, Pars I, p. 66.
Fortschritte Röntgenstrahlen, Vol. 39, p. 343.

Austria.

“ Sicherheitsvorschriften für elektrische Starkstromanlagen. ” Herausgegeben vom Elektrotechnischen Verein in Wien. “ Vorschriften für Röntgenanlagen. ” SCHÖNFELD, A. : “ Schutzmassnahmen im Röntgenbetrieb. ” (*De lege ferenda.*)
Wiener Medizinische Wochenschrift, Nos. 35, 36, 37, 38, 1929.

Czechoslovakia.

“ Vorschriften des Čechoslowakischen Elektrotechnischen Verbandes für elektromedizinische Anlagen. ” Teil XVIII des *Vorschriftenbuches ESC 1930.*

Denmark.

“ Betaenkning fra det af Ministeriet for Sundhedsvaesen under 24. August 1927 nedsatte Røntgenudvalg. ” København, Trykt hos G. H. Schultz a/s 1928.

England.

“ Internationale Richtlinien. ”

Germany.

“ Vorschriften für den Hochspannungsschutz in medizinischen Röntgenanlagen. DIN Roent. 3. ” Beuth Verlag, Berlin S.W.14, Dresdener Str. 97.
Fortschritte Röntgenstrahlen, Vol. 40, p. 542, 1929.

Greece.

Memorandum of the Greek Ministry of Public Health. (League of Nations, document C.H.827.)

Hungary.

RATKOCZI, Budapest : “ On injuries in X-Ray Laboratories and Protective Measures. Proposals for Legislation providing for the Following Protective Measures. ”
League of Nations, document C.H.775.

Spain.

Stadt Madrid. “ Prescriptions of the Constitutional Council of Madrid : Chapter IX, (a). Medico-Electro-Radiological Installations. ”

Sweden.

“ Proposals from the Swedish X-Ray and Radium Protection Committee. ” Second International Congress of Radiology. Stockholm July 23rd-27th, 1928.
Kungl. Boktryckeriet. P. A. Norstedt & Söner.

Switzerland.

“ Richtlinien der Schweizerischen Röntgengesellschaft für die Erstellung und Führung von Röntgeneinrichtungen. ”

Strahlentherapie, Vol. 31, p. 829.
Röntgenpraxis, II, p. 613, 1930.

Union of Soviet Socialist Republics.

Verfügung des “ Volkskommissariats der Arbeit ” der Räterepublik vom 22. Nov. 1924 No. 478/487 : “ Sicherheitsmassregeln für elektrotechnische Anlagen mit starkem Strom von niedriger und hoher Spannung. ”

Nachrichten des Volkskommissariats der Arbeit der Räterepublik 1924, No. 46.

* * *

ANGEBAUD : “ Dispositif de protection pour haute tension dans les installations radiologiques. ”

Journal de Radiologie et d'Electrologie, t. VII, p. 227.

BANGERT, K. : “ Die Vorschriften für den Betrieb elektrischer Starkstromanlagen und ihre Anwendung in der Röntgentechnik. ”

Zentralblatt Röntgenstrahlen, Radium und verwandte Gebiete, p. 3, 1919.

BEEKMANN : “ Gewebsverbrennungen durch hohe Hitze. ”

Klinische Wochenschrift, p. 743, 1923.

BORUTTAU, zit. nach BEHNKEN : *Handbuch der Physik*, Vol. 17, p. 197, 1926.

BOUWERS, A. : “ Röntgenröhren mit vollständigem Hochspannungsschutz bis 200 kv. ”
Strahlentherapie, Vol. 38, p. 157, 1930.

BREMONT, J., y MASGRAU : “ Los peligros del instrumental de alta tension para Rayos X. ”
Revista de Diagnostico y Tratamiento Fisicos, I, p. 139, 1925.

CONNOLLY, F. T. : “ The Testing and Rating of Transformers for X-Ray Work. ”

Brit. Journ. of Radiology (Journal of the Roentgen Society), Vol. 23, No. 92, p. 224, 1927.

ERBEN : “ Spätwirkungen galvanischer Ströme. ”

Medizinische Klinik, p. 426, 1923.

DELKESKAMP, G. : *Über Verletzungen durch den elektrischen Strom. Bruns Beiträge zur klinischen Chirurgie*, Vol. 141, p. 515, 1927.

FRITSCH, E. : “ Die Beseitigung der Hochspannungsgefahr im Röntgenbetriebe durch den Securo. ”

Fortschritte Röntgenstrahlen, Vol. 37, p. 309, 1928.
Ebenda, Vol. 40, Kongressheft, p. 110, 1929.
Strahlentherapie, Vol. 28, p. 810.

“ Zur Frage des Hochspannungsschutzes an Röntgeneinrichtungen. ”

Röntgenpraxis, Vol. II, p. 375, 1930.

- GAUSS, C. J. : (Hochspannungsschutz.) *Lehrbuch der Strahlentherapie*, Vol. IV, 1, p. 374.
- GROEDEL, F. M., und LOSSEN, H. : " Schutzmassregeln gegen elektrische Unfallschäden in modernen Röntgenbetrieben. " *Medizinische Klinik*, p. 465, 1925.
- HENLER, W. F. : " High-Tension Electric Shocks in Roentgenologie Practice. " *American Journal of Roentgenology*, Vol. IX, p. 365, 1922.
" Complete Insulation versus Grounding as Protection against High-Tension Electric Shocks. " *American Journal of Roentgenology*, Vol. XV, p. 49, 1926.
- HOLSTEIN-RATHLOU : " De tekniske Forhold, der staar i Forbindelse med Ulykkestilfaeldet i Helsingör. " *Hosp.-Tid.*, 1928, p. 1.
- JELLINEK : " Hautschädigungen durch Elektrizität. " *Wiener Klinische Wochenschrift*, No. 9, 1923.
" Aufgaben und Ziele der Elektropathologie. " *Wiener Klinische Wochenschrift*, p. 1181, 1929. -
- JONA, M., und ZAKOVSKY, J. : " Über Hochspannungsschutz an Röntgeneinrichtungen. " *Röntgenpraxis*, Vol. I, p. 927, 1929.
- KENNELLY, A. E. : " The Danger of Electric Shock from the Electrical Engineering Standpoint. " *Physic. Therapeut*, Vol. 45, p. 16, 1927.
- KLEMPERER : " Hochspannungsvoltmeter. " *Physikalische Zeitschrift*, p. 673, 1927.
- LEVY-DORN : " Die Tötung eines Arztes und seiner Gehilfin durch den elektrischen Strom bei Vornahme einer Röntgenuntersuchung. " *Medizinische Klinik*, p. 1762, 1924.
- LEVY : " Kritische Bemerkungen über den Schutz gegen Hochspannungsgefahr für Arzt, Patient und Personal im Röntgenlaboratorium. " *Röntgenpraxis*, Vol. I, p. 556, 1929.
- MARAGLIANO : " L'impiego dell' oscilloscopio quele mezzo di misura della corrente de alta tensione. " *Radiologia Medica*, 13, p. 205, 1926.
- " Massregeln gegen die Hochspannungsgefahr in Röntgenzimmern. " *Ziekenhuis*, p. 26, 1925.
- MIEREMETT : " Hautveränderungen durch Einwirkung des elektrischen Stromes, ihre differentialdiagnostische Bedeutung und ihr histologisches Bild. " *Klinische Wochenschrift*, p. 1362, 1923.

- MUTSCHELLER, A. : " Physical Characteristics and Physiological Effects of High-Frequency Currents. "
Radiology, May 1927, p. 427.
- NIEMANN : " Hochspannungsberührungsschutz. "
Fortschritte Röntgenstrahlen, Vol. 38, p. 1128, 1928.
- NIXDORF und BRANDENBURG, zit. nach BEHNKEN : *Handbuch der Physik*, Vol. 17.
- NÖLKE, W. : " Elektrischer Unfall durch einen Fusschalter. "
Röntgenpraxis, Vol. I, p. 512, 1929.
- OTTO, W. : " Schutzeinrichtung von Hochspannungsschäden bei Berührung von hochspannungsführenden Teilen von Röntgenröhren. " (Zusatz zu DRP. 398, 541. 1927) DRP. 451, 815. 1927.
Zentralblatt für Radiologie, Vol. IV, p. 537.
- PLAATS, B. J. VAN DER : " Massregeln gegen die Hochspannungsgefahr in Röntgenzimmern. "
II. Ziekenhuis, p. 46, 1928.
Fortschritte Röntgenstrahlen, Vol. 37, p. 270, 1928.
" Massregeln gegen die Hochspannungsgefahr in Röntgenzimmern. "
II. Ziekenhuis, p. 46, 1928.
Rheinisch-Westfälische Röntgengesellschaft 26. November 1927.
Sitzungsbericht : *Fortschritte Röntgenstrahlen*, Vol. 37, p. 270, 1928.
- PANSDORF : " Starkstrom- und Hochspannungsschäden im Röntgenbetriebe. "
Röntgenpraxis, Vol. II, p. 359, 1930.
- PFAHLER, G. E. : " A Protection Device for High-Voltage Therapy. "
The American Journal of Roentgenology, Vol. XIII, p. 291, 1925 (Zu Strahlenschutz).
- PIETRUSKY, F. : " Zur Begutachtung elektrischer Unfälle. "
Monatsschrift für Unfallheilkunde und Versicherungsmedizin, p. 121, 1927.
" Über den tödlichen elektrischen Unfall. "
Medizinische Klinik, p. 339, 1930.
- POMETTA, D. : " Nothilfe bei elektrischen Unfällen. "
Schweizer Medizinische Wochenschrift, p. 82, 1930.
Zeitschrift für die gesamte physikalische Therapie, Vol. 39, p. 66, 1930.
- SCHRIDDES : " Der elektrische Tod. "
Monatsschrift für Unfallheilkunde und Versicherungsmedizin, p. 275, 1925.
- SOILAND, A. : " Further Remarks on Protective Measures with Special Reference to High Voltage. "
Radiology, Vol. II, p. 22.
- SPIEGLER, G. : " Der akustische Milliamperezähler. "
Röntgenpraxis, Vol. I, p. 758, 1929.

- STARKE, H., und SCHROEDER, R. : " Ein direkt anzeigendes statisches Voltmeter für hohe Spannungen. " *Strahlentherapie*, Vol. 29, p. 798, 1928.
- STRASSMANN, G. : " Vier Todesfälle durch elektrischen Strom. " *Arztliche Sachverständigenzeitung*, No. 2, 1925.
- THIBONNEAU : " Précautions à prendre contre les accidents dus aux chutes des trolleys. " *Journal de Radiologie*, t. VII, p. 409.
- THOREUS, R. : " How far can Ordinary Milli-Ammeters be used for reading Short-Time Currents ? " *Acta Radiologica*, Vol. XI, p. 321, 1930.
- VULPIUS : " Seltene Folge eines Betriebsunfalles im Röntgenzimmer. " *Monatsschrift für Unfallheilkunde*, p. 5, 1927.
- ZIEMKE, E. : " Todesfälle durch den elektrischen Strom und ihre Beziehungen zum Unfall. " *Monatsschrift für Unfallheilkunde und Versicherungsmedizin*, Nos. 5/6, 1923.

III. Hygienic Measures in the Radiological Establishments.

" Internationale Richtlinien für Röntgenstrahlen- und Radiumschutz. "

Acta Radiologica, Suppl. III, Pars 1, p. 66.

Fortschritte Röntgenstrahlen, Vol. 39, p. 343, 1929.

Austria.

Schönfeld, A. : " Schutzmassnahmen im Röntgenbetrieb. " (De lege ferenda.)

Wiener Medizinische Wochenschrift, Nos. 35, 36, 37 and 38, 1929.

England.

X-Ray and Radium Protection Committee. Third Revised Report (May 1927).

The British Journal of Radiology, Vol. 32, p. 330, 1927.

S. " Internationale Richtlinien. "

Germany.

" Vorschriften für den Strahlenschutz in medizinischen Röntgenanlagen. " (DIN-Röntgen-Normen.) Beuth-Verlag, Berlin, S.W. 14, Dresdenerstr. 97.

Vollständiger Wortlaut : *Fortschritte Röntgenstrahlen*, Vol. 41, p. 86, 1930.

Greece.

Memorandum of the Greek Ministry of Public Health.

League of Nations, document C.H.827.

Hungary.

RATKOCZI, Budapest : " On Injuries in X-Ray Laboratories and Protective Measures.

Proposals for Legislation providing for the Following Protective Measures. "

League of Nations, document C.H.775.

Sweden.

“ Proposals from the Swedish X-Ray and Radium Protection Committee. ”
Kungl. Boktryckeriet. P. A. Norstedt & Söner.

Union of Soviet Socialist Republics.

“ Verfügung des “ Volkskommissariats der Arbeit ” der Räterepublik vom 9. Sept. 1925,
No. 233/389 betreffs des Arbeitsschutzes der in Röntgenkabinetten tätigen Arbeiter. ”
Fortschritte Röntgenstrahlen, Vol. 35, p. 781, 1927.

* * *

ADAM, A. : “ Ultraviolettlicht und D-Vitaminforschung in ihrer Bedeutung für die Rachitis. ”

Ergebnisse der medizinischen Strahlenforschung, Vol. IV, p. 109, 1930.

ANDERSEN und KOHLMANN : “ Experimentelle Untersuchungen über die Ursachen des Röntgenkaters. ”

Fortschritte Röntgenstrahlen, Vol. 30, Kongressheft, I and II, p. 148, 1922.

“ Der Röntgenkater, seine Verhütung und seine Behandlung. ”

Fortschritte der Therapie, Vol. IV, p. 75, 1928.

BLUMER, L. : “ Verhütung der Strahlenschädigungen vom Standpunkt des Gynäkologen. ”

Schweizer Medizinische Wochenschrift, p. 606, 1927.

Zentralblatt Radiologie, Vol. III, p. 777.

BOUCHACOURT, L. : “ Sur la protection des radiologistes pendant les examens radioscopiques. ”

Journal de Radiologie, t. 14, p. 487, 1930.

BRAUN, Reichsarbeitsminister. Berlin, 6. August 1925. “ Die Richtlinien über gewerbliche Berufskrankheiten. ”

Klinische Wochenschrift, p. 1750, 1925.

BUREAU INTERNATIONAL DU TRAVAIL : Radiologues (Pathologie professionnelle et hygiène).
D'après un rapport original du professeur F. PERUSSIA (Milan) révisé par le Comité de correspondance d'hygiène industrielle du Bureau international du Travail.

Hygiène du Travail, No. 131.

BUCKY, G. : “ Die Diathermie-Behandlung des Röntgenkaters ”.

Fortschritte Röntgenstrahlen, Vol. 30, Kongressheft, I and II, p. 151, 1922.

BURGHEIM, F. : “ Die Bedeutung des Cholesterins für das Zustandekommen und die Verhütung des ‘ Röntgenkaters ’. ”

Deutsche Medizinische Wochenschrift, p. 1858, 1927.

“ Neue Untersuchungen zur Pathogenese und Therapie des Röntgenkaters. ”

Strahlentherapie, Vol. 27, p. 297, 1927.

CZEPA und HÖGLER : “ Zur Pathogenese des Röntgen- und Radiumkaters. ”

Klinische Wochenschrift, p. 2341, 1923.

DADLEZ (Ozonisierende Wirkung der Quecksilberdampflampe). *Comptes rendus* 185, p. 89, 1927.

Zit. nach Adam. *Ergebnisse der medizinischen Strahlenforschung*, Vol. IV, p. 109.

DAVID, O., und HIRSCH, M. : " Über die Ventilation von Röntgeninstituten (mit einer Übersichtsskizze). "

Acta Radiologica, Vol. IX, p. 305, 1928.

DÖDERLEIN, A. : " Strahlenbehandlung und Nachkommenschaft. "

Deutsche Medizinische Wochenschrift, p. 1997, 1928.

DYES, Otto : " Die Dunkelkammer und ihre zweckmässige Einrichtung. "

Fortschritte Röntgenstrahlen, Vol. 42, p. 387, 1930.

FISCHER, Eugen : " Strahlenbehandlung und Nachkommenschaft. "

Deutsche Medizinische Wochenschrift, p. 89, 1929.

FLASKAMP, W. : " Röntgenschädigungen, ihre zivil- und strafrechtlichen Folgen. "

Klinische Wochenschrift, No. 22, 1922.

" Röntgenschädigungen als Unfälle und Gewerbekrankheiten. "

Fortschritte Röntgenstrahlen, Vol. 32, p. 641, 1924.

" Über Röntgenschäden und Schäden durch radioaktive Substanzen. "

12. Sonderband der Strahlentherapie. Verlag Urban und Schwarzenberg, Berlin-Wien, 1930.

FOVEAU DE COURMELLES : " Radioanaphylaxie. "

Arch. d'Electr. méd. et de Physiothérapie, No. 482, p. 327, 1922.

Fortschritte Röntgenstrahlen, Vol. 31, p. 129, 1923.

FRIESLEBEN, M. : " Berufliche Röntgenschädigungen und ihre Verhütung. "

Deutsche Medizinische Wochenschrift, p. 464, 1929.

" Röntgenschädigungen beim Hilfspersonal. "

Deutsche Medizinische Wochenschrift, p. 1680, 1929.

FRIK, K., und LEVY-DORN, Max : " Die beim Arbeiten mit Röntgenstrahlen auftretenden Gefahren und ihre Verhütung. "

Deutsche Zeitschrift für öffentliche Gesundheitspflege, p. 147, 1927.

Zentralblatt für Radiologie, Vol. IV, p. 358.

GUTHMANN : " Schädigungen an Bestrahlten und Bestrahlern durch die im Röntgenzimmer entstehenden Gase. " Erlangen, Dissertation, 1919.

Sitzungsberichte der Physikalisch-Medizinischen Sozietät in Erlangen. Vols. 50, 51 (1918-19).

" Über den Gehalt der Röntgenzimmerluft an Ozon und salpetriger Säure und über die Ursache der Röntgengasvergiftung (Ozonwirkung). "

Strahlentherapie, Vol. 12, p. 262.

- “ Nochmals zur Frage der Gasvergiftung im Röntgenzimmer. Erwiderung an Herrn Dr. Lönne. ”
Münchener Medizinische Wochenschrift, p. 89, 1922.
- HAHN, K. : “ Röntgenstrahlenschädigungen der Haut, ihre Prophylaxe und Therapie mit Raderma. ”
Medizinische Klinik, No. 44, 1930.
- HOFFMANN, F. L. : “ Radiumnekrose. ”
Journ. Amer. Med. Assoc. 85/13, p. 961.
Ref. Fortschritte Röntgenstrahlen, Vol. 34, p. 208, 1925.
- LACASSAGNE, A. : “ Eine neue Berufskrankheit bei der Hantierung mit radioaktiven Körpern. ”
Paris méd., p. 132, 1926.
Ref. Fortschritte Röntgenstrahlen, Vol. 34, p. 822, 1926.
- “ Anémie pernicieuse et leucémie myéloïde mortelles provoquées par la Manipulation de substances radioactives. ” (En collaboration avec Emile WEIL.)
Bulletin de l'Académie de Médecine, 3rd Series, Vol. XCIII, p. 237.
- LIGNAC et DEVOIS : “ A propos de la pathogénie du mal des irradiations pénétrantes. ”
La Presse médicale, No. 27, p. 292 (April 2nd, 1924).
- LOEFFLER, L. : “ Röntgenschädigungen der männlichen Keimzelle und Nachkommenschaft. Ergebnisse einer Umfrage bei Röntgenärzten und Technikern. ”
Strahlentherapie, Vol. 34, p. 735.
- LOENNE : “ Zur Kritik der Ozonbestimmung. Ein Beitrag zur Frage der Gasvergiftung im Röntgenzimmer. ”
Münchener Medizinische Wochenschrift, p. 1519, 1921.
- LUNDQUIST, A. : “ Über die Einrichtung der Dunkelkammer an Röntgenabteilungen. ”
Acta Radiologica, Vol. IX, p. 65, 1928.
- MAHNERT und ZACHERL : “ Die Behandlung des Röntgenkaters mit hypertonen Lösungen. Zugleich ein Beitrag zur Frage ihrer Wirkungen. ”
Wiener klinische Wochenschrift, No. 7, 1923.
- MALLET et COLIEZ : “ Influence de l'ozone dans le mal des irradiations. ”
Journal de Radiologie et d'Electrologie, 1922, No. 6.
- MARTLAND, H. S., COULON, P., und KNEF, J. P. : “ Einige unbekannte Gefahren bei dem Gebrauch und der Hantierung mit radioaktiven Substanzen, mit besonderer Beziehung auf die Speicherung unlöslicher Radium- und Mesothoriumprodukte im reticulo-endothelialen System. ”
Journ. Amer. Med. Assoc. 1925/85, p. 1769.
Fortschritte Röntgenstrahlen, Vol. 34, p. 424.
- MELVILLE, St. : “ Radiography as it affects the Assurability of Operators. ”
The Lancet, February 12th, 1927.

MEMMESHEIMER : " Ein Beitrag zur Frage des Röntgenkaters. "

Strahlentherapie, Vol. 16, p. 741, 1924.

MURPHY, D. P. : " Ovarian Irradiation; its Effect on the Health of Subsequent Children. Review of Literature, experimental and clinical, with a Report of three hundred and twenty Human Pregnancies. "

Surg., Gynec., Obstetr., Vol. 47, p. 201, 1928.

Zentralblatt Radiologie, Vol. VI, p. 458.

" Ovarian Irradiation and the Health of the Subsequent Child. A Review of more than two hundred previously Unreported Pregnancies in Women subjected to Pelvic Irradiation. "

Surg., Gynec., Obstetr., Vol. 48, p. 766, 1929.

Zentralblatt Radiologie, Vol. VII, p. 527.

NAUJOKS, H. : " Die Entwicklung der Kinder, die nach temporärer Strahlensterilität der Mutter geboren wurden. "

Strahlentherapie, Vol. 37, Chap. 3.

" Fertilität und Nachkommenschaft früherer Röntgenassistentinnen. " (Ein Beitrag zur sog. " Keimschädigung ".)

Strahlentherapie, Vol. 32, p. 613.

NEUDA, REDLICH, SIELMANN : " Zur Pathogenese des sog. Röntgenkaters. "

Klinische Wochenschrift, No. 28, p. 1306, 1923.

NEUDA : " Patogénesis del llamado ' Kater ' roentgenologica. "

Revista de Radiologia, Year 2, p. 4, 1924.

NÜRNBERGER, L. : " Die tiereperimentellen Grundlagen zur Frage der Spätschädigung durch Röntgenstrahlen. "

Strahlentherapie, Vol. 37 (Festschrift für Döderlein).

PERUSSIA : " Berufliche Pathologie und Hygiene des Röntgenologen ".

See under : Bureau international du Travail.

REINBERG, S., und KUPRITZ, E. : " Gewerbliche Schädigung bei der Herstellung von Röntgenröhren in der (Leningrader) Elektrovakuumanstalt. "

Gigiena truda, No. 7/8, pp. 59/66.

Internationale Radiotherapie, Vol. II, p. 59.

REUSCH, W. : " Gasvergiftung im Röntgenzimmer und ihre Verhütung. "

Münchener Medizinische Wochenschrift, p. 445, 1917.

Röntgenkater (Acidosis) : *Radiology*, Vol. II, p. 160, 1924.

ROSENZWEIG, B. K. : " Berufliche Erkrankungen der Röntgenologen und ihre Prophylaxe. "

Fortschritte Röntgenstrahlen, Vol. 36, p. 778, 1927.

RUSSIE. — " La Journée des Médecins Radiologistes. "

Journal de Radiologie, t. X, p. 19.

SCHECHTMANN, J. : "Die Luftionisation in Röntgenräumen. "

Fortschritte Röntgenstrahlen, Vol. 42, p. 639.

SCHMITT, W. "Über die spätere Entwicklung der Kinder vorbestrahlter Frauen. "

Strahlentherapie, Vol. 30, p. 24, 1928.

Monatsschrift für Geburtshilfe und Gynäkologie, Vol. 80, p. 157. Aussprache, p. 195, 1928.

SCHMITZ, H. : "The Treatment of Primary and Latent Injuries of the Skin from Radium and X-Rays. "

Radiology, Vol. I, p. 34, 1923.

"The Clinical Significance and Treatment of Radiation Sickness. "

Radiology, Vol. II, p. 137, 1924.

SCHÖNFELD, A. : "Schutzmassnahmen im Röntgenbetrieb. "

Wiener Medizinische Wochenschrift, No. 35, 36, 37 and 38, 1929.

SIELMANN : "Untersuchungen über den Einfluss der Röntgenstrahlen auf den Kochsalzstoffwechsel und seine Beziehungen zur Therapie des 'Röntgenkaters'. "

Strahlentherapie, Vol. 15, p. 458, 1923.

SOLOMON, I. : *Précis de radiothérapie profonde*.

Masson & C^e, Editeurs, Paris, 1926.

UHLMANN, H. : "Über die Möglichkeit der Vermeidung von Strahlenschäden der Haut. "

Strahlentherapie, Vol. 38, 1930.

UNTERBERGER : "Röntgenschädigung der Frucht durch wiederholte Durchleuchtungen während der Schwangerschaft. "

Zentralblatt für Gynäkologie, p. 44, 1929.

Verhandlungen der Deutschen Röntgengesellschaft, Vol. 17a. "Ovarialbestrahlung und Nachkommenschaft. " Aussprache.

Fortschritte Röntgenstrahlen, Vol. 35, Kongressheft, pp. 30 et seq., 1926 (Naturforschertag, Düsseldorf).

Verhandlungen der Deutschen Gesellschaft für Gynäkologie, Leipzig 1929. Aussprache über die Frage der Keimschädigung.

Archiv. f. Gynäkologie, Vol. 137, p. 974.

Verhandlungen der Bayerischen Gesellschaft für Geburtshilfe und Frauenheilkunde. "Zur Frage der Keimschädigung nach Röntgenbestrahlung der Ovarien. " Sitzungsberichte.

Monatsschrift für Geburtshilfe und Frauenheilkunde, Vol. 56, p. 92 (1921) ; Vol. 67, p. 228 (1924) ; Vol. 71, p. 204 (1925) ; Vol. 76, p. 349 (1925) ; Vol. 79, p. 122 (1927) ; Vol. 80, p. 179 (1927) ; Vol. 88, p. 111 (1931).

Verhandlungen der Bayerischen Gesellschaft für Geburtshilfe und Frauenheilkunde. Sitzung vom 27. Februar 1927 zu München. "Richtlinien zur Unterbrechung der Schwangerschaft bei Verdacht auf Keimschädigung nach Bestrahlung der Frucht in utero. "

Monatsschrift für Geburtshilfe und Gynäkologie, Vol. 79, p. 141. 1927.

Vorschriften für das Verhalten nach der Bestrahlung und für die Behandlung der bestrahlten Hautstellen.

Röntgeninstitut der Universitäts-Frauenklinik Erlangen (Direktor : Professor Dr. H. Wintz).

WARREN and WHIPPLE : " Roentgen-Ray Intoxication. "

Journal of Experimental Medicine. Vol. 38, pp. 713, 725, 731, 741, 1923.

WEBER, E. : " Schädigungen des Kranken und des Personals im Röntgenbetriebe und deren Prophylaxe. Hygiene des Röntgenbetriebs. "

Fortschritte Röntgenstrahlen, Vol. 34, p. 728, 1926.

WELSCH, K. : " Die Salbenbehandlung der bestrahlten Haut. "

Münchener Medizinische Wochenschrift, p. 1489, 1930.

WINTZ, H. : " Die Gasvergiftung im Röntgenzimmer. "

Münchener Medizinische Wochenschrift, p. 297, 1918.

" Röntgenschädigungen in der Tiefentherapie. " (Kombinationsschäden !)

Fortschritte Röntgenstrahlen, Vol. 30, p. 133, des Kongressheftes.

" Injuries from Roentgen-Rays in Deep Therapy. "

American Journal of Radiology, Vol. X, p. 140, 1923.

" Die Vor- und Nachbehandlung nach Röntgenbestrahlung. "

Therapie der Gegenwart, Juni 1923.

" Fore-care and After-care. "

Radiology, Vol. II, 1924.

" Die Mitarbeit des praktischen Arztes bei der Röntgentherapie. "

Deutsche Medizinische Wochenschrift, p. 700, 1927.

" Strahlenschäden an Hoden, Eierstock und Frucht. "

Monatsschrift für Geburtshilfe und Gynäkologie, Vol. 78, p. 428, 1928.

" Die Methodik der Röntgentherapie " in *Handbuch der gesamten Strahlenheilkunde, Biologie, Pathologie und Therapie* herausgegeben von Lazarus. Verlag J. F. Bergmann, München, 1928.

WINTZ, H., und FLASKAMP, W.: " Zur Frage der Schädigung der Nachkommenschaft durch Röntgenstrahlen. " Naturforschertagung, Düsseldorf, 1926.

Fortschritte Röntgenstrahlen, Vol. 35, Kongressheft, p. 42.

WULLYAMOZ, Lausanne : " Un cas d'aspermatozoidie roentgénienne guéri par le port pendant huit mois d'un tablier protecteur invisible sous les vêtements. "

Arch. d'électricité méd., p. 278, 25 janvier 1910.

Ref. Journal de Radiologie, t. IV, p. 63, 1910.

Fortschritte Röntgenstrahlen, Vol. XV, p. 54.

ZWEIFEL, E. : " Kein Röntgenkater mehr i "

Strahlentherapie, Vol. 18, p. 875, 1924.

Hierzu : *Czepa*, Vol. 19, p. 601 und *Schwartz*, p. 606.

Materialiensammlung der Unfälle und Schäden in Röntgenbetrieben. Herausgegeben von F. M. Groedel, G. Liniger und H. Lossen.

Fortschritte Röntgenstrahlen, Ergänzungsband 36, fasc. 1 (first fasc.), 1925. Ergänzungsband 33 (second fasc.), 1927.

Materialiensammlung von Unfällen und Schäden in Schweizerischen Röntgenbetrieben.

Herausgegeben von H. R. Schinz und F. Zollinger.

Röntgenpraxis, II, pp. 385, 433, 505, 546, 613, 1930.

IV. Safe-Guarding of Storage of X-Ray Films.

Germany.

" Denkschrift des preussischen Ministeriums für Volkswohlfahrt vom 2. März 1929, über die Gefahren der in den Krankenhäusern verwendeten Röntgen-usw.-Filme aus Zelluloid. "

Mitteilungen, in *Röntgenpraxis*, Vol. I, p. 472, 1929.

Bayern. — " Sammlung von feuerpolizeilichen Vorschriften in Bayern ", herausgegeben von O. Hofmiller.

München 1929, Schweitzer Verlag. Vorschriften vom 9. März 1912 in der Fassung vom 19. Juni 1926.

Frankfurt. — Örtliche Regelung der Filmaufbewahrung im Frankfurter Bezirk. "

Mitteilungen, in *Röntgenpraxis*, Vol. II, p. 273, 1930.

Normenstelle der Deutschen Röntgengesellschaft " Arbeitsgruppe IX " Filmkonservierung. Vorschriften für die Handhabung und Lagerung von Röntgenfilmen in medizinischen Betrieben. (Din-Röntgen-Normen.) Vorschlag 1. Einspruchsfrist bis 1. September 1930.

Fortschritte Röntgenstrahlen, Vol. 42, p. 130, 1930. (Vollständiger Wortlaut.)
Schlussentwurf: Din Rönt. 3; Beuth Verlag, G.m.b.H. Berlin, S. 14.

Normenstelle der Deutschen Röntgengesellschaft, Arbeitsgruppe IX " Filmkonservierung " : Vorschriften für die Handhabung und Lagerung von Röntgenfilmen in medizinischen Betrieben. (Din Roent 3).

Fortschritte Röntgenstrahlen, Vol. 43, p. 113, 1931.

Strahlentherapie, Vol. 40, p. 392. (Endgültige Fassung).

Normenstelle der Deutschen Röntgengesellschaft, " Arbeitsgruppe IX ", Bemerkungen zu dem Artikel des Herrn Dr. Wertheimer (Über Röntgenfilmaufbewahrung).

Röntgenpraxis, Vol. II, p. 957.

Röntgenpraxis, Vol. II, pp. 958 and 960.

Fortschritte Röntgenstrahlen, Vol. 42, pp. 669 et seq.

England.

“ Handling and Storage of X-Ray Films. ” Recommendation of the X-Ray and Radium Protection Committee.

Brit. Medical Journal, No. 3593, p. 923.

Zentralblatt Radiologie, Vol. VIII, p. 211.

United States of America.

Proceedings of the Board of the Chemical Warfare Service, appointed for the purpose of investigating conditions incident to the disaster of the Cleveland Hospital Clinic, Cleveland, Ohio, on May 15th, 1929, Edgewood Arsenal, Maryland I. T., Walter C. Baker, C.W.S., Commanding.

Summary in “ Report on the Recent Fire at the University of California Hospital. ”, by Howard E. Ruggles.

American Journal of Roentgenology, Vol. XXIII, p. 84, 1930.

Report of the Committee on Safety and Standards.

“ Regulations for the Storage and Handling of Photographic and X-Ray Nitro-Cellulose Films. ”

American Journal of Roentgenology and Radium Therapy, Vol. XXIII, p. 81.

* * *

BALASZ, G. : “ Über die beim Brennen der Röntgenfilme entstehenden Gasvergiftungen. ”

Magy. Röntgen-Közl., p. 263, 1929.

Zentralblatt Radiologie, Vol. VIII, p. 757.

BARKE : “ Röntgenfilme in Krankenhäusern, ihre Gefahren und deren Anwendung. ”

Zeitschrift für Krankenhauswesen, p. 265, 1930.

Zentralblatt Radiologie, Vol. IX, p. 259.

BEHN : “ Einiges zur Filmfrage. ”

Röntgenpraxis, Vol. I, p. 843, 1929.

BRAUN-SOLINGEN : “ Neue Wege zur Verhütung der Gas- und Feuersgefahr beim Aufbewahren von Röntgenfilmen. ”

Röntgenpraxis, Vol. II, p. 84, 1930.

“ Über Aufbewahrung von Röntgenfilmen. ” Naturforschertagung, Königsberg, 1930.

Röntgenpraxis, Vol. II, p. 953, 1930.

BROWN, C. R. : “ Safeguarding the Storage of Photographic, Motion-Picture and X-Ray Films. ”

Radiology, Vol. XIV, p. 454, 1930.

Disaster at the Cleveland Hospital Clinic.

Government Printing Office, Washington, 1929.

EFFENBERGER : “ Die Lagerung von Röntgenfilmen in Krankenhäusern. ”

Feuerschutz, Zeitschrift des Reichsvereins Deutscher Feuerwehringenieure, Berlin, April 1930.

- FEILITZEN, VON : *Brandskydd, Svenska Brandskyddsföreningens tidskrift*, Okt. 1929.
- FOLEY, M. O. : " Cleveland Disaster spurs Inquiry into Hospital Film Storage Methods. " *Hospital Management*, Vol. XXVII, No. 6, 1929.
- GIEBMANN : " Wirksame Bekämpfung von Filmbränden. " *Strahlentherapie*, Vol. 38, p. 196, 1930.
- GLOCKER, R. : " Die Filmbrandgefahr und die Massnahmen zu ihrer Verhütung. " *Fortschritte Röntgenstrahlen*, Vol. 41, p. 53.
- HAENISCH, F. : " Über die Aufbewahrung des Filmarchivs. " *Röntgenpraxis*, Vol. II, p. 273, 1930.
" Filmkonservierung. " Referat gehalten auf der Tagung der Deutschen Naturforscher und Ärzte. September 1930, Königsberg in Pr.
Röntgenpraxis, Vol. II, p. 952, 1930.
- HERRNKIND, O. P. : " Die Feuergefährlichkeit der Röntgenfilme. " *Röntgenpraxis*, Vol. I, p. 649, 1929.
- HOBBS, R. D. : " Methoden der Aufbewahrung von Röntgenfilmen, um der Feuergefahr vorzubeugen. " *Journal of the American Medical Association*, Vol. 92, p. 1763, 1929. Ref. *Fortschritte Röntgenstr.*, Vol. 40, fasc. 2.
Aus der röntgentechnischen Abteilung der I. G. Farben Industrie A.-G. (Leiter : Dr. Limpach) : " Über die Feuergefährlichkeit von Röntgenfilms. " (Bemerkungen zu dem Aufsatz von Prof. Dr. Walter Straub.) *Münchener Medizinische Wochenschrift* 1929, No. 25.
Münchener Medizinische Wochenschrift, p. 1565, 1929.
- JANKER-BONN : " Zur Möglichkeit der Selbstentzündung von Röntgenfilmen. " *Röntgenpraxis*, Vol. I, p. 378.
- KAISER : " Aufbewahrung von Röntgenfilmen in Schränken aus Hartholz. " *Feuerschutz, Zeitschrift des Reichsvereins Deutscher Feuerwehringenieur*, Berlin, Februar. 1930, No. 2, p. 22.
- KLASSEN : " Der Röntgenfilmbrand im Krankenhaus in Cleveland. " *Feuerschutz*, p. 138, 1929.
" Filmlagerungen in Krankenanstalten und Krankenkassengebäuden. " *Feuerschutz*, p. 181, 1928.
- KNUTSSON, F. " Über die Feuergefährlichkeit des Röntgenfilms. " *Acta Radiologica*, Vol. X, p. 566, 1929.
- KRAUSE, P. : " Sicherung gegen Explosionsgefahr von Röntgenfilmen. " *Fortschritte Röntgenstrahlen*, Vol. 41, p. 477, 1930.

- LEHMANN : " Sitzungsbericht der Normenstelle der Deutschen Röntgengesellschaft Arbeitsgruppe IX " Filmkonservierung. "
Fortschritte Röntgenstrahlen, Vol. 41, p. 989, 1930.
- LIMPACH : " Massenvergiftung durch verbrennende Röntgenfilms. "
Münchener Medizinische Wochenschrift, p. 1565, 1929.
- LOWRY : " An Accessory Protective Measure in Film Storage. "
Radiology, Vol. 14, p. 157, 1930.
- NICHOLS, B. H. : " The Clinical Effects of the Inhalation of Nitrogen Dioxide. "
American Journal of Roentgenology, Vol. XXIII, p. 516, 1930.
- NIEHAUS, H. : " Sickerheitsmassnahmen bei der Lagerung von Röntgenfilmen. "
Röntgenpraxis, Vol. II, p. 705, 1930.
- OSTERMANN : " Die Feuergefahr der Röntgenfilme in Krankenanstalten. "
Medizinische Welt, p. 797, 1929.
- ROCCHI, G. : " Sulla Inflammabilità delle pellicole radiografiche. "
Radiologia medica, Vol. XVI, 1929.
- RÖCKER : " Über Vorbeugungsmassnahmen bei Filmbränden in Krankenhäusern. "
Fortschritte Röntgenstrahlen, Vol. 41, p. 474, 1930.
- RUGGLES, H. E. : " Report on the Recent Fire at the University of California Hospital. "
American Journal of Roentgenology, Vol. XXIII, p. 83, 1930.
- SANDERS, G. B. : " Roof Vault provides Safe Storage for X-Ray Films. "
Modern Hosp., Vol. XXIII, p. 53, 1929.
- SZYNDANYI, S. : " Feuersicherheitsmassregeln bei der Einlagerung des Filmmaterials der Röntgenlaboratorien. "
Magy. Röntgen-Közl. Vol. 3, p. 261, 1929.
Zentralblatt für Radiologie, Vol. VIII, p. 757.
- SCHÖNFELD, A. : " Röntgenfilm und Feuerschutz. "
Wiener Klinische Wochenschrift, p. 1231, 1928.
- SCHULTE, G. : " Die im Knappschafts Krankenhaus Recklinghausen bestehenden Schutzeinrichtungen für die Aufbewahrung von Röntgenfilmen. "
Fortschritte Röntgenstrahlen, Vol. 41, p. 476, 1930.
- STRAUB, W. : " Massenvergiftung durch verbrennende Röntgenfilme. "
Münchener Medizinische Wochenschrift, p. 1049, 1929.
- Verhandlungen der Deutschen Röntgengesellschaft* (Tagung der Gesellschaft Deutscher Naturforscher und Ärzte. 7.-11. September 1930 in Königsberg Pr.).
Referate über Filmkonservierung (Haenisch, Wagner, Pleus).
Fortschritte Röntgenstrahlen, Vol. 42, Kongressheft, p. 17.

Verhandlungen der Rheinisch-Westfälischen Röntgengesellschaft, 2. November 1929 zu Essen. " Über Explosionsgefahr der Röntgenfilme und ihre Vermeidung. "

Fortschritte Röntgenstrahlen, Vol. 41, p. 474, 1930.

WAGNER und PLEUS : Erläuterungen zu den Vorschriften DIN Roent für die Handhabung und Lagerung von Röntgenfilmen in medizinische Betrieben.

Fortschritte Röntgenstrahlen, Vol. 43, p. 236, 1931.

WAGNER : " Röntgenfilme in Krankenhäusern, ihre Gefahren und deren Abwendung. "

Feuerschutz, Zeitschrift des Reichsvereins Deutscher Feuerschutzingenieure, Berlin, 1930, p. 29. (Bericht von D. Backe, Berlin, in Röntgenpraxis 11/9, p. 431, 1930.)

WATTERS, R. A., and PIERSALL, C. E. : " X-Ray Films ; Methods of Filing to prevent Possibility of Fire. "

Journal American Medical Association, Vol. XCII, p. 1763, 1929.

WERTHEIMER, A. : " Über die Röntgenfilmaufbewahrung. "

Strahlentherapie, Vol. 36, p. 573, 1930.

" Über die Röntgenfilmaufbewahrung. "

Röntgenpraxis, Vol. II, p. 957.

" Bemerkung zur Erwiderng der Filmkonservierungskommission. "

Röntgenpraxis, Vol. II, p. 959, 1930.

Fortschritte Röntgenstrahlen, Vol. 42, pp. 669 et seq.

Hospital and Institution Fires.

National Fire Protection Association. International. Boston, Mass.

ADDENDUM.

I. Protection against Dangers caused by Radiation.

BAENSCH, W. : " Besserer Strahlenschutz für die Hände des Röntgenologen. "

Röntgenpraxis, Vol. III, chap. 6, p. 286, 1931.

BELOT, J. : " Paravent protecteur du docteur J. Belot. "

Bull. Soc. radiol. méd. France, XVIII, pp. 120-124.

Ref. Zentralblatt für Radiologie. IX, 15.

HABS, H. : " Die Gefahr des Palpierens mit der ungeschützten Hand. "

Fortschritte Röntgenstrahlen, Vol. 42, p. 779.

LA ROCHE, O. : " La protection contre les rayons X et l'électrocution. " (Film de la maison Gaiffe, Gallot et Pilon.)

Bull. Soc. radiol. méd. France, XVIII, p. 164.

Zentralblatt Radiologie, Vol. IX, p. 16.

IV. Protective Measures against the Danger of X-Rays Film Fires.

- Normenstelle der Deutschen Röntgengesellschaft, Arbeitsgruppe IX, "Filmkonservierung" : "Vorschriften für die Handhabung und Lagerung von Röntgenfilmen in medizinischen Betrieben." (DIN ROENT 3.)
Fortschritte Röntgenstrahlen, Vol. 43, p. 113, 1931.
Strahlentherapie, Vol. 40, p. 392. (Rédaction définitive.)
- WAGNER und PLEUS : "Erläuterungen zu den Vorschriften DIN ROENT 3 für die Handhabung und Lagerung von Röntgenfilmen in medizinischen Betrieben."
Fortschritte Röntgenstrahlen, Vol. 43, p. 236, 1931.
- Verhandlungen der Deutschen Röntgengesellschaft (Tagung der Gesellschaft Deutscher Naturforscher und Ärzte, 7.-11. Sept. 1930 in Königsberg (Pr.)).
"Referate über Filmkonservierung" (HAENISCH, WAGNER, PLEUS).
Fortschritte Röntgenstrahlen, Vol. 42, p. 17.
-

Official No. : C. H. 1056(1).

Geneva, 1931.

LEAGUE OF NATIONS

Health Organisation

**REPORT OF THE
PERMANENT COMMISSION
ON BIOLOGICAL STANDARDISATION**

(London, June 23rd, 1931.)

Series of League of Nations Publications

**III. HEALTH
1931. III. 10.**



CONTENTS

REPORT OF THE PERMANENT COMMISSION ON BIOLOGICAL STANDARDISATION :

	Page
I. Gas-Gangrene (<i>Perfringens</i>) Antitoxin	5
II. Gas-Gangrene (<i>Vibrion Septique</i>) Antitoxin.	5
III. Tuberculin.	6
IV. Toxins used for the Schick Test.	6
V. Diphtheria Prophylactic	8
<i>Plan for testing the Immunising Power of Diphtheria Prophylactic :</i>	
1. Plan of Work for the " Staatsinstitut für Experimentelle Therapie ", Frankfort	8
2. Plan of Work for the Copenhagen and Frankfort Institutes.	8
3. General Plan of Work for the Participat- ing Institutes	9
VI. Diphtheria Antitoxin.	10
VII. Scarlet Fever	10
VIII. Antimeningococcus and Anti-pneumococcus Serum.	10
IX. Standardisation of Biological Products for Vete- rinary Use.	10
X. Standardisation of Sex Hormones	11
XI. Totaquina.	11
XII. Proposed Alteration of the Name of the Commis- sion.	11
XIII. Vitamins	11
List of Persons attending the Meetings	12
<i>Annex I.—Report by Dr. P. Hartley on an " Inter- national Investigation relating to the Adop- tion of a Standard for Gas-Gangrene Antitoxin (<i>Perfringens</i>) and the Definition of a Unit in Terms of such Standard " .</i>	
Summary.	13-23
Conclusions.	22
Recommendation	23
<i>Appendix : Memorandum concerning the Standardisation of Gas-Gan- grene Antitoxin (<i>Perfrin- gens</i>)</i>	
	27

	Page
<i>Annex II.</i> —Report on the Methods of Standardisation of Toxins used for the Schick Test, by Dr. P. Hartley	28
<i>Section I</i> , containing the Results of the Comparative Tests of the Toxins A and B used in the Schick Test, on Human Beings.	32-45
<i>Section II</i> , containing the Results of the Comparative Tests of the Toxins A and B used in the Schick Test on Passively Immunised Guinea-pigs . .	46-54
<i>Appendix</i> : Memorandum concerning the Investigation of Methods of Standardisation of Toxins used for the Schick Test proposed by the Permanent International Standards Commission	55
<i>Annex III.</i> —Questionnaire concerning Cases of Diphtheria ending fatally in Spite of Treatment by Serum (Document C.H.954) .	60
<i>Annex IV.</i> —Report of the Conference on Vitamin Standards, held at London from June 17th to 20th, 1931 (Document C.H.1055(1))	68
List of Participants	68
I. The Fat Soluble Vitamin A. .	69
II. The Antirachitic Vitamin D. .	72
III. The Antineuritic Vitamin B. .	75
IV. The Antiscorbutic Vitamin C. .	77
Note on the Toxicity of Irradiated Ergosterol	77
<i>Appendix</i> : Memorandum on Carotene supplied for testing its Suitability as a Possible Standard for Vitamin "A"	78

REPORT OF THE PERMANENT COMMISSION ON BIOLOGICAL STANDARDISATION.

I. GAS-GANGRENE (*Perfringens*) ANTITOXIN.

In accordance with the recommendations made at the meeting of the Permanent Standards Commission in October 1930, the National Institute for Medical Research, London, distributed two preparations of gas-gangrene (*perfringens*) antitoxin (the American and English standards), as well as an antitoxin of unknown titre, to the following institutes :

Wellcome Physiological Research Laboratories, Beckenham, Kent ;
“ Reichsgesundheitsamt ”, Berlin ;
“ Statens Serum Institut ”, Copenhagen ;
“ Staatsinstitut für Experimentelle Therapie ”, Frankfort on the Main ;
Lister Institute of Preventive Medicine, London ;
“ Institut Pasteur ”, Paris ;
National Institute of Health, Washington.

The results obtained are summarised in the annexed report (Annex I).

In accordance with the proposals made by the group of experts who took part in these comparative investigations, the Commission recommends :

“ That the standard preparation and unit adopted in the United States of America be accepted for international use, and that the ‘ Statens Serum Institut ’, Copenhagen, be requested to keep and distribute the international standard, acting for this purpose as Central Laboratory on behalf of the League of Nations Health Organisation. ”

II. GAS-GANGRENE (*Vibrion Septique*) ANTITOXIN.

The Commission recommends that the possibility be explored of obtaining international agreement on the adoption of a standard preparation and unit for gas-gangrene (*vibrion septique*) antitoxin, the work to be performed on lines similar to those followed for *perfringens* antitoxin.

III. TUBERCULIN.

At the instance of the Commission, preliminary investigations were carried out as to the comparability of the different methods of standardising tuberculin (document C.H.429.1926). Further investigations were subsequently carried out, pursuant to a decision by the Commission (Geneva, 1926), with the object of comparing the standard tuberculin preparations of the "Staatsinstitut für Experimentelle Therapie", Frankfort, of the "Institut Pasteur", Paris, and of the Imperial Institute for the Study of Infectious Diseases, Tokio.

It has already been reported to the Commission in Frankfort (1928) that investigations undertaken in the "Staatsinstitut für Experimentelle Therapie", Frankfort, and the National Institute for Medical Research, London, showed their standard preparations to be of the same titre.

The National Institute for Medical Research thereupon prepared a considerable supply of tuberculin destined for further tests. Comparative assays carried out for several years have now shown the Copenhagen, Frankfort and London standards to be equivalent.

The Commission therefore recommends that :

"The preparation of tuberculin preserved at the 'Statens Serum Institut', Copenhagen, acting for this purpose as the Central Laboratory on behalf of the League of Nations Health Organisation, be accepted as a standard for international use. The standard preparation may be used for the comparative testing of tuberculins on tuberculous animals, whether the tests are made by the method of subcutaneous injection or by cutaneous or intracutaneous injection, or by all of these methods."

IV. TOXINS USED FOR THE SCHICK TEST.

In accordance with the recommendations made at the meeting of the Permanent Standards Commission in October 1930, the National Institute for Medical Research, London, distributed two samples of diphtheria toxins for comparative assays on human beings, to the following institutes :

"Statens Serum Institut", Copenhagen ;
"Istituto sieroterapeutico", Milan ;
National Institute of Hygiene, Prague ;
The Connaught Laboratories, Toronto, Canada ;
"Staatliches Serotherapeutisches Institut", Vienna ;
State Institute of Hygiene, Warsaw ;
National Institute of Health, Washington, D.C.

The results obtained are summarised in the annexed report (Annex II).

In accordance with the proposals made by the experts who had taken part in this work, the Commission decided to recommend for international use the following regulations for testing a toxin to be used for the Schick test :

“ A. In choosing a diphtheria toxin for use in the Schick test, the combining power for antitoxin as well as the toxicity of the preparation should be taken into account.

“ B. The Commission therefore recommends the acceptance of the following definitions of a diphtheria toxin suitable for use in the Schick test, and of the dose for making the test :

“ 1. The toxin shall be matured toxin ;

“ 2. The following alternative definitions may be accepted for the Schick test dose :

“ *Either : (a)* The Schick test dose shall be 1/40th of the minimum lethal dose of the toxin when injection is made in a volume of 0.2 c.c. and 1/50th of the minimum lethal dose when injection is made in a volume of 0.1 c.c. ;

provided that this quantity of the toxin,

when mixed with 1/750th part or more of an international unit of diphtheria antitoxin and injected intracutaneously into a normal guinea-pig, causes no local reaction ; but, when mixed with 1/1250th part or less of an international unit and similarly injected, causes a definite reaction of the type of a ‘ positive ’ Schick reaction.

“ *Or : (b)* The Schick test dose, for injection in a volume of 0.2 c.c. shall be that quantity of the toxin which,

when mixed with 1/750th part or more of an international unit of diphtheria antitoxin, and injected intracutaneously into a normal guinea-pig, causes no local reaction ; but, when mixed with 1/1250th part or less of an international unit and similarly injected, causes a marked reaction of the type of a ‘ positive ’ Schick reaction ;

provided that the toxin is such that 1/25th of the Schick test dose as above determined, without admixture with antitoxin, when injected intracutaneously into a normal guinea-pig, causes a definite local reaction of the type of a ‘ positive ’ Schick reaction ; but that 1/50th of the Schick test dose, similarly injected without admixture, causes no local reaction of this type.”

V. DIPHTHERIA PROPHYLACTIC.

The Commission recommends that the possibility be explored of obtaining for international acceptance a standard preparation of diphtheria prophylactic, preferably consisting of a formol toxoid (anatoxin), and of defining in terms of this standard a unit of immunising potency for international acceptance. The following plan of work was agreed upon for this purpose :

Plan for testing the Immunising Power of Diphtheria Prophylactic.

1. *Plan of Work for the "Staatsinstitut für Experimentelle Therapie", Frankfort.*

Before comparative tests can be undertaken with different prophylactics with any hope of success, the *most favourable* period must be determined for testing the immunity to the toxin (by injection of $10 \times$ D.I. (75)—*i.e.*, ten times the amount, killing 75 per cent of the guinea-pigs of 250 grammes injected).

To this end, 200 guinea-pigs of about 250 grammes (230 to 270) will be injected with the same quantity—*viz.*, 10 flocculation units—of the control formol toxoid (anatoxin) to be supplied by the "Statens Serum Institut", Copenhagen. From this series there will be selected thirty animals of all ranges of weight at different periods—namely, after ten, twenty, thirty and forty days. In each of these groups of animals, one-half is to be killed, and the antitoxin content of their serum to be determined by the animal experiment. The remaining fifteen guinea-pigs of each group will be used for testing the immunity to diphtheria toxin by injection of $10 \times$ D.I. (75).

2. *Plan of Work for the Copenhagen and Frankfort Institutes.*

After the most favourable period for testing the toxin immunity has thus been determined in experiment 1, the assumed *seasonal variations* will be investigated by performing the immunisation of 100 guinea-pigs of about 250 grammes every other month. Each time

(a) Fifty guinea-pigs will be injected with the same dose of the control formol toxoid (anatoxin) (10 flocculation units), and

(b) Fifty guinea-pigs with the same dose (*i.e.*, 10 flocculation units) of a formol toxoid (anatoxin) to be selected by the Frankfort Institute.

The immunity of the animals surviving the tests 2 (a) and (b) shall be tested against $10 \times$ D.I. (75) at the period determined

by experiment 1. It is proposed that experiment 2 be carried out in the Copenhagen Institute during the months of February, April, June, August, October and December, and in the Frankfort Institute during the months of January, March, May, July, September and November.

3. *General Plan of Work for the Participating Institutes.*

Independently of experiment 2 (seasonal variability) and after completion of experiment 1 (the most favourable period for testing the immunity to toxin), comparative tests are to be carried out on the *immunising potency of different prophylactics*, this work to be done in different institutes.

For this purpose, five institutes will prepare a prophylactic, the amount required for each institute being five times 1,200 flocculation units (*e.g.*, for a prophylactic of 10 flocculation units, 600 c.c.; for a prophylactic of 5 flocculation units, 1,200 c.c., etc.). With each of these prophylactics, *as well as with the control toxoid* supplied by the "Statens Serum Institut" in Copenhagen, each of the institutes taking part in this investigation, is to immunise :

25 guinea-pigs of about 250 grammes with 5 flocculation units ;
25 guinea-pigs of about 250 grammes with 10 flocculation units ;
25 guinea-pigs of about 250 grammes with 20 flocculation units.

After the period determined in experiment 1, all the animals that have not died in the meantime are to be tested for their immunity to toxin by injection of 10 × D.I. (75) of the control toxin.

Each of the institutes participating in the investigation may, however, apply other methods of testing in animals in addition to, or in substitution for, the method outlined, for the purpose of comparing the immunising potency of the toxoids supplied.

*
* *

For the experiments under 1, 2 and 3, the "Statens Serum Institut", Copenhagen, will supply one uniform sample of formol toxoid (anatoxin); the "Staatsinstitut für Experimentelle Therapie" in Frankfort will supply one uniform sample of dried toxin.

The flocculating serum which has already been supplied by the Copenhagen Institute to various institutes in other countries has been found satisfactory as a basis of comparison in the flocculation test, and will be adopted for that purpose in this set of experiments.

The control of non-toxicity of the prophylactic should in each case be carried out by the injection of 10 c.c. to each of ten guinea-pigs of 250 grammes. None of these animals should die

of specific diphtheria intoxication, nor should any of the animals surviving up to six weeks show any paralysis.

In these investigations, the following institutes will take part—viz.

- “ Statens Serum Institut ”, Copenhagen ;
- “ Staatsinstitut für Experimentelle Therapie ”, Frankfurt ;
- National Institute for Medical Research, London ;
- “ Institut Pasteur ”, Paris ;
- National Institute of Health, Washington.

VI. DIPHTHERIA ANTITOXIN.

The President informed the Commission that a questionnaire concerning cases of diphtheria ending fatally in spite of treatment by serum (Annex III) had been distributed to clinics of various countries.

VII. SCARLET FEVER.

The Commission, after having taken note of the resolution of the Conference of Experts on Immunisation against Diphtheria and Scarlet Fever relating to anti-scarlet fever immunisation, considers that the most useful action which they can take at present for promoting the specific prophylaxis and treatment of scarlet fever is to encourage further investigations having the object of preparing an acutely acting toxin from the scarlatinal streptococcus, suitable for use in determining the activity of the serum by an animal test or for testing the resistance of animals actively immunised. They confirm their former decision—that the standard anti-scarlatinal serum of the United States of America shall be used to provide a basis of comparison in such investigations.

VIII. ANTI-MENINGOCOCCUS AND ANTI-PNEUMOCOCCUS SERUM.

The Commission is of opinion that at present it cannot take any effective action towards improving the standardisation of anti-meningococcus or anti-pneumococcus serum.

IX. STANDARDISATION OF BIOLOGICAL PRODUCTS FOR VETERINARY USE.

It is recommended that :

“ The Permanent Standards Commission, with appropriate veterinary advice, should undertake studies relating to the standardisation of those products the use of which affects human as well as veterinary therapeutics.”

The "Staatsinstitut für Experimentelle Therapie" in Frankfurt has offered to place at the disposal of the Health Organisation a supply of *swine erysipelas* serum and culture, with a view to performing comparative investigations on the possibility of standardising this serum.

X. STANDARDISATION OF SEX HORMONES.

The Commission, having taken note of a communication by Dr. Dale on the possibility of arriving at an international agreement on the standardisation of sex hormones, recommends that :

" This study be undertaken with the assistance of suitable experts."

XI. TOTAQUINA.

It is the opinion of the members of the Permanent Standards Commission that the question of the standardisation of totaquina lies outside the proper scope of their activities.

XII. PROPOSED ALTERATION OF THE NAME OF THE COMMISSION.

The Commission is of the opinion that its present name may give rise to misunderstanding and therefore recommends that :

" Its name be changed to that of ' Permanent Commission on Biological Standardisation '."

XIII. VITAMINS.

The Commission, after having considered the report of the Vitamin Conference, held in London from June 17th to 20th, 1931 (see Annex IV), recommends the adoption of this report to the Health Committee.

LIST OF PERSONS ATTENDING THE MEETINGS.

I. *Permanent Commission on Standardisation of Sera, Serological Tests and Biological Products.*

Dr. Th. MADSEN, *Chairman*, Professor W. KOLLE,
Dr. H. H. DALE, Dr. G. W. MCCOY.

Professor J. Bordet and Professor L. Martin were unable to attend the meeting.

II. *International Conference on Standardisation of Vitamins.*

Professor E. MELLANBY, <i>Chairman</i> ,	Professor B. C. P. JANSEN,
Dr. W. R. AYKROYD, <i>Technical Secretary</i> ,	Professor E. V. MCCOLLUM,
Dr. H. CHICK, <i>Technical Secretary</i> ,	Professor E. POULSSON,
Professor J. C. DRUMMOND,	Mme. G. L. RANDOIN,
Professor H. VON EULER,	Professor A. C. SCHEUNERT,
Professor L. S. FRIDERICIA,	Dr. A. SEIDELL,
	Professor H. STEENBOCK,
	Professor A. WINDAUS.

The following also attended the meetings :

Dr. C. E. BILLS, Dr. R. BOURDILLON, Dr. Katherine COWARD, Professor R. A. PETERS, Dr. O. ROSENHEIM, Dr. S. S. ZILVA.

III. *Standardisation of Anti-Gas-Gangrene Serum.*

Dr. Th. MADSEN, <i>Chairman</i> ,	Dr. G. W. MCCOY,
Dr. P. HARTLEY,	Dr. R. PRIGGE,
Professor W. KOLLE,	Professor M. WEINBERG.
Dr. R. A. O'BRIEN,	

IV. *Toxins used in the Schick Test.*

Dr. Th. MADSEN, <i>Chairman</i> ,	Professor L. HIRSZFELD,
Dr. St. BAECHER,	Dr. G. W. MCCOY,
Dr. H. H. DALE,	Dr. R. A. O'BRIEN,
Dr. D. Th. FRASER,	Professor F. PEPEU,
Dr. P. HARTLEY,	Dr. O. SCHUBERT.

V. *Diphtheria Prophylactics.*

Dr. Th. MADSEN, <i>Chairman</i> ,	Dr. G. W. MCCOY,
Dr. H. H. DALE,	Professor W. KOLLE,
Dr. W. FISCHER,	Dr. R. PRIGGE.
Dr. P. HARTLEY,	

Secretariat : Professor PRAUSNITZ, Professor OLSEN, Professor CIUCA.

ANNEX I.

C.H./C.P.S./31.

REPORT BY DR. P. HARTLEY (NATIONAL INSTITUTE FOR MEDICAL RESEARCH, LONDON), ON AN "INTERNATIONAL INVESTIGATION RELATING TO THE ADOPTION OF A STANDARD FOR GAS-GANGRENE ANTITOXIN (*PERFRINGENS*) AND THE DEFINITION OF A UNIT IN TERMS OF SUCH STANDARD".

In the autumn of 1930, the Permanent Standards Commission of the Health Organisation of the League of Nations decided to explore the possibility of obtaining international agreement regarding the adoption of a standard for gas-gangrene antitoxin (*perfringens*), and the definition of a unit in terms of that standard.

Gas-gangrene antitoxin (*perfringens*) is being used to an increasing extent in the medical and surgical practice of several countries. Following the work of Miss BENGTON in the United States of America, the National Institute of Health in Washington prepared a dry, stable preparation of gas-gangrene antitoxin (*perfringens*) and defined a unit in terms of this standard, which has been adopted and supplied in the United States for some years. Through the courtesy of Dr. McCoy, Director of the National Institute of Health, Washington, the National Institute for Medical Research, Hampstead, has been supplied with several sealed ampoules of the Washington standard preparation and with full detail as to its manner of use. A gas-gangrene antitoxin (*perfringens*) of adequate potency was also obtained from the Wellcome Physiological Research Laboratories, Beckenham, England, and this has been reduced to the dry, stable condition, and assayed in terms of the Washington standard. There remained the question of defining a unit in terms of these dry, stable preparations. The unit first adopted in the United States of America having proved inconveniently large in practice, an official instruction was issued from Washington, in December 1930, informing manufacturers of serum that the unit had been changed, the new unit being defined as one-hundredth of the unit previously used. It was pointed out that no change in the method of testing was involved, and that, for purposes of labelling, one old unit was equal to 100 new units.

The National Institute for Medical Research, Hampstead, was asked by the Permanent Standards Commission to provide reagents suitable for an investigation on which decisions with regard to an international standard and unit for this antitoxin

might be based. There were available for this enquiry two dry, stable preparations of gas-gangrene antitoxin (*perfringens*)—the American and the British—the latter having been accurately assayed in terms of the former. The experiments which had been conducted in this institute indicated that :

(1) 100 new American units (= 1 old American unit) were contained in 32.2 mg. of the American standard preparation ; and, hence, 1 new American unit = 0.322 mg. of the American standard preparation, and

(2) 100 new American units (= 1 old American unit) were contained in 26.6 mg. of the British standard preparation, and, hence, 1 new American unit = 0.266 mg. of the British standard preparation.

From these dry standard preparations two standard solutions (in glycerol saline) were prepared—the one made from the American standard, containing fifty American units per c.c., and the one made from the British standard containing twenty American units per c.c.

The participating experts were invited to investigate the claim—based on the results obtained in this institute—that the British standard preparation had been correctly assayed. As a second part of the experimental enquiry, a preparation of gas-gangrene antitoxin (*perfringens*) of unknown potency was distributed and the experts were invited to determine the potency of this preparation. To facilitate the work, a preparation of dry, stable *perfringens* toxin was supplied to all participating in the experiments. A short memorandum (see page 22) supplied with the reagents indicated the purpose of the investigations and outlined a method of assay which, in this institute, had yielded consistent results. The memorandum also made suggestions relating to the experiments to be performed, and it was suggested that participants should use other methods and other toxins for comparing the two standard solutions, and for assaying the antitoxins of unknown potency.

The reagents and memorandum were sent to the following experts in the five countries named :

Denmark : Dr. Th. Madsen, State Serum Institute, Copenhagen.

France : Dr. M. Weinberg, Pasteur Institute, Paris.

Germany : (i) Geh. Professor Dr. W. Kolle, State Institute for Experimental Therapy, Frankfort on the Main.

(ii) Dr. H. Schlossberger, State Department of Health, Berlin.

Great Britain : (i) Dr. R. A. O'Brien, Wellcome Physiological Research Laboratories, Beckenham, Kent.

(ii) Dr. G. F. Petrie, the Lister Institute, Elstree, Herts.

The United States of America : Dr. G. W. McCoy, Director, National Institute of Health, Washington.

Dr. McCoy had previously reported that a comparative examination of the two standard solutions had been made by Miss BENGTON, using her own toxin and the method of intramuscular injection into pigeons, and that the results obtained in this institute, by the method of intravenous injection into mice, had been exactly confirmed.

The other participants in the investigation have completed their experiments and submitted reports. These are set out in the following pages.

In the summarised results given below, the new notation, based on the unit now defined in the United States of America, has been employed. For convenience of reference and correlation of the reports received, the standard solutions of antitoxin made from the American and British standard preparations are referred to shortly as the "American standard serum" and the "British standard serum" respectively; the sample of *perfringens* toxin distributed is referred to as the "toxin"; and the preparation of *perfringens* antitoxin of unknown potency is referred to as the "unknown antitoxin".

REPORT RECEIVED FROM DR. TH. MADSEN, COPENHAGEN,
DENMARK.

(a) *Comparison of the American and British Standard Sera.*

Each dose tested on six mice, the test being made three times with the American test serum and four times with the British test serum.

Toxin dose mg.	0.2 unit American standard serum			0.2 unit British standard serum			
	Proportion surviving in experiment No. :			Proportion surviving in experiment No. :			
	1	2	3	1	2	3	4
2.9	0/6	—	—	0/6	—	—	—
2.8	0/6	—	0/6	0/6	0/6	2/6	0/6
2.7	0/6	0/6	0/6	2/6	0/6	1/6	1/6
2.6	0/6	0/6	0/6	2/6	3/6	2/6	2/6
2.5	2/6	3/6	3/6	5/6	5/6	6/6	2/6
2.4	4/6	4/6	5/6	4/6	4/6	5/6	6/6

(b) *The Sample of Perfringens Antitoxin of Unknown Potency.*

After a preliminary experiment, by which the strength was found to lie between 200 and 300 units, the following test was made with six mice to each dose (quantity of toxin used as test dose = 2.6 mg.).

Serum tested on units	Proportion surviving
220	5/6
235	3/6
250	1/6
275	0/6

The antitoxin value of the serum lies between 235 and 250 American units per c.c.

REPORT RECEIVED FROM DR. M. WEINBERG, PARIS, FRANCE.

(a) *Comparison of the American and British Standard Sera.*

0.2 unit of the American standard protects completely mice receiving 2.5 mg. of the test toxin, and only some of the animals receiving 2.6 mg. of the test toxin. The same quantity of antitoxin protects none of the animals against 2.7 mg. of test toxin.

The English standard gives almost the same results; one mouse of the series injected with 2.5 mg. of test toxin, however, was not protected by 0.2 unit of antitoxin.

(b) *The Sample of Perfringens Antitoxin of Unknown Potency.*

Ten series of mice, five in each series, were injected with mixtures consisting of the test dose of the toxin (2.6 mg.) and increasing quantities of the serum of unknown potency.

Series	Quantity of serum c.c.	Result
1	1/5000	All 5 mice died in 30' to 90'
2	1/4500	All 5 mice died in 60' to 110'
3	1/4000	All 5 mice died in 75' to 105'
4	1/3500	All 5 mice died in 80' to 125'
5	1/3000	All 5 mice died in 90' to 130'
6	1/2500	All 5 mice died in 115' to 150'
7	1/2000	All 5 mice died in 2 to 4 hours
8	1/1500	All 5 mice died in less than 12 hours
9	1/1000	One mouse died in 30 hours : 4 mice survived
10	1/500	All 5 mice survived

Since 0.2 unit (American standard) protects some but not all of the 17- to 20-gramme mice against the test dose of toxin, it is concluded that the unknown serum contains almost exactly 200 units per c.c.

REPORT RECEIVED FROM GEH. PROFESSOR DR. W. KOLLE,
FRANKFORT ON THE MAIN, GERMANY.

(a) *Comparison of American and British Standard Sera.*

Toxin dose mg.	+ 0.2 c.c. 1/50 American standard serum			+ 0.2 c.c. 1/20 British standard serum		
	Number of mice used	Number of mice died	%	Number of mice used	Number of mice died	%
2.9	6	6	100	6	6	100
2.8	6	6	100	6	6	100
2.7	6	6	100	6	6	100
2.6	6	3	50	6	4	67
2.5	6	1	17	6	1	17
2.4	6	0	0	6	0	0

It is concluded that the ratio of the antitoxin content of the American and English standard sera is 5 : 2 (1 c.c. of the American standard serum = 50 units; 1 c.c. of the British standard serum = 20 units).

The test dose of the toxin is 2.5 mg.

(b) *The Sample of Perfringens Antitoxin of Unknown Potency.*

A. *Preliminary Test.*

Test dose of toxin	Unknown antitoxin	Number of mice used	Number of mice died	%
2.5 mg.	0.2 1 : 100	6	0	0
	0.14 1 : 100	6	0	0
	0.09 1 : 100	6	1	17
	0.06 1 : 100	6	6	100
	0.04 1 : 100	6	6	100

B. *Principal Experiment.*

Test dose of toxin	A. Control series				B. Unknown antitoxin series			
	American standard serum diluted 1 : 50	Number of mice used	Number of mice died	%	Unknown antitoxin diluted 1 : 100	Number of mice used	Number of mice died	%
2.5 mg.	c.c.	—	—	—	c.c.	—	—	—
	—	—	—	—	0.111	6	0	0
	0.222	6	0	0	0.1	6	0	0
	0.20	6	5	83	0.09	6	3	50
	0.18	6	6	100	0.081	6	6	100
	—	—	—	—	0.073	6	6	100
	—	—	—	—	0.066	6	6	100
	—	—	—	—	0.059	6	6	100
	—	—	—	—	0.053	6	6	100

Value of the unknown serum = 220 units per c.c.

REPORT RECEIVED FROM DR. H. SCHLOSSBERGER, BERLIN, GERMANY.

(a) *Comparison of the American and British Standard Sera.*

Determination of the L₊ and L₀ values of the *perfringens* toxin, vol. 1/5th of the new American unit (American and British standard solutions compared).

Dose of toxin (vol. 0.3 c.c.) mg.	1/5th new American unit (volume = 0.2 c.c.)			
	Number of mice used	Number of mice died	Number of mice survived	Proportion : Mice survived/ Mice used

A. *American Standard Serum.*

2.7	12	12	0	0/12
2.6	12	11	1	1/12
2.5	12	9	3	3/12
2.4	9	0	9	9/9

B. *British Standard Serum.*

2.7	12	12	0	0/12
2.6	12	11	1	1/12
2.5	12	4	8	8/12
2.4	9	0	9	9/9

(b) *The Sample of Perfringens Antitoxin of Unknown Potency (and of a German Perfringens Antitoxin B., August 26th, 1930).*

Test dose of toxin (vol. 0.3 c.c.), mg.	+ Serum	Number of mice used	Number of mice died	Number of mice survived	Proportion: Mice survived/Mice used
	<i>American Standard Serum</i>				
	c.c. c.c.				
	0.2 I : 55 = 1/275	5	5	—	0/5
	0.2 I : 50 = 1/250	5	—	5	5/5
	0.2 I : 45 = 1/225	5	—	5	5/5
	<i>British Standard Serum</i>				
	c.c. c.c.				
	0.2 I : 22 = 1/110	5	5	—	0/5
	0.2 I : 20 = 1/100	5	—	5	5/5
	0.2 I : 18 = 1/90	5	—	5	5/5
	<i>Unknown Antitoxin (British)</i>				
2.4	c.c. c.c.				
	0.2 I : 300 = 1/1500	3	3	—	0/3
	0.2 I : 275 = 1/1375	3	3	—	0/3
	0.2 I : 250 = 1/1250	3	3	—	0/3
	0.2 I : 225 = 1/1125	3	2	1	1/3
	0.2 I : 200 = 1/1000	3	—	3	3/3
	0.2 I : 175 = 1/875	3	—	3	3/3
	<i>Perfringens Antitoxin, German B., August 26th, 1930</i>				
	c.c. c.c.				
	0.2 I : 100 = 1/500	3	3	—	0/3
	0.2 I : 75 = 1/375	3	—	3	3/3
	0.2 I : 50 = 1/250	3	—	3	3/3

Value of the unknown antitoxin = 200 units per c.c.

Value of the antitoxin B., August 26th, 1930 = 75 units per c.c.

REPORT RECEIVED FROM DR. R. A. O'BRIEN, BECKENHAM,
ENGLAND.

(a) *Comparison of the American and British Standard Sera.*

Intravenous Injection into Mice.

(Results recorded as : Number of deaths/Total injected.)

Toxin used	Toxin dose mg.	Volume of antitoxin diluted c.c.	Standard serum	
			American 1/50	British 1/20
Toxin, Hampstead	3.0	0.2	6/6	6/6
	2.8	0.2	9/12	10/12
	2.6	0.2	4/12	3/12
	2.4	0.2	2/12	1/12
NN. 167	3.2	0.16	2/4	2/4
	3.2	0.20	2/4	0/4
	3.2	0.24	0/4	0/4
	3.8	0.16	8/8	8/8
	3.8	0.20	4/8	0/8
	3.8	0.24	0/8	0/8
	4.0	0.16	4/4	8/8
	4.0	0.18	4/4	4/4
	4.0	0.20	8/8	1/7
	4.0	0.22	0/4	—
	4.0	0.24	0/4	—

The results with the Hampstead toxin are somewhat irregular. Those with our own toxin are better and appear to show that the British standard is slightly higher than the American.

(b) *The Sample of Perfringens Antitoxin of Unknown Potency.*

The unknown serum against our toxin contained 200 units per c.c.

REPORT RECEIVED FROM DR. G. F. PETRIE, ELSTREE, HERTS,
ENGLAND.

(a) *Comparison of the American and British Standard Sera*

Date	Toxin dose mg.	+ 1/500th old American unit (1/5th of new unit)								
		American standard serum				British standard serum				
		Number of mice used	Number dying	Number surviving	Proportion surviving	Number of mice used	Number dying	Number surviving	Proportion surviving	
Dec. 22nd, 1930	2.7	6	6	0	0/6	6	6	0	0/6	
	2.6	6	6	0	0/6	6	2	4	4/6	
	2.5	6	1	5	5/6	6	1	5	5/6	
Jan. 20th, 1931	2.7	6	6	0	0/6	6	6	0	0/6	
	2.6	6	5	1	1/6	6	4	2	2/6	
	2.5	6	2	4	4/6	6	2	4	4/6	
Feb. 19th, 1931	2.6	6	3	3	3/6	6	1	5	5/6	
	2.5	6	2	4	4/6	6	1	5	5/6	
	2.4	6	0	6	6/6	6	0	6	6/6	
			<i>Summary</i>					<i>Summary</i>		
	2.7	12	12	0	0/12	12	12	0	0/12	
	2.6	18	14	4	4/18	18	7	11	11/18	
	2.5	18	5	13	13/18	18	4	14	14/18	
	2.4	6	0	6	6/6	6	0	6	6/6	

(b) *The Sample of Perfringens Antitoxin of Unknown Potency.*

Test dose of toxin used = 2.6 mg.

Date	Serum dose c.c.	Number of mice used	Number dying	Number surviving	Proportion surviving
Dec. 22nd, 1930	1/100	2	0	2	2/2
	1/200	2	0	2	2/2
	1/300	2	0	2	2/2
	1/400	2	0	2	2/2
	1/500	2	0	2	2/2
Jan. 20th, 1931	1/500	2	0	2	2/2
	1/1000	2	1	1	1/2
	1/1500	2	2	0	0/2
	1/2000	2	2	0	0/2
	1/2500	2	2	0	0/2
Feb. 19th, 1931	1/875	6	0	6	6/6
	1/1000	6	2	4	4/6
	1/1125	6	6	0	0/6

The unknown serum contains 200 units per c.c.

Summary.

1. With regard to the question as to whether the American and British standard solutions, when diluted in the proportion of 1 c.c. to 50 c.c. and 20 c.c. respectively, yield solutions of identical potency (*i.e.*, each containing 1 unit of gas-gangrene antitoxin (*perfringens*)), while all the reports received show that the two solutions are almost identical, an examination of the protocols shows that, in four cases (MADSEN, SCHLOSSBERGER, O'BRIEN and PETRIE), there is evidence that the British standard solution is slightly stronger than the American standard solution. In these cases, there is a slightly higher survival rate in the groups of animals receiving certain mixtures of the British standard serum and toxin than in the corresponding groups receiving the American standard serum and toxin. The difference is small, and, since the method of assay is evidently very accurate, the "dilution factor" for the British standard preparation can easily be adjusted so that solutions of exact equivalence can be prepared.

2. The testing of *perfringens* antitoxin of unknown potency provided a means of determining the degree of variation likely to be experienced in the application of the methods of standardisation of gas-gangrene antitoxin (*perfringens*) as practised in different countries. The values returned for the potency of the unknown serum are summarised below :

Observer	Value returned, units per c.c.
MADSEN, Copenhagen	235-250
WEINBERG, Paris	200
KOLLE, Frankfort	220
SCHLOSSBERGER, Berlin	200
O'BRIEN, Beckenham.. .. .	200
PETRIE, Elstree	200
BRUCE WHITE, London	210

Six out of the seven workers returned values for the antitoxin ranging from 200 to 220 units per c.c.

Conclusions.

We suggest that the following conclusions may be drawn from the results presented above :

- (1) That gas-gangrene antitoxin (*perfringens*) can be assayed with a high degree of accuracy ;
- (2) That the method of intravenous injection of toxin-antitoxin mixtures in mice is simple and practicable, and yields consistent and comparable results when applied by different workers ;

(3) That dry, stable preparations of gas-gangrene anti-toxin (*perfringens*) can be prepared and assayed in terms of the American standard, and accurately standardised solutions, suitable for distribution for purposes of biological assay, can be prepared.

Recommendation.

We recommend that the International Conference should agree to accept the standard preparation and unit adopted in the United States of America as suitable for international use.

Addendum.

REPORT RECEIVED FROM DR. I. A. BENGTON, WASHINGTON.

Since the foregoing report was completed, the results of Dr. Bengtson's experiments have been received. The following is a copy of her report :

"The method of intravenous inoculation of mice suggested was used in carrying out the tests. Though some difficulty was experienced at first in obtaining entirely consistent results, the test seems to be quite satisfactory and is probably as accurate as the pigeon test.

"The potency of the serum tested (gas-gangrene antitoxin (*perfringens*), natural serum) was found to be less than 225 units and more than 200 per c.c. on the basis of the new American standards (1 c.c. contains 50 units). Tests on doses between 200 and 225 were not done.

"We shall probably continue to use the intravenous inoculation of mice to some extent, particularly in preliminary tests. Comparative tests so far indicate, however, that there is a difference in susceptibility in proportion to the weights—*e.g.*, a toxin recently tested showed a test dose of 0.021 gramme for 350-gramme pigeons and 0.0044 gramme for 20-gramme mice. The pigeon is therefore more susceptible. On the basis of 0.0044 gramme for a 20-gramme mouse, a dose of 0.079 gramme would be the test dose for a pigeon if the two animals were equally susceptible, whereas slightly more than one-fourth of this dose is required.

" May 16th, 1931.

(Signed) I. A. BENGTON,
*National Institute of Health,
Washington.*"

The table given on page 20 should, accordingly, be amended so as to include Dr. Bengtson's results, and the sentence following this table should now read :

“ Seven out of the eight workers returned values for the antitoxin ranging from 200 to 225 units per c.c.”

Appendix.

MEMORANDUM CONCERNING THE STANDARDISATION OF GAS-GANGRENE ANTITOXIN (*Perfringens*).

The National Institute for Medical Research, Hampstead, London, N.W.3, has been requested by the Permanent Standards Commission of the Health Organisation of the League of Nations to furnish samples of gas-gangrene antitoxin (*perfringens*), and of toxin prepared from the organism, in order to explore the possibility of obtaining international agreement regarding the adoption of a standard for this antitoxin, the definition of a unit of activity in terms of such standard, and the biological assay of gas-gangrene antitoxin (*perfringens*).

In accordance with this request, the following reagents are being sent to you under separate cover.

1. A solution of antitoxin (*perfringens*) prepared from the standard maintained in the National Institute of Health, Washington, U.S.A. (label marked 1).

Through the courtesy of Dr. McCoy, of Washington, we have been supplied with a number of phials of the dry standard preparation maintained in his institute. The contents of one phial have been dissolved exactly in the manner prescribed by the Washington laboratory—1 c.c. of the standard solution (glycerol, 2 parts ; physiological salt solution, 1 part) contains 16.1 mg. of the standard preparation, which is equivalent to 0.5 of the unit established, and at present in official use in the United States of America.

2. A solution of antitoxin (*perfringens*) made from a dried preparation of antitoxin maintained at this institute (label marked 2). This preparation has been accurately assayed in relation to the American standard and the solution (glycerol, 2 parts ; physiological salt solution, 1 part) now sent contains 5.32 mg. of the British dry standard preparation in each c.c., and this quantity is, according to our determination, equivalent to 0.2 of the American unit.

The contents of three separate phials of the American standard have at different times been dissolved to make

standard solutions, and five separate solutions of the British standard have been prepared and assayed in comparison with the American standard, four different preparations of dried *perfringens* toxin having been employed in the comparative tests. The results obtained in this institute indicate that, when 1 c.c. of the American standard solution (paragraph 1 above) is diluted to 50 c.c., and 1 c.c. of the British standard solution (paragraph 2 above) is diluted to 20 c.c., the resulting dilutions are of identical potency—1 c.c. of each dilution contains 1/100th of the unit officially adopted in the United States of America.

3. A dried preparation of *perfringens* toxin (label marked 3). This has been prepared by precipitating the germ-free filtrate from a sixteen-hour growth of *B. welchii* with ammonium sulphate, removing the resulting precipitate, and drying the same over phosphorus pentoxide. The sealed tube contains about 1 gramme of dried toxin.

4. A sample of gas-gangrene antitoxin (*perfringens*) (natural serum) for purposes of trial assay (label marked 4).

Methods.

For the purposes of our own experiments, the assay of the British standard antitoxin in terms of the American standard has been made by the intravenous injection of mixtures of toxin and antitoxin into the tail vein of mice weighing from 17 to 20 grammes. By adopting the following procedures, the "test dose" of the toxin supplied, and the relative potencies of the two standard solutions, may be determined in one experiment.

(1) 1 c.c. of the American standard solution is diluted to 50 c.c.

(2) 1 c.c. of the British standard solution is diluted to 20 c.c.

(3) A quantity of the dried toxin is accurately weighed out and dissolved in physiological salt solution, the final volume being adjusted so that 10 mg. of the toxin are contained in each c.c.

(4) Mixtures of each of the standard antitoxin dilutions with the toxin solution are made so that 0.5 c.c. of each mixture (the volume injected into a mouse) contains 0.2 c.c. of the diluted antitoxin (= 1/500th of the American unit) + a varying quantity of the toxin solution. Suitable quantities of the toxin for the purpose of the test will be found to range from 2 to 3 mg. (*vid. inf.*).

The mixtures are allowed to stand at room temperature for from forty-five to sixty minutes, and then 0.5 c.c. quantities are injected intravenously into mice.

The mice used should be drawn from a uniform stock, and we have found it desirable to use mice of as uniform a weight as possible (17 to 20 grammes). We have used, for final comparison of the two standard solutions, groups of six mice for each mixture of toxin and antitoxin tested, and, as far as our experience goes, it appears that (with the reagents supplied, at least), with this number of mice in each group, an accuracy of about ± 4 per cent can be attained.

We have adopted the arbitrary period of forty-eight hours for the observation of the test animals. The majority of the animals which succumb to the injection die during the first twenty-four hours, and very few deaths occur after forty-eight hours.

(5) A protocol of one of our experiments, on the lines indicated in (1), (2), (3) and (4) above is given below. From the data it will be seen that the "test dose", for our mice, of the toxin supplied—*i.e.*, the dose of toxin which, when mixed with 1/500th of a unit (American) of *perfringens* antitoxin protects some, but not all, of the six mice injected, is 2.6 mg. If the dose of toxin was increased by 0.1 mg., all six mice injected died within twenty-four hours, and, when the dose was decreased by 0.1 mg., all the six mice injected showed slight symptoms, and survived.

From the protocol it is also seen that the American and British standard solutions, when suitably diluted in accordance with their content of specific antibody, are of identical potency. This result has been repeatedly confirmed in other experiments in which larger groups of mice have been used.

(6) A preliminary determination of the lethal dose of the toxin now sent indicates that this value is about 0.14 mg. The "test dose" of toxin, therefore, contains from eighteen to twenty lethal doses.

Toxin dose mg.	+ 1/500th American unit (Washington standard solution)				+ 1/500th American unit (British standard solution)			
	Number of mice used	Number dying	Number surviving	Proportion surviving	Number of mice used	Number dying	Number surviving	Proportion surviving
2.9	6	6	0	0/6	6	6	0	0/6
2.8	6	6	0	0/6	6	6	0	0/6
2.7	6	6	0	0/6	6	6	0	0/6
2.6	6	2	4	4/6	6	2	4	4/6
2.5	6	0	6	6/6	6	0	6	6/6
2.4	6	0	6	6/6	6	1	5	5/6

Investigations suggested.

1. It is hoped that investigators in different countries will be interested to verify the relation above indicated between the solutions of the original American standard and the provisional British standard. It is suggested that this may be done by use of the method described above, or preferably by any other method in which the investigator has confidence. A repetition of the comparison with preparations of *perfringens* toxin other than that supplied would have special interest. It may be noted that, by the courtesy of Dr. McCoy, the comparison had already been repeated by Miss BENGTON in America, using her own toxin and the method of intramuscular injection into pigeons. Dr. McCoy reports that the ratio obtained by us, with intravenous injection into mice, has been exactly confirmed.

2. It is suggested that the sample of gas-gangrene antitoxin (*perfringens*) (natural serum) be standardised in terms of the American standard solution sent herewith. For this purpose, the method outlined above, and the standardised toxin now sent, may be used, if desired, or other methods and other reagents workers have in use may be applied. The sample is to be treated as a *perfringens* antitoxin of unknown potency; but, in order to economise time and animals, it may be stated that the value, according to our tests, lies between 1 and 5 American units per c.c.

December 15th,
1930.

*Department of Biological Standards,
National Institute for Medical Research,
Hampstead, London, N.W.3.*

NOTE ON GAS-GANGRENE ANTITOXIN (*Perfringens*).

After the accompanying memorandum had been prepared, a letter was received from Dr. McCoy, of Washington, enclosing a copy of an official instruction, which had been issued to American manufacturers on December 10th, 1930, in the following terms :

“ National Institute of Health, Washington, D.C.

“ December 10th, 1930.

“ *To all Serum Manufacturers,*

“ Effective this date, the strength of the official standard unit of *perfringens* antitoxin is changed as follows : The new unit will be one one-hundredth of the original unit described in *Hygienic Laboratory Bulletin* 122. No change in the method of testing commercial antitoxins will be required. The product will be tested in the pigeon as heretofore, the

test dose of antitoxin representing the new unit instead of 1/100 unit as before. In other words, for purposes of labelling, one old unit will equal 100 new units.

(Signed) G. W. McCoy,
Director."

It will be clear, accordingly, that all indications in the memorandum in terms of American units should now be multiplied by 100, the solution of the American standard, referred to on page 22, containing 50 of the new official American units per c.c., in place of 0.5 of the unit previously current in the United States of America, and the solution of the British standard similarly containing 20 units instead of 0.2 unit per c.c. The corresponding alterations should be made throughout the memorandum by multiplying each unit-indication by 100.

December 22nd, 1930.

ANNEX II.

REPORT ON THE METHODS OF STANDARDISATION OF TOXINS USED FOR THE SCHICK TEST.

(Prepared by Dr. P. Hartley, Department of Biological Standards,
National Institute for Medical Research, London.)

In accordance with the proposed investigation of Schick test toxins described in the "Memorandum concerning the Investigation of Methods of Standardisation of Toxins used for the Schick Test proposed by the Permanent International Standards Commission"¹, issued from the Department of Biological Standards, the National Institute for Medical Research, London, on February 24th, 1931, dilutions of the two Schick test toxins, A and B, therein described, together with the corresponding heated controls, were distributed on February 25th, 1931, March 27th, 1931, and April 22nd, 1931, to the undermentioned experts in the six countries named:

Austria : Dr. D. BÄCHER, "Staatliches Serotherapeutisches Institut", Vienna.

Czechoslovakia : Dr. B. FEIERABEND, State Institute of Public Hygiene of the Czechoslovak Republic, Prague.

Denmark : Dr. Th. MADSEN, State Serum Institute, Copenhagen.

¹ See page 55.

Great Britain : (i) Dr. E. H. R. HARRIES, City Hospital, Little Bromwich, Birmingham ; (ii) Dr. Alex. JOE, North-Western Hospital, Hampstead, N.W.3 ; (iii) Dr. J. REID, County Hospital, Motherwell, Lanarkshire.

Italy : Professor Francesco PEPEU, " Istituto Siero-terapeutico Milanese ", Milan.

Poland : Professor L. HIRSZFELD, " Panstwowy Zaklad Higjeny ", Warsaw.

The undiluted toxins were sent to the following experts :

Canada : Professor J. G. FITZGERALD, School of Hygiene and Preventive Medicine, University of Toronto.

Denmark : Dr. Th. MADSEN, State Serum Institute, Copenhagen.

United States of America : (i) Dr. G. W. MCCOY, National Institute of Health, Washington ; (ii) Dr. W. H. PARK, Bureau of Laboratories, Department of Health, New York City.

The results of the tests carried out by the individual experts participating in the investigation were received either prior to or during the meeting of the Permanent Standards Commission held in London on June 17th to June 20th, 1931. A report embodying as many of the results as were at the time available was prepared for convenience of reference and purposes of discussion, and to facilitate comparison of the results obtained by the different experts. Further results having now been received, the present final report has been prepared. It presents the summarised results of each participating expert and contains, also in the form of summaries, the main results of the international enquiry.

In some cases, experts submitted their results in the form of the table suggested on page 58 and are reproduced, in this summarised report, as received. Other investigators sent very full details of the tests carried out on individual patients. It has not been possible to reproduce these latter in full, and in these cases the detailed reports have been summarised and the results expressed in the form suggested in the table on page 58 of the Memorandum. In preparing these summaries from the detailed protocols submitted by individual experts, it was decided to exclude all cases in which individuals tested gave any reaction to either or both of the heated Schick controls. These reactions are sometimes very difficult to interpret even by the medical officer who makes and reads the test on the patient, and the difficulties are increased when an interpretation is attempted from a written record of the test. Further, a careful scrutiny of the protocols suggested that the exclusion of those individuals reacting to the heated Schick controls did not affect the main purpose of

the enquiry, which was to determine whether a significant proportion of human beings—patients and normal individuals—gave different results when tested with two Schick toxins, which, though containing the same amount of toxin, differ rather widely in their combining power for antitoxin. The figures presented in the summaries consist, therefore, of those submitted by the individual experts who have decided, in the case of each individual tested, whether a reaction was positive or negative (Dr. FEIERABEND, Dr. JOE, Dr. BÄCHER, Dr. JENSEN, Dr. BIE, Dr. FRASER), and the undoubtedly positive or negative cases in the detailed protocols submitted by Dr. HARRIES, Dr. REID, Professor PEPEU and Professor HIRSZFELD. The total number of cases excluded because of the reaction to the heated Schick controls was sixty, leaving a total of 1,457 individuals in which the reaction was either read and interpreted by the observer making the test, or in which an unequivocal interpretation of the reactions could be made from the written record of the tests.

With regard to the results of the tests of the Schick test toxins A and B carried out on human beings, a table has been prepared (page 43) summarising the results received from all the participating experts. From this table it will be seen that :

The total number of individuals tested was	1,457
The total number reacting positively to toxins A and B was	592
The total number reacting negatively to toxins A and B was	795
The total number reacting negatively to toxin A and positively to toxin B was	68
The total number reacting positively to toxin A and negatively to toxin B was	2

The two Schick test toxins A and B supplied for this investigation, when used for the testing of the 1,457 individuals considered in this report, show the following division into Schick positive and Schick negative reactors :

Toxin	Schick +		Schick —	
	Number	Per cent	Number	Per cent
A ..	594	40.8	863	59.2
B .	660	45.3	797	54.7

Thus, one of the main results of the international enquiry has been to show that the number of persons classed Schick-positive and Schick-negative, respectively, depends upon the

properties of the toxin used in making the test. As was to be expected from the nature of the toxins A and B used in the enquiry (and as was actually found by Dr. FEIERABEND, Dr. HARRIES, Dr. REID, Dr. JOE, Professor PEPEU, Dr. JENSEN, and Dr. FRASER), a certain number of individuals (in all, 68 out of the 1,457 tested) reacted negatively to A and positively to B. Further, examination of the protocols showed that, when an individual reacted unequally to both toxins, in the great majority of cases, the reaction to toxin B was greater than the reaction to toxin A. Only two cases were recorded in which the individual reacted positively to toxin A and negatively to toxin B.

The percentage differences shown by the two toxins A and B are as follows :

	Per cent
The whole population (1,457 persons)	4.5
Persons actively immunised (197 persons) ..	4.6
Convalescent diphtheria patients (250 persons)	3.2
Passively immunised contacts (44 persons) ..	16.0
Normal individuals (966 persons)	4.5

The participating experts met on Friday, June 19th, 1931, and, after discussion of the results obtained, a recommendation was submitted for the consideration of the Permanent International Standards Commission.

The following experts have taken part in a comparative investigation relative to the *standardisation of Schick test toxin* for the Permanent Standards Commission : Dr. MADSEN, Dr. BÄCHER, Dr. O'BRIEN, Dr. MCCOY, Dr. DALE, Dr. FRASER, Dr. HARTLEY, Professor HIRSZFELD, Professor PEPEU, Dr. SCHUBERT.

At their meeting in London on June 17th and 18th, 1931, the recommendations as indicated on page 5 were formulated.

The results obtained by each of the participating experts are given in the following pages, and, for convenience of reference, the report is presented in two sections—viz :

Section I, containing the results of the comparative tests of the toxins A and B used in the Schick test, on human beings. The reports of Dr. FEIERABEND, Dr. JOE, Dr. BÄCHER and Professor FRASER, Professor HIRSZFELD and Professor BIE (Professor BIE's results being forwarded by Dr. MADSEN) are reproduced in the form in which they were received. The reports of Dr. HARRIES, Dr. REID, Dr. JENSEN and Professor PEPEU are the summarised results, prepared by the writer, from the detailed protocols of the individuals tested by each of these investigators.

The table on page 43 summarises all the results obtained on human beings.

Section II, containing the results of the comparative tests of the toxins A and B used in the Schick test on passively immunised guinea-pigs (see pages 46-54).

Section I.

COMPARATIVE TESTS OF THE SCHICK TEST TOXINS A AND B ON HUMAN BEINGS.

- I. Dr. Feierabend's Results.
- II. Summary of Dr. Harries' Results.
- III. Dr. Joe's Results.
- IV. Summary of Dr. Reid's Results.
- V. Summary of Professor Pepeu's Results.
- VI. Dr. Bächer's Results.
- VII. Professor Hirszfeld's Results.
- VIII. Dr. Madsen's Results (Professor Bie's Results).
- IX. Summary of Dr. Claus Jensen's Results.
- X. Professor Fraser's Results.

Page 43. Table showing Combined Results of the above Investigation.

I. REPORT SUBMITTED BY DR. B. FEIERABEND, STATE INSTITUTE OF PUBLIC HYGIENE, PRAGUE.

A. *Division of Work.*

The tests were performed as follows :

A. A children's hospital :		Cases
Group II } different ages		1
Group IV }		79
B. An orphans' asylum :		
Group I } older children		18
Group IV }		188
C. A factory :		
Group IV, small children		80
D. The State Institute of Public Health, Prague :		
Group IV, adults		8
Total		374

The tests were performed by :

- A. Docent Dr. J. PROHAZKA.
- B. Docent Dr. J. PROHAZKA.
- C. Primary Physician Dr. V. TOLAR.
- D. Dr. O. SCHUBERT.

Readings were made by Dr. B. FEIERABEND.

*B. Results of Comparative Schick Tests with Toxins A and B,
Medical Research Council.*

Group		Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A and Schick + to B	Schick + to A and Schick - to B
Persons actively immunised	Anatoxin : 1 year since last injection	2	0	2	—	—
	Löwenstein : seven weeks to four months since last smear	16	7	9	—	—
	Total	18	7	11	—	—
Convalescent diphtheria patients	Three weeks since antitoxin injection	1	—	1	—	—
Passively immunised contacts	—	—	—	—	—	—
Normal individuals	Age-groups :					
	1-3 years	94	84	5	5	—
	4-7 years	57	32	23	2	—
	8-10 years	99	44	55	—	—
	Over 10 years ..	105	42	60	3	—
Total	355	202	143	10	—	
Grand total	374	209	155	10	—	

C. Details about Cases Positive to Toxin B and Negative to A.
(Readings after seven days.)

No.	Sex	Years	Reaction to toxin A	Reaction to toxin B	Controls
1	Girl	1½	o	5 × 5 mm., trace of pigmentation, no desquamation	o
2	Girl	1½	o	15 × 15 mm., pigmentation and desquamation	o
3	Girl	1½	A trace (?)	20 × 20 mm., infiltration and pigmentation	o
4	Girl	2½	o	30 × 20 mm., pigmentation and desquamation	o
5	Girl	6	o	A trace	o
6	Girl	2	o	10 × 10 mm., infiltration and desquamation	o
7	Boy	12	o	8 × 7 mm., pigmentation and desquamation	o
8	Girl	13	o	10 × 9 mm., irregular pigmentation, desquamation	Control A : o Control B : 5 × 5 mm., slight pigmentation, no desquamation
9	Girl	6	o	9 × 9 mm., pigmentation and desquamation	o
10	Woman	25	o	10 × 10 mm., pigmentation, infiltration, desquamation	o

II. SUMMARY OF REPORT SUBMITTED BY DR. E. H. R. HARRIES
CITY HOSPITAL, LITTLE BROMWICH, BIRMINGHAM.

Group	Remarks	Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Persons actively immunised	Adults (nurses) previously Schick + recently immunised	8	2	6	0	0
Convalescent diphtheria patients	Period since anti-toxin injection: three weeks or more	85	3	77	5	0
Total		93	5	83	5	0

Of the five convalescent diphtheria patients, one gave a reaction to toxin B, measuring 38×40 mm., on the seventh day; one gave a reaction of 14×20 mm., which was recorded as "fading" on the seventh day and three gave reactions measuring 12×8 mm., 15×9 mm., and 16×20 mm., respectively, which were recorded as "faint" on the seventh day. These five cases gave no reaction to toxin A.

One case was recorded as giving a good positive (12×26 mm.) to toxin B and a very faint positive (6×17 mm.) to toxin A. This case is one of the five recorded as being positive to toxins A and B.

III. REPORT SUBMITTED BY DR. A. JOE,
NORTH-WESTERN FEVER HOSPITAL, LONDON, N.W.3.

Group	Remarks	Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Persons actively immunised (alum toxoid in all cases)	Period since last injection :					
	4 weeks	8	3	5	0	0
	8 weeks	3	2	0	1	0
	12 weeks	2	0	2	0	0
	16 weeks	1	0	0	1	0
	Total	14	5	7	2	0
Convalescent diphtheria patients	Period since anti-toxin injection :					
	21-27 days	29	0	29	0	0
	28-34 days	18	1	17	0	0
	35-41 days	18	1	17	0	0
	42-48 days	8	0	8	0	0
	49-55 days	9	1	6	2	0
	Over 56 days	15	5	10	0	0
	Total	97	8	87	2	0
Normal individuals	Age-groups :					
	1-3 years	47	35	12	0	0
	4-7 years	75	46	27	2	0
	8-10 years	17	7	10	0	0
	11-15 years	8	1	7	0	0
	16-20 years	7	2	5	0	0
	21-25 years	8	3	5	0	0
	Over 26 years	9	4	5	0	0
	Total	171	98	71	2	0
	Grand total	282	111	165	6	0

Notes on Dr. Joe's Report.

“ Size and intensity of reactions in forty-one of the reactors who were positive to both toxins,

- A = B in 20 cases ;
- B > A in 20 cases ;
- A > B in 1 case.

“ This bears out the general impression that, where positive reactions occurred to both toxins, the reaction to B was the more striking.”

With regard to the six cases which reacted negatively to toxin A and positively to toxin B, Dr. Joe records that the results are quite definite. The positive reactions showed definite pigmentation and desquamation, and these patients showed no reactions to either of the heated controls.

**IV. SUMMARY OF REPORT SUBMITTED BY DR. JOHN REID,
COUNTY HOSPITAL, MOTHERWELL, LANARKSHIRE, SCOTLAND.**

Group	Remarks	Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Persons actively immunised (adults, nurses)	Period since last injection :					
	Under 3 months	5	1	2	2	0
	3-6 months ..	2	0	1	1	0
	7-12 months ..	3	1	2	0	0
	1-2 years	8	1	5	2	0
	Over 2 years ..	7	0	7	0	0
	No history ..	2	0	2	0	0
	Total	27	3	19	5	0
Convalescent diphtheria patients	Period since anti-toxin injection :					
	Less than 1 week	8	1	7	0	0
	1-2 weeks	12	1	11	0	0
	2-3 weeks	5	0	5	0	0
	Over 3 weeks ..	3	0	3	0	0
	Total	28	2	26	0	0
Positive swabs, no clinical signs ; no antitoxin given	—	12	8	3	1	0
Normal individuals	(a) Nurses (18-21 years)	17	6	10	1	0
	(b) Scarlet fever patients :					
	1-3 years ..	3	2	1	0	0
	4-7 years ..	11	4	7	0	0
	8-10 years ..	4	0	4	0	0
Over 10 years	10	1	9	0	0	
	Total	45	13	31	1	0
Grand total		112	26	79	7	0

V. SUMMARY OF REPORT SUBMITTED BY
 PROFESSOR FRANCESCO PEPEU, ISTITUTO SIEROTERAPEUTICO
 MILAN, ITALY.

Group	Remarks	Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Persons actively immunised	Period since last application of the vaccine : 60 days	45	7	38	0	0
Convalescent diphtheria patients	Period since anti-toxin injection : 3-4 weeks	21	0	20	1	0
Passively immunised contacts	Period since anti-toxin injection : (a) 4 weeks	13	8	4	1	0
	(b) 5 weeks	27	10	11	6	0
	Total	40	18	15	7	0
Normal individuals	1 to 3 years	13	10	3	0	0
	4 to 7 years	14	6	8	0	0
	8 to 10 years	14	7	4	3	0
	Total	41	23	15	3	0
Grand total		147	48	88	11	0

Notes on Professor Pepeu's Report.

1. *The group of persons actively immunised.*—The individuals were actively vaccinated against diphtheria through nasal insufflation with concentrated anatoxin. They were Schick tested with toxins A and B sixty days after the last application of vaccine. All the cases recorded in this group gave a positive Schick reaction before the vaccination began.

2. *The group of convalescent diphtheria patients.*—Seven received 4,000 to 10,000 units of antitoxin. Three received from 10,000 to 20,000 units of antitoxin. Six received from 20,000 to 40,000 units of antitoxin. Five received from 40,000 to 100,000 units of antitoxin.

3. *The group of passively immunised contacts.*—The thirteen cases which were Schick tested four weeks after injection received 500 units (nine cases) or 1,000 units (four cases) of antitoxin. The twenty-seven which were tested five weeks after injection all received 500 units of antitoxin.

4. Eleven of Professor Pepeu's cases reacted positively to toxin B and negatively to toxin A, and gave no reaction to either of the heated controls. The positive reactions to toxin B, the size of which has been calculated as the arithmetical mean of the maximum and minimum diameters, are recorded as follows : 4, brown (the convalescent diphtheria patient); 11, brown; 14, light brown; 9, brown; 17, dark brown; 13, light brown; 6, brown; 17, pale red (the passively immunised contacts); and 17, light brown; 11, pale red; 9, light brown (the normal individuals).

VI. REPORT SUBMITTED BY DR. D. BÄCHER,
"STAATLICHES SEROTHERAPEUTISCHES INSTITUT",
VIENNA, AUSTRIA.

Group	Remarks	Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Persons actively immunised	Period since last injection :					
	1 week ..	2	1	1	0	0
	2 weeks ..	5	5 (2 ++)	0	0	0
	3 weeks ..	2	2 (1 ++)	0	0	0
	5 weeks ..	7	6	1	0	0
	32 weeks ..	4	2 (1 ++, 1 +)	2	0	0
	Total.. ..	20	16	4	0	0
Convalescent diphtheria patients	Period since anti-toxin injection :					
	1 week ..	3	0	3	0	0
	2 weeks ..	1	0	1	0	0
	3 weeks ..	2	0	2	0	0
	5 weeks ..	2	0	2	0	0
	Total.. ..	8	0	8	0	0
Passively immunised contacts	Period since anti-toxin injection : 1 week	1	0	1	0	0
Normal individuals	Age-groups :					
	1-3 years ..	3	2 (1 ++)	1	0	0
	4-7 years ..	19	16 (3 ++)	3	0	0
	Over 7 years..	45	24 (3 +, 5 ++)	21	0	0
	Total.. ..	67	42	25	0	0
Grand total		96	58	38	0	0

+ , reaction to A rather stronger than reaction to B.
++ , reaction to A rather weaker than reaction to B.

VII. REPORT SUBMITTED BY PROFESSOR L. HIRSZFELD,
 " PANSTWOWY ZAKLAD HIGJENY ", WARSAW, POLAND.

No.	Age	Warsaw toxin		English toxin			
		T.	C.	A		B	
				T.	C.	T.	C.
1, C. H.	12	+++	—	+++	±	+++	±
2, G. S.	11	++	—	++	—	++	—
3, H. F.	13	+	±	+	+	+	+
4, K. M.	11	+++	—	+++	±	+++	+
5, M. M.	12	+	—	+	±	+	±
6, M. Z.	9	++	+	++	++	++	++
7, M. J.	10	+	+	+	+	++	++
8, P. Z.	11	+	—	+	—	++	—
9, S. J.	9	++	—	±	—	±	—
10, S. J.	11	++	±	++	+	++	+
11, W. A.	7	++	—	++	+	++	+
12, L. S.	6	++	—	++	+	++	+

T. = toxin.
 C. = control.

VIII. REPORT SUBMITTED BY DR. TH. MADSEN,
STATE SERUM INSTITUTE, COPENHAGEN, DENMARK,
GIVING THE RESULTS OBTAINED
BY PROFESSOR BIE AT THE BLEGDAMS HOSPITAL.

Group	Remarks	Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Convalescent diphtheria patients	Period since anti-toxin injection :					
	2 weeks ..	1	0	1	0	0
	3 weeks ..	2	0	2	0	0
	4 weeks ..	1	0	1	0	0
	5 weeks ..	1	0	1	0	0
	6 weeks ..	4	2 (++) to A and B	2	0	0
	12 weeks ..	1	1 (+) to A and B	0	0	0
Total ..	10	3	7	0	0	
Passively immunised contacts	Period since anti-toxin injection :					
	1 week ..	1	0	1	0	0
	2 weeks ..	1	0	1	0	0
	3 weeks ..	1	0	1	0	0
Total ..	3	0	3	0	0	
Normal individuals	Age-groups :					
	1-3 years ..	1	1 (+)	0	0	0
	4-7 years ..	8	4 (++); 1 (+)	3	0	0
	8-10 years ..	6	4 (++); 1 (+) to A, (++) to B	1	0	0
	Over 10 years ..	1	0	1	0	0
Total ..	16	11	5	0	0	
Grand total		29	14	15	0	0

Character of reaction :

(++) = more than 10 mm. length and 10 mm. breadth.

(+) = less than 10 mm. length and 10 mm. breadth.

In both groups, swelling and redness.

**IX. SUMMARY OF REPORT SUBMITTED BY DR. CLAUS JENSEN,
STATE SERUM INSTITUTE, COPENHAGEN, DENMARK.**

Group	Remarks	Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Persons actively immunised	Period since last injection:					
	(i) 13 months	19	2*	17	0	0
	(ii) 1½ to 3 years	46	4*	40	2	0
	Total	65	6	57	2	0

* Reaction to toxin B greater than reaction to toxin A.

Dr. Jensen's Conclusions.

1. Although employing a Schick test toxin standardised according to the English regulations, it has not been possible to separate the sixty-five actively immunised children with scientific accuracy into two classes, corresponding to antitoxin contents in the blood below and above a certain antitoxin level.

2. The necessity, however, for standardising Schick toxins by combining power is indicated by the fact that, in forty-six immunised boys, only four (8.7 per cent) were positive to toxin A, while six (12.3 per cent) were positive to toxin B.

**X. REPORT SUBMITTED BY PROFESSOR D. T. FRASER,
THE CONNAUGHT LABORATORIES, UNIVERSITY OF TORONTO,
CANADA.**

Group		Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Normal individuals	Age-group : 9 years and over	268	120	118	28	2

In twenty-six cases, not included in the above total, one or both of the tests could not be interpreted as positive or negative.

Note submitted by Professor D. T. Fraser, Connaught Laboratories, University of Toronto.

In addition to the recorded results obtained in 294 individuals tested with A and B Schick test toxins and their heated controls, certain data may be added. For the purpose of information, and as an additional check on the results obtained in the testing of A and B toxins, a toxin of the Connaught Laboratories, University of Toronto, was included in the study. This toxin (C) complied with the existing British requirements. In place of the "heated control", a dilution of toxoid, standardised against a known solution selected for the purpose of testing for skin sensitivity, was used.¹ The dilution of toxoid was 1 in 100, made with physiological saline. The amount injected intradermally was 0.1 c.c. Readings were made at forty-eight hours, five and seven days. This "reaction test" is primarily designed to enable one to determine the degree of skin sensitivity of an individual to toxoid so as to gauge, within a wide margin of safety, the amount of toxoid which may be administered subcutaneously for purposes of immunisation without causing undesirable reactions.² Secondly, this intradermal test serves as a control for the Schick test in substitution for the heated control.

The reaction test has been in use since 1925 and has proved of definite and practical value in the case of older children (6-14 years) and adults.³

It has been shown that, of 216 young adults positive to the reaction test, 75 per cent were immune (more than 1/25th unit per c.c. of serum), and 25 per cent were susceptible (less than 1/50th unit) to diphtheria.³ That these figures are substantially correct is supported by the fact that, in over 3,000 children manifesting a reaction of redness of more than 10 mm. and with induration (+++reactors), and to whom on account of administrative difficulties no toxoid was given, only 20 per cent of the diphtheria observed in 60,000 unimmunised children occurred.

It is the practice to read the Schick test, as carried out with the diluted toxoid as a control, as follows⁴:

Toxin positive, diluted toxoid negative indicates susceptibility.

Toxin negative, diluted toxoid negative indicates immunity.

¹ MOLONEY, P. J., and FRASER, C. J., *Ann. Inst. Pasteur*, 1928, Vol. XLIII, 1420.

² BURKE, F. S., *Canadian Public Health Journal*, May 1930.

³ Report submitted, Clinical Experts Committee (The Use of the Skin Test for determining Sensitivity to Toxoid). FRASER, D. T.

⁴ MOLONEY, P. J., and FRASER, C. J., *Ann. Inst. Pasteur*, 1929, Vol. XLIII, 129.

Toxin negative, diluted toxoid positive indicates immunity.
Toxin positive, diluted toxoid positive indicates reaction uninterpretable.

In order to obtain information as to immunity in the last group, the quantity of antitoxin in the serum must be determined.

In the younger age-groups the interpretation of this modified Schick test may be satisfactorily made. In older children and adults, a number of questionable or uninterpretable reactions will occur, because of the fact that the incidence of skin sensitivity to the specific protein (?) in the filtrate of a culture of *Corynebact. diphtheriæ* increases with age.¹

From certain individuals tested in the study of A, B, and C Schick toxins, blood was drawn and the amount of antitoxin determined by intracutaneous tests on animals. The detailed report of this investigation will be made at a later date. The results show that, of thirteen individuals negative to A and positive to B, all possessed more than 1/25th unit of antitoxin per c.c. of serum. Seventeen showing positive A, positive B, uninterpretable C, all had more than 1/25th unit. The heated controls were negative when read on the seventh day. It is to be noted that, in the above-mentioned group of thirteen, the diluted toxoid control was positive, and, hence, such individuals may be classed as "reactors". Thus, though B toxin gives more positives than A, it is suggested that the discrepancy is due to the greater amount of specific diphtheria protein (?) contained therein. Such reactions in this series, from whom blood was drawn, which were read as negative A, positive B, are in the nature of false positives in point of view of immunity and susceptibility, since their serum contains more than 1/25th unit of antitoxin. Toxin C is of the character of B rather than of A.

CONCLUSIONS.

- (1) Toxin B gave a greater number of positives than Toxin A.
- (2) The divergence between A and B is due to the fact that B contains more of the specific diphtheria substance to which older children and adults react, and to which sensitivity is manifested by the reaction test of diluted toxoid.

¹ Report submitted, Clinical Experts Committee (The Use of the Skin Test for determining Sensitivity to Toxoid). FRASER, D. T.

TABLE SUMMARISING THE RESULTS OF THE COMPARATIVE TESTING OF TOXINS A AND B OBTAINED BY DR. FEIERABEND, DR. HARRIES, DR. JOE, DR. REID, DR. BÄCHER AND DR. C. JENSEN, PROFESSOR PEPEU, PROFESSOR HIRSZFELD, PROFESSOR BIE AND PROFESSOR FRASER.

Group	Observer	Number tested	Number			
			Schick + to A and B	Schick - to A and B	Schick - to A Schick + to B	Schick + to A Schick - to B
Persons actively immunised	Dr. Feierabend ..	18	7	11	0	0
	Dr. Harries	8	2	6	0	0
	Dr. Joe	14	5	7	2	0
	Dr. Reid	27	3	19	5	0
	Professor Pepeu ..	45	7	38	0	0
	Dr. Bächer	20	16	4	0	0
	Dr. Jensen	65	6	57	2	0
	Total	197	46	142	9	0
Convalescent diphtheria patients	Dr. Feierabend ..	1	0	1	0	0
	Dr. Harries	85	3	77	5	0
	Dr. Joe	97	8	87	2	0
	Dr. Reid	28	2	26	0	0
	Professor Pepeu ..	21	0	20	1	0
	Dr. Bächer	8	0	8	0	0
Professor Bie	10	3	7	0	0	
	Total	250	16	226	8	0
Passively immunised contacts	Professor Pepeu ..	40	18	15	7	0
	Dr. Bächer	1	0	1	0	0
	Professor Bie	3	0	3	0	0
	Total	44	18	19	7	0
Normal individuals	Dr. Feierabend ..	355	202	143	10	0
	Dr. Joe	171	98	71	2	0
	Dr. Reid	45	13	31	1	0
	Professor Pepeu ..	41	23	15	3	0
	Dr. Bächer	67	42	25	0	0
	Professor Hirszfeld	3	3	0	0	0
	Professor Bie	16	11	5	0	0
Professor Fraser ..	268	120	118	28	2	
	Total	966	512	408	44	2
	Grand total	1,457	592	795	68	2

Section II.

COMPARATIVE TESTS OF THE SCHICK TEST TOXINS A AND B ON PASSIVELY IMMUNISED GUINEA-PIGS.

1. Dr. Feierabend's Results.
 2. Mr. Glenny's Results.
 3. Dr. Hartley's Results.
 4. Professor Pepeu's Results.
 5. Dr. Bächer's Results.
 6. Professor Hirszfeld's Results.
-

Some of the participating experts have tested the toxins supplied (and, in some cases, other Schick test toxins as well) on immunised guinea-pigs.

It was suggested (page 59) that guinea-pigs should be given small doses (1.5 to 3 units) of antitoxin subcutaneously, and that then, beginning on the second day after inoculation, the passively immunised animals should be Schick tested with toxins A and B, one toxin being injected into the skin of one flank and the other toxin injected into the skin of the other flank of the same passively immunised animal.

The experiment has been carried out in the manner suggested by Dr. Feierabend, Dr. Glenny, Dr. Hartley, Dr. Bächer and Dr. Hirszfeld, and their results are given in the following pages. Professor Pepeu performed the experiment in a somewhat different way, but his results bring out the same point as those of other workers—viz., that, in the passively immunised animals, in which the antitoxin level is falling rather rapidly, a phase is reached at which the animals react positively to toxin B while still reacting negatively to toxin A.

I. REPORT SUBMITTED BY DR. B. FEIERABEND,
STATE INSTITUTE OF PUBLIC HYGIENE, PRAGUE.

D. Results of Tests with Toxins A and B on Guinea-pigs.

Three groups of guinea-pigs, five pigs in each, received 1½, 2 and 3 U.A. respectively. Schicking was then performed every day with this result (readings after forty-eight hours) :

Number of reactions		After days					
		1	2	3	4	5	7
Negative	A	15	15	15	14	4	0
	B	5	4	1	0	0	0
±	A	0	0	0	1	9	0
	B	6	2	5	1	1	0
Positive	A	0	0	0	0	2	15
	B	4	9	9	14	14	15

Injections : Mrs. O. Pyro.

Readings : Dr. B. Feierabend.

E. Results of Tests with Toxin A and Our Toxin No. 2 on Guinea-pigs.

Toxin	M.L.D.	Schick dose	Neutralising dose
A	1/60 c.c.	1/2400 c.c.	1/1000 U.A.
No. 2	1/30 c.c.	1/1200 c.c.	1/1000 U.A.

In capillaries of Schick outfits, a little more toxin is being filled than the correct amount, so that the ready dilution contains 1/1000 c.c. as a Schick test dose instead of 1/1200 c.c. This (1 : 1000) dilution and toxin A were used on five guinea-pigs immunised with 2 U.A. with this result :

Positive reactions	After days					
	1	2	3	4	5	7
Toxine A..	0	0	0	0	0	5
No. 2.. ..	0	0	2	4	5	5

2. REPORT SUBMITTED BY MR. A. T. GLENNY, B.Sc.,
THE WELLCOME PHYSIOLOGICAL RESEARCH LABORATORIES,
BECKENHAM, ENGLAND.

The toxin dilutions have been compared, and the difference in their combining powers demonstrated, in passively immunised guinea-pigs. The guinea-pigs were given antitoxin (DI447.78/200) subcutaneously, and Schick tested, starting on the second day after giving the antitoxin, and then each day following, until the antitoxin in the animals was reduced to an amount which failed to wipe out the half-fold toxin. This occurred on the fourth day as a rule (see table).

Number of Guinea-pigs giving + or — Reactions to $\frac{1}{2}$, 1, 2 and 3 fold Schick on the Days following Injection of Antitoxin Subcutaneously.

Units of antitoxin given subcutaneously	Schick	Second day		Third day		Fourth day		Fifth day	
		—	+	—	+	—	+	—	+
0.5	1/2	1	3	—	4	—	—	—	—
	1	—	4	—	4	—	—	—	—
	2	—	1	—	1	—	—	—	—
	3	—	1	—	1	—	—	—	—
0.75	1/2	3	1	1	2	—	—	—	—
	1	1	3	—	4	—	—	—	—
	2	—	4	—	4	—	—	—	—
	3	—	4	—	4	—	—	—	—
1.0	1/2	3	—	2	1	—	3	—	—
	1	2	4	—	6	—	6	—	—
	2	—	3	—	3	—	3	—	—
	3	—	3	—	3	—	3	—	—
1.5	1/2	3	—	2	1	1	2	—	—
	1	8	1	1	5	—	5	—	2
	2	2	7	1	5	1	5	—	2
	3	1	5	—	6	—	6	—	2
2.0	1/2	7	—	6	1	4	3	—	—
	1	12	1	3	10	1	12	—	2
	2	2	5	—	7	—	7	—	—
	3	2	8	—	10	—	6	—	2
5.0	1/2	—	—	—	—	—	—	—	—
	1	3	—	3	—	2	1	—	3
	2	—	—	—	—	—	—	—	—
	3	1	2	—	3	—	3	—	3

Note.—Two days after injection of 0.75 unit of antitoxin, three out of four guinea-pigs are negative to half-fold Schick; and, after an injection of five units, two out of three are positive to three-fold.

3. REPORT SUBMITTED BY DR. P. HARTLEY, THE NATIONAL INSTITUTE FOR MEDICAL RESEARCH, LONDON.

Two groups of four guinea-pigs were injected with 0.75 unit and 1.5 unit diphtheria antitoxin subcutaneously and Schick tested with toxins A and B two, three and four days later.

Guinea-pig No.	Weight, grammes	Antitoxin injected, units	Result of Schick test					
			48 hours		72 hours		96 hours	
			A	B	A	B	A	B
1	380	0.75	+	+	+	+		
2	370	0.75	—	+	+	+		
3	365	0.75	—	+	+	+		
4	380	0.75	±	+	+	+		
5	345	1.5	—	+	±	+	+	+
6	360	1.5	—	+	—	+	±	+
7	375	1.5	±	+	+	+	+	+
8	390	1.5	—	+	—	+	+	+

4. REPORT SUBMITTED BY PROFESSOR PEPEU, "ISTITUTO SIEROTERAPEUTICO MILANESE", MILAN, ITALY.

First Group: Guinea-pigs inoculated subcutaneously on March 9th, 1931, with 1.5 I.U. German Antitoxin.

Guinea-pig No.	Weight, grammes	Schick after 48 hours		Schick after 72 hours		Schick after 96 hours		Schick after 120 hours		Schick after 144 hours		Schick after 168 hours	
		Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control
<i>Toxin A.</i>													
1	350	--	--	--	--								
2	400	--	--	--	--								
3	350			--	--	+	--	--	--				
4	360					+	--	--	--				
5	360							--	--				
6	360					+	--	--	--				
7	350								--				
8	380									+	+	--	--
9	360									+	+	--	--
10	350									+	+	--	--
<i>Toxin B.</i>													
11	350	+	--	--	--								
21	360	--	--	--	--								
31	380			+	--	--	--						
41	350					+	+	--	--				
51	350					+	--	--	--				
61	350					+	--	--	--				
71	380								--				
81	360									+	+	--	--
91	390									+	+	--	--
101	350									+	+	--	--

*Second Group: Guinea-pigs inoculated subcutaneously on March 9th, 1931, with 2 I.U.
German Diphtheria Antitoxin Units.*

Guinea-pig No.	Weight, grammes	Schick after 48 hours		Schick after 72 hours		Schick after 96 hours		Schick after 120 hours		Schick after 144 hours		Schick after 168 hours	
		Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control
<i>Toxin A.</i>													
1	360	--	--	--	--								
2	350	--	--	--	--								
3	400			--	--	±	--	--	--				
4	390					±	--	--	--	+	--	--	--
5	350					±	--	--	--	±	--	--	--
6	360					±	--	--	--	±	--	--	--
7	350									±	--	--	--
8	350									±	--	--	--
9	360									+	+	--	--
10	350									+	+	--	--
<i>Toxin B.</i>													
11	400	±	--	--	--								
21	400	--	--	--	--								
31	390			+	--	+	--	--	--				
41	400					+	--	--	--	+	+	--	--
51	370					+	--	--	--	+	+	--	--
61	400					+	+	--	--	+	+	--	--
71	390									+	+	--	--
81	400									+	+	--	--
91	350									+	+	--	--
101	390									+	+	--	--

*Third Group : Guinea-pigs inoculated subcutaneously on March 9th, 1931, with 3 I.U.
German Diphtheria Antitoxin Units.*

Guinea-pig No.	Weight, grammes	Schick after 48 hours		Schick after 72 hours		Schick after 96 hours		Schick after 120 hours		Schick after 144 hours		Schick after 168 hours	
		Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control	Toxin	Control
<i>Toxin A.</i>													
1	350	--	--	--	--								
2	350	--	--	--	--								
3	390			--	--								
4	370					--	--	--	--				
5	370					--	--	--	--				
6	360					--	--	--	--				
7	350							±	--	--	--		
8	350									++	||	||	||
9	380									++	||	||	||
10	400									++	+	+	||
<i>Toxin B.</i>													
11	370	--	--	--	--								
21	400	--	--	--	--								
31	360			--	--	±	--	--	--				
41	350					±	--	±	--	--	--		
51	350					±	--	±	--	--	--		
61	350					--	--	--	--	--	--		
71	360							+	--	--	--		
81	350									++	||	||	
91	360									++	+	+	--
101	360									++	+	+	--

5. REPORT SUBMITTED BY DR. D. BÄCHER, "STAATLICHES
SERTHERAPEUTISCHES INSTITUT", VIENNA, AUSTRIA.,

The guinea-pigs were injected subcutaneously on May 9th. 1931; the first series with 1.5 unit (1 c.c.) and the second series with 3 units (2 c.c.) of diphtheria antitoxin (Serum 5354 a).

On the second day after injection, and on following days, the animals were tested with toxins A and B, 0.2 c.c. quantities of the diluted toxins being injected. Toxin A was injected on the right side and toxin B on the left side.

	First series (1.5 unit antitoxin)				Second series (3 units antitoxin)			
	No. 63 370 grammes	No. 64 370 grammes	No. 65 370 grammes	No. 66 370 grammes	No. 67 390 grammes	No. 68 390 grammes	No. 69 390 grammes	No. 70 390 grammes
May 11th:								
R 1 {								
1								
2	o	o	o	o	o	o	o	o
L 1 {								
1	+							
2	-	o	o	o	o	o	o	o
May 12th:								
R 2 {								
1								
2	o	o	o	o	o	o	o	o
L 2 {								
1	+	+	+	+		+	+	+
2	-	-	-	-	o	-	-	-
May 13th:								
R 3 {								
1	+			+				
2	-	o	o	-	o	o	o	o
L 3 {								
1			+	+	+	+	+	+
2	+	+	-	+	-	-	-	-
May 14th:								
R 4 {								
1	+	+		+				
2	-	-	o	-	o	o	o	o
L 4 {								
1			+	+	+	+	+	+
2	+	+	-	+	-	-	-	-
May 15th:								
R {								
1		+	+	+			+	
2	+	-	-	-	o	o	-	o
L {								
1								
2	++	+	+	+	+	±	+	+

6. REPORT SUBMITTED BY PROFESSOR L. HIRSZFELD,
 " PANSTWOWY ZAKLAD HIGJENY ", WARSAW, POLAND.

Experiments on Guinea-pigs with the Toxins A and B.

(Each guinea-pig received one unit of antitoxin on April 20th
 1931.)

Date of test	No. 1		No. 2		No. 3	
	Toxin A	Toxin B	Toxin A	Toxin B	Toxin A	Toxin B
April 21st	—	—	—	—	—	—
April 22nd	—	—	—	—	—	—
April 23rd.. . . .	—	—	—	—	—	—
April 24th.. . . .	—	—	—	—	—	—
April 25th.. . . .	—	—	—	—	—	—
April 26th.. . . .	—	—	—	—	—	—
April 27th.. . . .	—	—	—	—	—	—
April 28th.. . . .	—	—	—	—	—	—
April 29th.. . . .	—	+	—	+	—	—
April 30th.. . . .	—	+	—	+	—	—
May 1st	+	+	+++	+++	—	—

Date of test	No. 4		No. 5		No. 6	
	Toxin A	Toxin B	Toxin A	Toxin B	Toxin A	Toxin B
April 21st	—	—	—	—	—	—
April 22nd	—	—	—	—	—	—
April 23rd.. . . .	—	—	—	—	—	—
April 24th.. . . .	—	—	—	—	—	—
April 25th.. . . .	—	—	—	—	—	—
April 26th.. . . .	—	—	—	—	—	—
April 27th.. . . .	—	—	—	—	—	—
April 28th.. . . .	—	—	—	+	—	—
April 29th.. . . .	—	++	—	+	—	—
April 30th.. . . .	—	++	±	++	—	+
May 1st	+++	+++	+++	+++	+	+

Appendix.

MEMORANDUM CONCERNING THE INVESTIGATION OF METHODS OF STANDARDISATION OF TOXINS USED FOR THE SCHICK TEST PROPOSED BY THE PERMANENT INTERNATIONAL STANDARDS COMMISSION.

At the request of the Permanent Standards Commission of the Health Organisation of the League of Nations, the National Institute for Medical Research, Hampstead, London, has been asked to supply two Schick test toxins for the purpose of an investigation the object of which is outlined below.

The original definition of the "Schick test dose" was one-fiftieth ($1/50$) part of the minimal lethal dose, for a guinea-pig, of a matured diphtheria toxin. This is still the definition in use in the United States of America, where the dilution is usually so made that this dose is contained in 0.1 c.c., this being the volume injected in making the test. If 0.2 c.c. is used for injection, as commonly in Europe, the American regulations stipulate that the dose contained in it shall be one-fortieth ($1/40$) instead of $1/50$ th of a guinea-pig lethal dose. In any case, however, the American dosage is based entirely on the lethal action of the toxin on the guinea-pig; and investigators in that country, who have had very great experience of the test, maintain that this definition gives a sufficiently accurate dosage for the practical purpose of distinguishing the sensitive (Schick-positive) from the immune (Schick-negative) subjects.

With measurement of dosage on this simple basis, it is clear that the Schick test doses of different toxins may contain varying proportions of toxoid to toxin, and, therefore, vary rather widely in their combining powers for antitoxin. The level of antitoxic content of the blood, at which a patient passes from the "positive" into the "negative" class, must vary accordingly with different toxins. Experimentally, it is easy to show that animals, with an appropriately small amount of antitoxin in the blood, will give a positive reaction to one and a negative reaction to the other of two toxins, varying in their combining power for antitoxin though containing the same amount of toxin, injected in equal fractions of their lethal doses. If the object of the practical test were to separate patients with scientific accuracy into two classes, corresponding to antitoxin contents in the blood below and above a certain agreed level, of unitage, there would be no difference of opinion as to the necessity of measuring the Schick test dose in combining power, in addition to ensuring that it has an adequate degree of specific toxicity. The question on which there is a difference of opinion between different countries, as reflected in official regulations, is the necessity of this admittedly more accurate adjustment for the practical conduct of the Schick test.

In the United States of America, the original definition is held to be sufficient ; in Great Britain, an additional adjustment of the dose by combining power has been legally enforced. This additional stipulation makes the testing more complicated and excludes from use for the Schick test a certain number of toxins which would be available on the American basis. With a view to international agreement on a definition of the Schick test dose, it is desired to put to a practical test this question of the necessity for dosage by combining power. Two toxins have accordingly been chosen, of which the Schick test doses, measured by their lethal doses, differ rather widely in their combining powers for antitoxin. The object of the trial is to discover whether a significant proportion of human beings (patients and normal individuals) under test give different results with these two toxins—*i.e.*, are classed "positive" by one and "negative" by the other.

The Schick Test Toxins supplied.

The two toxins chosen for this enquiry are naturally matured diphtheria toxins, selected from a number of carefully tested toxins which have been studied in recent years at the Wellcome Physiological Research Laboratories, Beckenham, Kent, England. We are greatly indebted to Dr. O'Brien and Mr. Glenny for their help in the selection of these toxins for investigation, and for the provision of sufficient quantities of them in suitable form for the trial.

The two toxins, A and B, were retested in January and February 1931; the results are shown in the following table :

Toxin	M.L.D.	The Schick test dose	Amount of antitoxin which	
			just neutralises the Schick test dose	fails to neutralise the Schick test dose
A	c.c. 1/60th	c.c. 1/2400th	1/1000th unit	1/1250th unit
B	1/50th	1/2000th	1/300th unit	1/350th unit

Thus, each of the toxins satisfies the requirements of a Schick test toxin as originally defined by Schick ; one of them, toxin A, further, conforms to the requirements of a Schick test toxin considered satisfactory for use in Great Britain, since the toxin contained in the Schick test dose is neutralised by 1/1000th of a unit of antitoxin. Toxin B, although containing the same amount of toxin in the Schick test dose as toxin A, contains more toxoid ; the amount of antitoxin required for its neutralisation is 1/300th of a unit.

The Solutions supplied.

Four solutions are supplied :

(1) Schick test toxin A. Prepared by diluting 1 volume of toxin A to 480 volumes. Schick test dose = 0.2 c.c. (orange label) ;

(2) Schick control A. Prepared as (1) but heated to 85° C. for thirty minutes. Control test dose = 0.2 c.c. (yellow label) ;

(3) Schick test toxin B. Prepared by diluting 1 volume of toxin B to 400 volumes. Schick test dose = 0.2 c.c. (red label) ;

(4) Schick control B. Prepared as (3) but heated to 85° C. for thirty minutes. Control test dose = 0.2 c.c. (pink label).

The dilutions have been made in the boric acid-borate buffer mixture recommended by GLENNY, POPE and WADDINGTON (*Journal of Pathology and Bacteriology*, London, 1928, Vol. 31, page 133). The toxins have been found to be stable to shaking and to incubation at 35° C. for twenty-four hours. The solutions may be used for four weeks after their receipt. Tests carried out on samples of similarly diluted Schick test toxins returned two months after their issue have shown that the potency has remained unaltered during that time.

Suggested Method of Use of the Solutions.

It is suggested that 0.2 c.c. quantities of the solutions supplied be injected intracutaneously into human beings, Schick test toxin A and the corresponding heated control into one arm, and Schick test toxin B and the corresponding heated control into the other arm.

The reactions may be read at any convenient interval, but the reading at seven days should be recorded.

The Type of Individuals to be tested.

It is suggested that the following groups of individuals should be tested in the manner indicated in the preceding paragraph :

(1) Individuals undergoing active immunisation against diphtheria. It is suggested that the tests be applied three to four weeks after the last injection of prophylactic.

(2) Recovered cases of diphtheria which have received diphtheria antitoxin for the treatment of the disease. The tests should be applied three weeks, or later, after the injection of the antitoxin.

(3) If available, healthy individuals who, because of exposure to risk of infection, have been given diphtheria

antitoxin as a prophylactic measure ; such cases to be tested four weeks, or later, after injection of antitoxin.

(4) Normal healthy individuals. The most suitable subjects for the test will probably be found to be children between the ages of 2 and 10 years.

Recording of the Results of the Tests.

The method of recording the reactions is left to the observer. The reaction may be measured and its size in millimetres recorded, and notes may be added relating to colour, etc. If the reactions are recorded by means of signs, it is suggested that observers shall indicate, by means of a key, the size and character of the reaction which is indicated by the signs adopted—*e.g.*, ++, +, ±, —.

It will probably be sufficient to summarise the results of the tests performed, and it may be found convenient to state the results in tabular form in some such way as the following :

Group		Number tested	Number			
			Schick + to A and B	Schick — to A and B	Schick — to A and Schick + to B	Schick + to A and Schick — to B
Persons actively immunised	Period since last injection :					
	weeks					
	weeks					
Convalescent diphtheria patients	Period since anti-toxin injection :					
	weeks					
	weeks					
Passively immunised contacts	Period since anti-toxin injection :					
	weeks					
	weeks					
Normal individuals	Age-groups :					
	> 1 to 3 years					
	4 to 7 years					
	8 to 10 years					

Any further details of the results obtained, especially in regard to instances showing differences in reaction to the two toxins would be welcomed.

Suggested Tests on Experimental Animals.

Although the main purpose of the enquiry is to investigate the results obtained, in human beings, by the use of two Schick test toxins of different combining power, those taking part may be interested to study the results obtained in actively or passively immunised guinea-pigs. For the latter kind of experiment (passively immunised guinea-pigs), the following indications, which should reveal the different properties of the two toxins, may be given : groups of four or more guinea-pigs (350 to 400 grammes in weight) are given, by subcutaneous injection, 1.5, 2 or 3 units of antitoxin. The guinea-pigs are then Schick tested with toxins A and B, starting on the second day after injection of the antitoxin and the tests repeated each day following. The animals will ultimately become Schick-positive to both toxins (probably in about four days); but at some stage in the intervening period it will be found that some animals react negatively to toxin A, while reacting positively to toxin B.

ANNEX III.

C.H.954.

QUESTIONNAIRE CONCERNING CASES OF DIPHTHERIA
ENDING FATALLY IN SPITE OF TREATMENT BY SERUM.

Hospital : Locality :
Name of patient :
Male—female Age : ... year : ... month : ...
Onset of disease : date hour
 First symptoms :
 Date of death hour

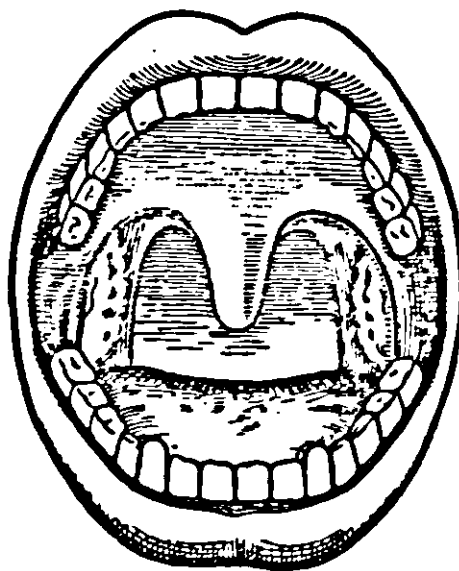
I. CONDITION OF THE PATIENT ON ADMISSION TO HOSPITAL.

1. *Condition of the throat* : Swelling of tonsils ; other symptoms.

2. *Extension of false membranes on palate and throat* :

Right side pillar of palate—right tonsil—left side pillar of
palate—left tonsil—palate—velum of palate—uvula—
back of the throat—tongue, oral mucous membrane.

Please show the extension of the false membranes on the
diagram below (with coloured pencil).



Note.—Strike out what is not applicable.

3. *Swelling of the lymph-glands (ganglions) :*

Size of the retro-maxillary lymph glands :

Right glands : Size of a bean—a hazelnut—or a walnut.

Left glands : Size of a bean—a hazelnut—or a walnut.

Size of the swelling about :

The right maxillary lymph glands : size ... cm. × ... cm.

The left maxillary lymph glands : size ... cm. × ... cm.

4. *Fætor :*

Strong—slight—none.

5. *Nasal diphtheria :*

Coryza : present—or not.

Secretions : sero-hæmorrhagic—sero-purulent—serous.

Visible false membranes on nasal mucous membranes :

Right side : present—or not.

Left side : present—or not.

Ulcer of nostrils : present—or not.

6. *Laryngeal diphtheria :*

Hoarseness : Date of onset : hour :

Stenosis : Date of onset : hour :

Intubation } Date of operation : hour :
Tracheotomy }

Sign of descending diphtheria—for instance, dyspnœa during expiration : present—or not.

7. *Toxic symptoms :*

Pallor : Very marked—not present.

Tongue : Dry—moist—coated (fuliginous—white)—or not.

Sign of myocarditis :

Enlargement of the heart dullness ? Yes—no (if possible X-ray photograph).

Heart sounds : Normal—weak—dull—indistinct (character of the sounds).

Arhythmia ? Present—or not.

Blood pressure : systolic diastolic.

Blood findings :

Hæmorrhage : Observed—not observed.

Throat ? Nose ? Skin ? Urine ? Other ?

Enlargement of the liver : relationship between the lower margin of the liver and the costal margin.

Is the liver tender to pressure ? Yes—no.

Repeated vomiting :

One day ? Yes—no.

Several days ? Yes—no.

Diarrhœa :

Result of urine examination :

Quantity c.c.; specific gravity :

Albumen : Present—or not. How much per thousand? . . .

Cellular elements and casts :

Paralysis : Present (for instance, velum paralysis, paralysis of other organs)—not present.

Knee-jerk :

Present on the *right*—or not.

Present on the *left*—or not.

Sensorium : Dulled—clear.

8. *Bacteriological examination :*

Were diphtheria bacilli recovered from the throat, the nose, larynx (examination to be carried out only in case of intubation or tracheotomy), in the blood, in the urine or in other excreta of the patient—which ?

How was *Bacillus diphtheriæ* identified ?

By means of pure culture ? Yes—no.

By sugar fermentation ? Yes—no. Which ?

By inoculation of laboratory animals ? Yes—no.

Associated bacteria :

Were bacteria other than the diphtheria bacilli found ?

Which ?

(a) By means of direct microscopical examination of smears taken from affected organs ?

(b) By culture ?

In the case of diphtheria fatal in spite of serum treatment, you are earnestly requested to obtain by pure culture diphtheria bacilli and to send them as soon as possible to :

Professor PRIGGE,

State Institute for Experimental Therapy,
Frankfort on the Main,

for the comparative testing of the toxin producing properties.

9. *Treatment by diphtheria antitoxin :*

Date	Date	Date	Date
..... Hour	..... Hour	..... Hour	..... Hour
..... How many I.U.	..... How many I.U.	..... How many I.U.	..... How many I.U.

Through :

Intravenous .	.....	.....	.....	.....
Intramuscular	.....	.....	.....	.....
Subcutaneous routes...	.....	.....	.....	.....

Origin of the serum :
 Albumen content : concentrated—not concentrated.
 Did the serum contain antiseptics ? Yes—no. Phenol—
 Tricresol—Chinosol—Others ? Which ?

10. *Treatment with other sera ?* For example, scarlet fever, antistreptococcic serum, other serum ? Which ?

Date	Date	Date	Date
..... Hour	..... Hour	..... Hour	..... Hour
..... Quantity	..... Quantity	..... Quantity	..... Quantity

Through :

Intravenous ...	.....	.....	.....	.....
Intramuscular..	.....	.....	.....	.....
Subcutaneous routes.....	.....	.....	.....	.....

Origin of the serum :
 Albumen content : concentrated—not concentrated.
 Did the serum contain antiseptics ? Yes—no. Phenol—
 Tricresol—Chinosol—Others ? Which ?

II. *Serum Sickness and Accidents :*

Immediate—later—none.
 Was exanthem observed ? Yes—no. When ? (Date)....
 On which part of the body ?
 Swelling of the joints ? Yes—no. When ? (Date)....
 Which joint ?
 Other symptoms :

II. EVOLUTION OF THE DISEASE.

12. *Did the false membranes in the throat increase?*

On :	Within the first twenty-four hours after the first injection of antitoxin	Later
Right side pillar of palate
Right tonsil
Left side pillar of palate
Left tonsil
Palate
Velum of palate
Uvula
Back of throat
Tongue
Oral mucous membrane

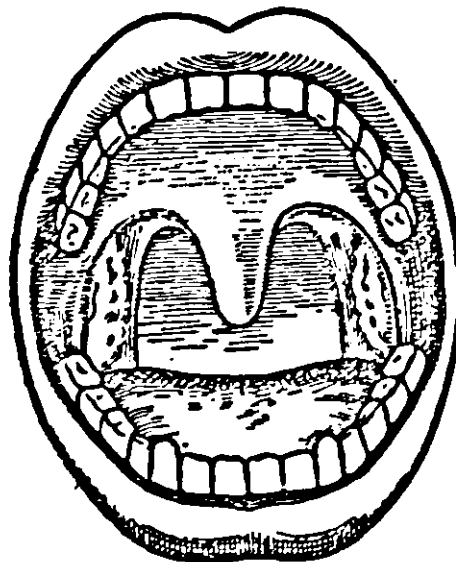
Colour and character of the

false membranes :	Within the first twenty-four hours after the first injection of antitoxin	Later
	Opalescent-white, Yellow-œdematous Hæmorrhagic, Necrotic, Gangrenous.	Opalescent-white, Yellow-œdematous Hæmorrhagic, Necrotic, Gangrenous.

It is requested to show the extension of the false membranes on the diagram below (with coloured pencil).

Diagram showing condition within the first twenty-four hours after the first injection of antitoxin.

Diagram showing condition later than the first twenty-four hours after the first injection of antitoxin.



13. *Separation of the false membranes :*

Beginning of the separation : Date
End of the separation : Date

14. *Œdema round the lymph glands :*

Increase within the first twenty-four hours after the first
injection of antitoxin : Yes—no.
Or later : Yes—no.
Decrease : Yes—no. .

15. *Was fœtor observed which was not present on admission
to hospital ?*

Within the first twenty-four hours after the first injection of
antitoxin : Yes—no.
Or later : Yes—no.

16. *Was nasal diphtheria observed which was not present on
admission to hospital ?*

Within the first twenty-four hours after the first injection
of antitoxin : Yes—no.
Or later : Yes—no.

17. *Was laryngeal diphtheria observed which was not present
on admission to hospital ?*

Within the first twenty-four hours after the first injection of
antitoxin : Yes—no.
Or later : Yes—no.

If necessary :

Hoarseness : Date of onset hour

Stenosis : Date of onset hour

Intubation } Date of operation hour
Tracheotomy }

Sign of descending diphtheria—for instance, dyspnœa during
expiration : present or not?

If present, when observed : Date hour

18. *Hæmorrhage :*

From the throat : Yes—no. Date hour

From the nose : Yes—no. Date hour

In the skin : Yes—no. Date hour
Miliary—in plaques—isolated—multiple.

In the urine : Yes—no. Date hour

Other hæmorrhages : Yes—no. Date hour

Where ?

19. *Blood findings* :
20. *Paralysis* : Present—or not.
When observed (date) ?
In which groups of muscles ?
21. *Curve of the temperature, pulse and respiration* :

III. LAST EXAMINATION BEFORE DEATH.

22. *Toxic symptoms* :
- Pallor : Very marked—not present.
- Signs of myocarditis :
- Enlargement of the heart dullness ? Yes—no (X-ray photograph if possible).
Heart sounds : normal—weak—dull—indistinct (character of the sounds).
Arhythmia ? Present—or not.
- Blood pressure : mm. systolic mm. diastolic
Blood findings :
- Hæmorrhage : Observed—not observed.
Throat ? Nose ? Skin ? Urine ? Other ?
- Enlargement of the liver—relationship between the lower margin of the liver and the costal margin.
Was the liver tender to pressure ? Yes—no.
Pains in the precordium and epigastrium ? Yes—no.
- Repeated vomiting :
On last day of life : Yes—no.
- Diarrhœa :
- Findings in the urine examined : Quantity c.c.;
specific gravity
Albumen : Present—or not. How much per thousand?...
Cellular elements and casts :
- Paralysis : Present—or not. In which groups of muscles?
.....
- Knee-jerk :
- Right* : Present—absent.
Left : Present—absent.
- Sensorium : Dulled—clear.
Motor disturbances : Present—absent.
Convulsions : Present—absent.

IV. CAUSE OF DEATH.

23. *Clinical diagnosis.*

For example :

Circulatory disturbances : Yes—no.

Paralysis : Yes—no.

Complications, such as pneumonia : Yes—no.

 Hæmorrhagic condition : Yes—no.

 Septicemia : Yes—no.

Asphyxia : Yes—no.

24. *Was a post-mortem performed ?* Yes—no.

Post-mortem findings :

.....
.....
.....
.....

V. CULTURE OF THE BLOOD TAKEN FROM THE HEART.

25. *Results of this culture :*

.....
.....
.....
.....

It is requested that the completed questionnaire may be returned as soon as possible to the Health Section, League of Nations, Geneva.



ANNEX IV.

C.H.1055(1).

REPORT OF THE CONFERENCE
ON VITAMIN STANDARDS, HELD AT LONDON FROM
JUNE 17TH TO 20TH, 1931.

LIST OF PARTICIPANTS.

Chairman :

Professor E. MELLANBY, Professor of Pharmacology,
University of Sheffield, Sheffield.

Participants :

Professor J. C. DRUMMOND, Professor of Biochemistry,
University College, University of London.

Professor H. VON EULER, Professor of Biochemistry,
University of Stockholm, Stockholm.

Professor L. S. FRIDERICIA, Director, Institute of Hygiene
of the University, Blegdamsvej 21, Copenhagen.

Professor B. C. P. JANSEN, Professor of Physiological
Chemistry, University of Amsterdam, Amsterdam.

Professor E. V. McCOLLUM, Professor of Chemical Hygiene,
School of Hygiene and Public Health, Johns Hopkins
University, Baltimore.

Professor E. POULSSON, Director of the State Vitamin
Institute, Skoyen-Oslo.

Mme. G. L. RANDOIN, " Directeur du Laboratoire de
physiologie au centre de recherches sur l'alimentation
(Institut de recherches agronomiques), Directeur du
laboratoire de physiologie de la nutrition à l'Ecole des Hautes-
Etudes ", Paris.

Professor A. C. SCHEUNERT, " Direktor des Tierphysio-
logischen Instituts der Universität ", Leipzig.

Dr. A. SEIDELL, Chemist, National Institute of Health,
United States Public Health Service, Washington, D.C.

Professor H. STEENBOCK, Professor of Agricultural
Chemistry, University of Wisconsin, Madison, U.S.A.

Professor A. WINDAUS, " Direktor, Allgemeines Che-
misches Laboratorium der Universität Göttingen", Germany.

Technical Secretaries :

Dr. H. CHICK, Lister Institute for Preventive Medicine, London.

Dr. W. R. AYKROYD, Lister Institute for Preventive Medicine, London.

The following were also present :

Dr. C. E. BILLS, Director of Research, Mead Johnson and Co., Evansville, Indiana, U.S.A.

Dr. R. BOURDILLON, National Institute for Medical Research, London.

Dr. Katherine COWARD, Pharmaceutical Society's Laboratories, London.

Professor R. A. PETERS, School of Biochemistry, Oxford.

Dr. O. ROSENHEIM, National Institute for Medical Research, London.

Dr. S. S. ZILVA, Lister Institute for Preventive Medicine, London.

In the following recommendations, the question of standards and units for the four following vitamins only is considered :

- I. The fat soluble Vitamin A.
- II. The antirachitic Vitamin D.
- III. The antineuritic Vitamin B (also known as Vitamin B₁).
- IV. The antiscorbutic Vitamin C.

It is the general opinion that, in the present state of our knowledge, only these vitamins can be profitably discussed in this connection.

I. THE FAT SOLUBLE VITAMIN A.

(a) *International Standard.*

The Conference recommends that carotene be accepted as an international provisional standard of reference for Vitamin A and that a selected sample of cod-liver oil be held in view as a possible secondary standard.

(b) *Mode of Preparation.*

It was decided that the information available does not yet justify the selection of one isomer of carotene as a standard. The similar biological activity of the two isomers that have recently been described is further justification for adopting as

the provisional international standard a mixture prepared in an approved manner.

It was decided to employ a preparation of carotene made from carrots by Willstätter's method and purified by recrystallisation by the method described in the memorandum issued by the Department of Biological Standards, National Institute for Medical Research, London (see Appendix, page 76), until the melting-point determined is above 179° C. It was suggested that preparations should be made in various countries and despatched immediately and with all necessary precautions against decomposition to the National Institute for Medical Research, London, where they will be mixed to form a uniform preparation by the most suitable method. The details of this final purification is to be left to the discretion of the authorities of the National Institute. It was suggested that original preparations of, say, 4 to 5 grammes might be made in the following institutions :

Department of Physiological Chemistry, University of Amsterdam.

“ Laboratoire de physiologie de la nutrition, Ecole des Hautes Etudes ”, Paris.

“ Tierphysiologisches Institut ”, Leipzig.

National Institute for Medical Research, Hampstead, London.

Department of Agricultural Chemistry, University of Wisconsin, U.S.A.

Biochemical Department, University of Stockholm, and
“ Institut für Organische Chemie der Universität ”,
Zürich.

School of Hygiene and Public Health, Johns Hopkins University, Baltimore, U.S.A.

(c) *Place of Preparation.*

It was decided that the National Institute for Medical Research, London, acting for this purpose as the *central laboratory on behalf of the Health Organisation of the League of Nations*, should be asked to undertake the final preparation of the sample of carotene to be used as the international standard for Vitamin A.

(d) *Mode of Distribution.*

It was considered desirable that, as far as possible, the standard preparation should be distributed to workers through the appropriate official institution in each country, preferably that now responsible for the distribution of similar biological standards. The material should be sent out in tubes of 10 mg. as described in the Appendix, page 76.

(e) *Definition of Unit.*

The unit of Vitamin A recommended for adoption is the Vitamin A activity of 1 γ (0.001 mg.) of the international standard.

Note.—Daily doses of about 3 γ to 5 γ of the international standard, when administered to young rats suitably prepared on a Vitamin A-deficient diet, have been found adequate to restore growth and to cure xerophthalmia.

(f) *Permanence of the Standard.*

The Conference recommends that this international standard and unit be accepted provisionally for two years.

(g) *Subjects recommended for Future Investigations.*

It is highly desirable that, during the provisional period, further investigations of the standard should be made regarding the stability of the carotene preparation both when sealed in the original tubes and after it has been removed and dissolved for biological testing. In the latter connection, emphasis is laid on the importance of minimising contact with air or oxygen of the solutions used for animal feeding. It is recommended that they be always stored in an inert gas and, at low temperature.

It will be of great value if investigators submit to the League of Nations Health Organisation observations on the stability of the preparation, its behaviour in various solvents and under different conditions of storage, and any other information bearing on its use as a biological standard. The use of suitable "antioxidants" ("*antioxygènes*" in French) should, in particular, be studied.

(h) *Biological Methods for Estimation of Vitamin A.*

It was decided not to recommend any one particular method of conducting the biological assay, but to invite members of the Conference to submit to the League of Nations Health Organisation their observations on the value of the methods they have been using.

It is recommended that further attention be given to the methods based on the curative action of carotene for xerophthalmia and other lesions characteristic of Vitamin A deficiency, as well as to those based on increase in weight.

(i) *Selected Sample of Cod-Liver Oil for use as a possible Secondary Standard.*

It is recommended that a supply of an approved sample of cod-liver oil be obtained with the object of making a series

of comparative tests to determine its suitability as an alternative standard. The Conference is informed that the United States Department of Agriculture is making arrangements for such a standard substance to be available in the United States during the coming year.

It was decided to ask the United States Department of Agriculture to obtain sufficient supplies of the oil for distribution in order to enable investigators of other countries to assay this oil in terms of the international unit of standard carotene. It is hoped thus to obtain evidence regarding the stability of Vitamin A in cod-liver oil as affected by conditions and time of storage.

II. THE ANTIRACHITIC VITAMIN D.

(a) *International Standard to be adopted and Arrangements for Control.*

The Conference recommends that the standard solution of irradiated ergosterol at present issued from the National Institute of Medical Research, London, be adopted as international Vitamin D standard for the next two years.

If within this period it should become necessary, owing to threatened exhaustion of the present supply, to replace this solution by a fresh standard, the equivalence shall be determined by experts of different countries who have had the opportunity of comparing the proposed new standard with the one at present issued. It is suggested that the following Institutions, among others, be invited to co-operate in those tests :

“ Allgemeines Chemisches Laboratorium ”, Göttingen.

“ Tierphysiologisches Institut ”, Leipzig.

Food and Drugs Administration Laboratory, Department of Agriculture, Washington, D.C.

Biochemical Department, University of Stockholm.

Department of Agricultural Chemistry, University of Wisconsin.

School of Hygiene, Johns Hopkins University, Baltimore.

“ Laboratoire de physiologie de la nutrition, Ecole des Hautes Etudes ”, Paris.

Pharmaceutical Society, London.

(b) *Method of Preparation.*

1. It is recommended that, in the preparation of the solutions of irradiated ergosterol, used as standards of reference for Vitamin D (or as sub-standards), irradiation with ultra-violet light shall be done in ethereal solution in the absence of any

appreciable traces of oxygen, and the solution should be kept in rapid motion. The conditions of exposure should be such as to transform between 30 per cent and 80 per cent of the ergosterol. The solution of the product and of further dilutions shall be made in a stable unsaturated natural vegetable oil, which has given a negative test for Vitamin D.

2. The standard solution of irradiated ergosterol at present issued from the National Institute for Medical Research, London (Standard Solution III), was, however, prepared as follows, in January 1929 :

A 0.1 per cent solution of the ergosterol in absolute alcohol was exposed for half an hour in a silica cell, 1 cm. thick, to the unfiltered radiation from a K.B.B. (Kelvin, Bottomley and Baird) mercury vapour lamp, taking 2.5 amperes and 125 volts at atmospheric pressure, at 15 cm. distance from cell to lamp. The resulting solution was mixed with a little olive oil, and then evaporated at 45° C. at a low pressure to remove the alcohol. The concentrated oily solution thus obtained was diluted with pure olive oil to give a concentration corresponding to 1 mg. of the original ergosterol in 10 c.c. of olive oil at 18° C. The olive oil used was tested for stability and gave a negative test for Vitamin D.

The additional larger quantity of standard (prepared January 1931), which is available for distribution later if required, was prepared with observance of the general conditions indicated under 1.

(c) *Mode of Distribution.*

The National Institute for Medical Research, London, *acting for this purpose as the central laboratory on behalf of the League of Nations Health Organisation*, shall distribute to each country wishing to use the standard a sufficient quantity of the solution to enable the standard to be effectively applied according to the conditions in the particular country. Such quantity should be supplied only to a central institution nominated for the purpose by the country concerned, which will be responsible for the distribution either of the portion of international standard solution received or, wherever possible, of an equivalent sub-standard prepared by comparison therewith.

(d) *Stability of the International Standard.*

The stability of the standard solution at present issued from the National Institute for Medical Research, London, has proved satisfactory on the results of tests over a period of two years, when preserved at or below 0° C. with exclusion of air.

(e) *Definition of Unit.*

The unit of Vitamin D recommended for adoption is defined as the Vitamin D activity of 1 mg. of the international standard solution of irradiated ergosterol.

Note.—The international standard solution has been prepared to have such potency that approximately 1 mg. thereof given daily to a rachitic rat for eight successive days will produce a wide line of calcium deposits in the metaphysis of the proximal ends of the tibiæ and of the distal ends of the radii.

(f) *Permanence of the Standard.*

The international standard at present recommended shall be regarded as provisional for the next two years, in the hope that a more stable crystalline substance may in the meantime become available.

(g) *Subjects recommended for Further Investigation.*

1. The influence of various oils as solvents upon the stability of solutions of irradiated ergosterol.

2. Further investigation of the crystalline antirachitic substances recently isolated from irradiated ergosterol. It was decided that Professor Windaus and Dr. Bourdillon shall be asked to investigate the constancy of the physical properties of the crystalline products recently isolated by them respectively, in order to determine whether these may be regarded as pure substances. If so, the potency of these products should be accurately compared with that of the (present) international standard at intervals of three months during the next two years, in order to compare the stability in each case. If the results are satisfactory, it is hoped that one of these crystalline substances may eventually replace the solution of irradiated ergosterol as international Vitamin D standard.

3. The toxicity of the present standard and of the crystalline products should be investigated (see also Appendix, page 75).

(h) *Biological Methods for Estimation of Vitamin D.*

In using the international standard solution for the determination of the antirachitic potency of unknown preparations, it is recommended that not fewer than twenty rats (preferably more) be used for a determination, half of these to receive the standard and the remaining litter-mates the unknown substance. Provided this precaution is observed, it is considered permissible to use various biological methods of estimation, either prophylactic or therapeutic. For instance, the "line" test, X-ray examination or determination of the bone ash, are all considered reliable methods.

III. THE ANTINEURITIC VITAMIN B.

(a) *International Standard.*

The Conference recommends the adoption, as international standard, of the adsorption product of the antineuritic Vitamin B prepared in the Medical Laboratory, Batavia (Java), by the method of Seidell, as described by Jansen and Donath.

(b) *Terminology.*

The international standard preparation should be known as the "standard adsorption product of the antineuritic Vitamin B".

(c) *Method of Preparation.*

The international standard is prepared by extracting rice polishings with water, sufficient sulphuric acid being added to make the pH 4.5. Salicylic acid to a concentration of 0.2 per cent and toluene are then added to prevent bacterial decomposition. The process of extraction is continued for two days, after which the solution is filtered. For each 100 kilogrammes of the original rice polishings, 3 kilogrammes of fuller's earth (specially selected for its adsorptive powers) are added to the solution, which is then stirred for twenty-four hours. Subsequently, the solution is filtered off and the fuller's earth, after being washed with water and alcohol, is dried; 3 kilogrammes of the fuller's earth adsorbate represents the antineuritic Vitamin B from 100 kilogrammes of rice polishings.

(d) *Place of Preparation.*

It is recommended that the Medical Laboratory, Batavia, Java, should be asked, through Professor Jansen, of Amsterdam, to prepare a batch of 25 kilogrammes of the standard preparation. This should provide an adequate supply for many years.

(e) *Place of Distribution.*

It is suggested that this batch of standard adsorption product of antineuritic Vitamin B should be kept at the National Institute for Medical Research, London, *acting for this purpose as central laboratory on behalf of the Health Organisation of the League of Nations.*

One hundred grammes would be an amount suitable for distribution to individual laboratories. No special precautions are necessary in keeping this preparation, except that it should be stored in a dry place. In the presence of moisture, bacterial decomposition readily takes place.

(f) *Definition of Unit.*

The unit recommended for adoption is the antineuritic activity of 10 milligrammes of the international standard adsorption product.

Note.—A daily dose of 10 to 20 mg. of this preparation is required to maintain normal growth in a young rat on a diet deficient in the antineuritic Vitamin B but complete in all other respects, including the antidermatitis Vitamin (B₂); the curative "day dose" for a pigeon (300 grammes weight) suffering from polyneuritis on a diet of polished rice is about 20 to 30 mg. (method of Kinnersley and Peters).

(g) *Permanence of the International Standard Recommended.*

This standard adsorption product should serve as a provisional international standard for five years, or until advances in the knowledge of this vitamin make a revision desirable.

(h) *Recommendations for Further Investigations.*

1. The standard adsorption product should be investigated for its content of other vitamins B.

2. Although there is no evidence that loss of potency is liable to occur in the standard adsorption product, the Conference suggests that the following laboratories be asked to undertake a further investigation of its stability :

Department of Physiological Chemistry, University of Amsterdam.

National Institute of Health, United States Public Health Service, Washington, D.C.

Institute of Hygiene, University of Copenhagen.

School of Biochemistry, University of Oxford.

"Tierphysiologisches Institut", Leipzig.

Biochemical Institute, University of Stockholm.

"Laboratoire de physiologie au Centre de recherches sur l'alimentation (Institut des recherches agronomiques)", Paris.

Lister Institute for Preventive Medicine, London.

(i) *Biological Methods for Estimation of the Antineuritic Vitamin B.*

The Conference expresses no opinion on the relative merits of current biological methods for estimation of the antineuritic Vitamin B (as recorded in the report on this vitamin, presented to this Conference and in the literature generally). It considers that good evidence is provided by that report that the different methods described, either prophylactic or curative in type, and employing either the rat or the pigeon as experimental animal, may yield equally valid results.

IV. THE ANTISCORBUTIC VITAMIN C.

(a) *International Standard.*

The Conference recommends the adoption as international standard of the fresh juice of the lemon, Citrus limonum.

(b) *Definition of Unit.*

The unit of the antiscorbutic Vitamin C recommended for adoption is the Vitamin C activity of 0.1 c.c. of fresh juice of the lemon, *Citrus limonum*.

Note.—This is about 1/10th of the daily dose necessary to prevent development of macroscopic scorbutic lesions in a young guinea-pig maintained on a scurvy-producing diet.

(c) *Method of Use.*

The fresh lemon juice used as standard may be decitrated as follows : to the expressed juice after filtration through muslin an excess of calcium carbonate is added until effervescence stops. After standing for one hour, the mixture is filtered through a Buchner funnel. The decitrated juice should have a reaction of pH about 6 and should be administered to the experimental animal within two hours after filtration.

(d) *Permanence of Standard.*

This international standard shall be regarded as provisional for the next two years.

* * *

NOTE ON THE TOXICITY OF IRRADIATED ERGOSTEROL.

In view of the toxic effects which have been reported after administration of certain specimens of irradiated ergosterol, this Conference suggests the advisability of testing all preparations of irradiated ergosterol, destined for medicinal use, for toxicity as well as for antirachitic potency.

Appendix.

MEMORANDUM ON CAROTENE SUPPLIED FOR TESTINGS ITS SUITABILITY AS A POSSIBLE STANDARD FOR VITAMIN "A".

Preparation.

The material provided has been prepared as follows : Commercial carotene (B.D.H.) was dissolved in benzene and filtered, and the clear solution poured into a large volume of warm absolute alcohol. The crystallisation was allowed to proceed at 37° C., and the crystals filtered off at the same temperature. All these operations were carried out in an atmosphere of CO₂. The crystalline material was dried *in vacuo*. Melting point 179° to 180° C. (taken in electrically heated "Berl block").

For distribution into tubes the material was dissolved in benzene at 37° C. to make a 2 per cent solution ; 0.5 c.c. of this solution was run into each of the brown glass tubes in which the material is distributed, the whole process of solution and filling out being again carried out in an atmosphere of CO₂. The filled tubes were transferred to a desiccator containing paraffin shavings and CaCl₂. The desiccator was evacuated and left attached to the pump until the benzene had completely evaporated and the carotene had been deposited, mainly as a crystalline residue, at the bottom of each tube. When drying was complete, the desiccator and contained tubes were again filled with CO₂, evacuated, and refilled with CO₂. The tubes, before filling, had been drawn out into narrow constrictions to facilitate sealing, which was thus rapidly effected with minimal contamination of the CO₂ by air.

Suggestions for Use.

It is assumed that less than the whole contents of one tube (10 mg.) will be required for a test. The tube having been opened, the necessary quantity of carotene can be removed with the aid of a fine glass rod or narrow platinum spatula, and immediately dissolved in the chosen solvent. The partly used tube should be enclosed in a test tube of suitable size, which should then be drawn out in preparation for sealing. The test tube and contained specimen tube can then be refilled with CO₂ in the vacuum desiccator, as above described, removed, quickly sealed, and preserved in a cold, dark place until again required. The prepared solution, if it is to be used for several tests, should be preserved from light and oxygen by similar or equivalent precautions.

January 6th, 1931.

*Department of Biological Standards,
National Institute for Medical Research, London.*

Geneva, July 31st, 1931

LEAGUE OF NATIONS

Health Organisation

EUROPEAN CONFERENCE ON RURAL HYGIENE

(June 29th to July 7th, 1931)

Volume I

RECOMMENDATIONS

Principles governing
the Organisation of Medical Assistance,
the Public Health Services and Sanitation
in Rural Districts

Series
of League of Nations Publications

III. HEALTH ✓
1931. III. 111

CONTENTS

	Page
Foreword	5
<i>Chapter I.</i> — ORIGIN; OBJECTS; IMMEDIATE RESULTS OF THE CONFERENCE . . .	7
I. Historical. — 2. Problems. — 3. Methods. — 4. The Conference. — 5. Resolutions: (a) Principles of General Administration; (b) Means of Action; (c) Realisation; (d) Minimum Standards; (e) Subjects for Study; (f) Tendencies.	
<i>Chapter II.</i> — MEDICAL ASSISTANCE.	15
I. Definition. — 2. Number of Doctors. — 3. Pharmacists — 4. Nurses. — 5. First-aid Personnel. — 6. Centres of Diagnosis; Liaison — 7. Hospitals; Means of Transport and Communication. — 8. Laboratories. — 9. Specialists; Liaison. — 10. Means of Realisation: (a) Collaboration; (b) Part played by Public Authorities; (c) Health Insurance; (d) Public Assistance	
<i>Chapter III.</i> — PUBLIC HEALTH SERVICES:	
A. General Considerations.	23
I. Gradual Decentralisation. — 2. The Medical Officer of Health; His Status. — 3. His Field of Action. — 4. His Responsibility: Unity of Direction. — 5. Minimum Personnel. — 6. The Sanitary Engineer. — 7. The Health Programme. — 8. Committees for Propaganda and Co-ordination. — 9. Budget. — 10. Source of Funds. — 11. Co-operation with Health Insurance Institutions. — 12. Co-operation with the Medical Profession and Private Agencies. — 13. Co-operation with Agricultural Advisers and Associations. — 14. Education	
B. Rural Health Centres	29
I. Definition. — 2. Relations with the General Health Organisation. — 3. Adaptation to Local Conditions. — 4. Two Chief Types: Primary and Secondary.	
I. The Primary Health Centre	31
Functions: 5. Health Information. — 6. Health Action. — 7. Treatment; Personnel. — 8. (a) Director; (b) Public Health Nurses; (c) Midwives; (d) Sanitary Inspector.	

B. Rural Health Centres (<i>Continued</i>).	Page
II. The Secondary Health Centre	35
9. Definition. — 10. Programme. — 11. Personnel: (a) Doctor; (b) Nurses; (c) Midwives; (d) Sanitary Engineer; (e) Sanitary Inspectors; (f) Laboratory Technicians. — 12. Committees for Administration and Patronage. — 13. Equipment. — 14. Liaison.	

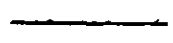
Chapter IV. — SANITATION.

General Considerations:

A. Disposal of Sewage and Refuse.	41
1. Dangers of Sewage. — 2. Sewerage Systems. — 3. Disposal of Sewer Effluents. — 4 and 5. Purification of Sewer Effluents. — 6. Disposal of Sewage and Refuse in Unsewered Districts. — 7. Disposal of Manure. — 8. Disposal of Garbage. — 9. Animal Carcases.	
B. Water Supply.	45
1. Public Water-Supply Systems. — 2. Purity of the Water. — 3. Supervision. — 4. Individual Water Supplies. — 5. The Central Organisation. — 6. Financial Assistance.	
C. Housing	49
1. Needs. — 2. Housing Defects. — 3. Methods of improving Housing. — 4. Housing of Agricultural Workers. — 5. Reconditioning of Existing Houses.	
D. Land Improvements or Bonifications	54
1 to 3. Definition. — 4. Results. 5. Drainage by Water-courses.	

<i>Chapter V.</i> — SUBJECTS FOR STUDY:	57
1 and 2. Training of Health Personnel (Public Health Nurse, Sanitary Engineer). — 3. Problems studied by the Schools of Hygiene: (a) Cost of Medical-Social Services; (b) Manure and Flies; (c) Typhoid Infections; (d) Milk. — 4. Study of Housing Conditions. — 5. Rapid Transport of the Sick	

<i>Chapter VI.</i> — VALUE OF COLLABORATION BETWEEN THE PROFESSIONS AND GROUPS CONCERNED	59
--	----



FOREWORD.

The *report* of the proceedings of the European Conference on Rural Hygiene is contained in two volumes.

Volume I is devoted to the *recommendations* made by the Conference.

Volume II contains the Minutes of the plenary meetings and committees of the Conference.

The present volume (*recommendations*) consists of an introductory chapter on the origin, objects and immediate results of the Conference and a series of chapters giving the resolutions of the Conference together with commentaries.

The resolutions adopted by the Conference are printed *in italics*.

The commentaries are printed in roman type. In drafting them, account was taken of the observations made during the discussion that took place in the *Report of the Preparatory Committee* (document C.H.1045).

CHAPTER I. — ORIGIN; OBJECTS; IMMEDIATE RESULTS OF THE CONFERENCE.

SUMMARY: 1. Historical. — 2. Problems. — 3. Methods. — 4. The Conference. — 5. Resolutions: (a) Principles of General Administration; (b) Means of Action; (c) Realisation; (d) Minimum Standards; (e) Subjects for Study; (f) Tendencies.

I. HISTORICAL.

In September 1930, the Spanish Government proposed to the Council that the League of Nations should convene at Geneva a Conference of representatives of European States for the purpose of a technical international study of rural hygiene, considered as one of the most important factors in the organisation of agricultural areas in Europe.

The Council accepted the proposal, and referred it to the Health Committee for technical study and report.

The Health Committee proposed that the provisional agenda of the Conference should be:

1. Guiding Principles and Suitable Methods for ensuring Effective Medical Assistance in Rural Districts.
2. The Most Effective Methods of organising the Health Services in Rural Districts.
3. The Sanitation of Rural Districts: the Most Effective and Economical Methods.

It also suggested that a Committee be set up to prepare for the Conference, and proposed the members of this Committee.¹

These suggestions received the approval of the Council, and the Preparatory Committee met in October and December 1930 and in May and June 1931.

On its proposal, the Council decided that the Conference should meet at Geneva on June 29th, 1931, and that Professor Gustavo Pittaluga, member of the Health Committee and Director of the National School of Hygiene at Madrid, should be its President.

The Council also decided to invite the Governments of non-European States which had a special interest in rural problems to send observers to attend the Conference and hear the discussions.

On the proposal of the Preparatory Committee, the Council decided that its members should be at the disposal of the delegates during the Conference.

¹ The members of this Committee are:

- Professor G. PITTALUGA (*Chairman*), Director of the School of Hygiene, Madrid;
Dr. H. CARRIÈRE, Director of the Federal Public Health Service, Berne;
Dr. A. LUTRARIO, former Director-General of Public Health, Rome;
Professor J. PARISOT, Director of the Institute of Hygiene, Nancy;
Dr. A. STAMPAR, Inspector-General of Health, Belgrade;
Dr. CHODZKO, Director of the School of Hygiene, Warsaw;
Professor Th. MADSEN, Director of the State Serum Institute, Copenhagen;
Mr. M. HESLTINE, Assistant Secretary, Ministry of Health, London;
Dr. C. HAMEL, President of the *Reichsgesundheitsamt*, Berlin;
Professor J. G. FITZGERALD, Director of the School of Hygiene and Connaught Laboratories, Toronto;
Professor V. PUNTONI (representing the International Institute of Agriculture), Rome;
M. A. TIXIER, Chief of the Section of Social Insurance, International Labour Office.
Dr. BOUDREAU, member of the Health Section of the League of Nations, acted as Secretary.

2. PROBLEMS.

The following subdivision of the items on the agenda was recommended to the Conference:

First Item.

Guiding Principles and Appropriate Methods for ensuring Effective Medical Assistance in Rural Districts.

A. *Personnel:*

1. The Doctor:

- (a) The number and distribution of doctors in rural districts;
- (b) Methods for ensuring an adequate number of doctors in rural districts:
 - (1) The law of supply and demand — no State or public regulation;
 - (2) Public medicine — every doctor a public official;
 - (3) Inducements offered to doctors to settle in rural districts;
 - (4) Organisation of social groups for medical treatment — health insurance, co-operatives, etc.;
- (c) Economic and financial, transport and social conditions as they affect the distribution of physicians.

2. The Nurse.

3. Other Auxiliary Medical Personnel.

B. *Medical Institutions:*

Number, distribution and capacity of hospitals, dispensaries, etc., in rural districts.

Second Item.

The Most Effective Methods of organising the Public Health Services in Rural Districts:

A. *Form of Organisation:*

- 1. A complete State health service.
- 2. Local autonomy in health services.

B. *Method of Organisation:*

- 1. Older form (ordinary administrative form).
Part-time health officers in all political subdivisions with restricted legal powers and duties.
- 2. The "modern" form.
Full-time health officers in large districts with full responsibility for all health work.
The health centre and county health unit plans.

C. *Subjects to be considered under the Item:*

1. The most important health problem in the rural area (malaria, infectious diseases, etc.).
2. Infant and maternal welfare.
3. Welfare of the child of pre-school age.
4. School hygiene; welfare of the child of school age.
5. The campaign against tuberculosis.
6. The campaign against venereal disease.
7. Sanitation.
8. Popular education in hygiene.
9. Provision of medical treatment, including first-aid in urgent cases and supervision of transport of sick and accident cases.

D. *The Milk Supply:* Limited strictly to considerations which affect rural districts.

Third Item.

The Sanitation of Rural Districts: the Most Effective and Economical Methods.

A. *Water Supplies:*

1. Collective water systems for two or more villages.
2. Water supply systems for individual villages.
3. Water supply systems for individual houses: wells, springs, cisterns.

B. *Sewage and Refuse Disposal:*

1. Systems of sewerage and drains.
2. Night soil — the latrine, cesspool, sewers, sewer effluents.
3. Manure — pits.
4. Garbage and other refuse.

C. *Housing, including living-in conditions of agricultural labourers:*

1. Public buildings, schools, sanitary institutions (hospitals, etc.).
2. Private houses.
3. Settlements — model villages.
4. Administration; financial and economic aspects — loans, legislation, etc.

D. *Land Improvements (Bonifications):*

Minor and major sanitary improvements. — Drainage.

Limit of Studies:

These problems had to be studied in relation to rural districts only and, for the purposes of the Conference, the Preparatory Committee adopted the following definition:

"The term 'rural' refers to an area or a district where agriculture is the chief or even the sole industry, and where all other industries are of small importance and, in the main, dependent on agriculture."

3. METHODS.

The Committee referred to three groups of experts¹ the preparation of reports on the principles which should govern the provision of medical assistance, the organisation of the health services and the sanitation of rural districts.

These experts prepared and discussed some sixty reports on hygiene and health conditions in various European countries. The work of more than fifty experts in different branches of hygiene was thus brought together.

The Preparatory Committee drafted a printed report (document C.H.1045) based on all the work and reports of the Committees of Experts, and this served as a basis for the discussions of the Conference.

The Committee had recommended that the members of the various delegations to the Conference should be experienced in social questions, and representative of all the interests involved in rural hygiene — sanitary, agricultural, economic and social; including those of the agricultural employer and labourer. Each delegation had one vote.²

4. THE CONFERENCE.

The Conference met on June 29th, 1931 in Geneva, under the presidency of Professor Pittaluga (Spain). Twenty-three European countries sent delegations³: Austria, Belgium, Czechoslovakia, Denmark, Finland, France, Germany, Great Britain, Hungary, Iceland, Italy, Latvia, Luxemburg, Netherlands, Norway, Poland, Portugal, Roumania, Spain, Sweden, Switzerland, Turkey, Yugoslavia.

Eight countries sent observers:⁴ Bolivia, China, Colombia, Cuba, India, Japan, Mexico, United States of America.

The International Labour Office and the International Institute of Agriculture, Rome, given the Conference their co-operation.⁵ The League of Red Cross Societies and the International Professional Association of Medical Practitioners were represented.⁶

The delegations of the European countries proceeded, in plenary meeting, to elect six Vice-Presidents and, in the Committees, a Chairman for each of the three Committees to which the three items of the general programme were referred.⁴

¹ The names of these experts are given in Volume II (Minutes).

² The full text of the Committee's proposals may be found in the documents: C.L.301.1930 (Annex); C.H.952; C.H.1037 and C.H.1045.

³ The list of delegates is given in Volume II (Minutes).

⁴ The following were the Vice-Presidents of the Conference and Chairmen of Committees:

Vice-Presidents:

Professor KONRICH, Member and Adviser of the *Reichsgesundheitsamt*, Berlin;

Professor Léon BERNARD, President of the Higher Council of Public Health, Paris;

M. LUTRARIO, Member of the Health Committee of the League of Nations and of the *Office international d'Hygiène publique* (Italy);

Dr. CHODZKO, Director of the National School of Hygiene, Warsaw;

Dr. CARRIÈRE, Director of the Federal Public Health Service, Berne;

M. FIERLINGER, Permanent Delegate of Czechoslovakia accredited to the League of Nations.

Chairmen:

First Committee (Medical Assistance): Dr. A. SHEARER, of the Scottish Health Department;

Second Committee (Health Centres): Dr. B. JOHAN, Director of the National School of Hygiene, Budapest;

Third Committee (Sanitation): M. VIGNEROT, Chief Engineer of the *Génie rural*, Paris;

Dr. RAJCHMAN, Medical Director of the Health Section of the League of Nations, assisted by Dr. BOUDREAU, member of the Health Section, acted as Secretary of the Conference.

The reports were read in plenary meeting and, after a general discussion, the three Committees met and took as a basis for their work the report of the Preparatory Committee.

At the request of the Conference, the Health Organisation of the League of Nations convened at short notice a meeting of the Directors of European Schools of Hygiene and requested them to consider to what extent these schools might undertake certain studies among those to be recommended by the Conference and to make suggestions on this subject to a fourth committee, which was at once set up under the chairmanship of Dr. Chodzko (Poland).

In accordance with the wishes of the Conference, the meeting of the Directors of European Schools of Hygiene, under the chairmanship of Professor Léon Bernard, decided to request the Schools of Hygiene and various research institutions to study certain problems of a technical and practical nature connected with rural hygiene (see Chapter V).

The reports of the four Committees were adopted unanimously and, taken together, constitute the resolutions of the Conference, which was closed on July 7th, 1931.

5. RESOLUTIONS.

The resolutions really constitute a series of *recommendations*. They are thus, in a very summary form, a valuable and practicable guide to efficient and economical rural health administration.

This guide will be useful, not only to health administrations, but also — and its value is thereby increased — to general administrations and to all circles concerned with carrying out health policy: public authorities, agricultural associations, the medical profession, social insurance institutions and private organisations. It defines the part played by each of these in the promotion of public health.

(a) *Principles of General Administration*. — Although they do not form the subject of any special chapter and are even not always formally expressed, there are certain fundamental principles on which all the resolutions of the Conference are based. They are at the basis of every administration. The first is the principle of the greatest efficiency combined with the greatest economy. This *principle of maximum efficiency* was the notion which governed the whole Conference. Its corollary is the *division and technical value of the work done*. Division by area is intended to bring into direct touch with the scattered rural population a staff and institutions which are as many-sided as possible. A functional division is intended to place at the disposal of such a population over a wider area a specialised staff and specialised institutions. The technical value of the work calls for a qualified staff and an up-to-date and complete equipment.

Another corollary of the principle of maximum efficiency is the *principle of co-ordination and unity of action*, which presupposes the existence of the organisation (staff and institutions) necessary to avoid the waste and inefficiency due to duplication and gaps.

Finally, all the recommendations of the Conference were inspired by the *principle of adaptation to local conditions*, with the notion of the expediency of the action undertaken and the effort to discover the best solution in each particular case.

(b) *Means of Action*. — Like the *principles of administration*, the *means of action* recommended by the Conference are few in number and are not the subject of a special chapter. Nevertheless, they are an essential consideration in the whole of the *resolutions*. Reference is continually made to them, whether the subject is the provision of medical assistance, the organisation of public health services or sanitation.

Three of these fundamental means of action are, in a certain sense, specific:

(1) *Education*; (2) *Financial and technical assistance*; (3) *Supervision and sanctions*.

Education — and more particularly health and technical education — is recommended in all its forms: school instruction, propaganda, model buildings, health installations (shower-baths) at the disposal of the public, etc. It concerns the child, the future farmer and the future schoolmaster, as well as the population as a whole, and the technician (health personnel, engineers, building contractors, well-sinkers, etc.). The discussions brought out the importance of education and *general instruction* in rural centres (professional schools and continuation schools in Denmark).

Financial assistance also assumes many forms — e.g., subsidies and long-term loans at low rates of interest. It concerns the local authorities as well as associations and individuals. It should be given in such a way as to stimulate the efforts made by local authorities or associations and also individual efforts (self-help). If it is to be efficient, it must be combined with *technical assistance* and *technical supervision* — and supervision that is not backed by sanctions is valueless.

A judicious system of *legislation* must rely on these three fundamental means of action to hasten practical results in the health sphere.

A few other means of action, less direct but not less important, are mentioned in the *resolutions*. The Conference recognised, for instance, that *economic conditions* constitute a preponderating factor in public health matters, and specially stressed the hygienic value of the land improvements known as *bonifications* (the double object of which is the improvement of a district from both agricultural and health points of view). This is an example of the law of mutual action and reaction, for a raising of the standard of life influences public health, and the improvement in public health reacts on the working capacity of the people and on their way of life.

The *resolutions* frequently draw attention also to the way in which *means of communication* influence the efficient organisation of different health services.

(c) *Practical Organisation*. — On the practical side, the Conference recommended the application of the principle of unity of action and solved the problem of *unity of direction* by suggesting the co-ordination and, in certain cases, even the marked *centralisation of the responsibilities* falling on the medical officer of health.

To determine the relationship between the *central authority* and the *local authorities*, an *optimum equilibrium* between centralisation and decentralisation was recommended. *Gradual decentralisation*, corresponding to their stage of evolution, is approved in favour of the local authorities, but the central authority always retains its *right of supervision*.

There are two preliminary stages before any rational and effective action can be taken: (1) the *study of local conditions* and (2) the *preparation of the scheme*. The recommendations define the object of, and lay down certain rules for, the *preliminary study* (survey) and the *programme of work* in health matters.

The parts played by the different groups concerned in the study, preparation and execution of the health programme were considered by the Conference, and its recommendations define the respective duties of the *public authorities*, the *medical profession*, *health insurance institutions* and *private agencies* in the promotion of public health. Co-operation between the public authorities and these different groups is recommended by the Conference, which defined the procedure for such co-operation as a very effective and economical means of health organisation.

(d) *Minimum Standards*. — Subject to the application of the principle of adaptation to local conditions, the Conference prescribed certain minimum standards. Most of these standards relate to the *number, distribution and technical ability of health personnel and*

institutions (practising physicians and hygienists, nurses, sanitary engineers, sanitary inspectors, laboratory technicians, etc.; hospitals, centres of diagnosis, health centres, laboratories, etc.). Definite standards were also prescribed in connection with questions relating to sanitation, and in particular certain *rules were given for the purification of water supplies and the disposal of sewage.*

(e) *Subjects for Study.* — Amongst the subjects the study of which was recommended by the Conference, some relate to *the training of health personnel* and others to the *housing conditions of agricultural workers*, whilst one, less general in scope, is concerned with the *rapid transport of the sick.*

Special reference must be made to the problems the study of which was entrusted to different schools of hygiene and research institutions, since they direct the work of those organisations towards the essentially practical aims of the Conference itself. These schools and institutes will, for instance, study the *cost of public health services* in relation to their efficiency in several rural districts, the object being to show that economies can be effected by the rational application of the principles of organisation recommended by the Conference.

Problems connected with *milk, typhoid infections, manure and flies*, will be approached along the same lines — that is to say, their solution will fall into three stages: (1) *observation of the facts*; (2) *remedies proposed*; (3) *demonstration* by experiment on the spot of the efficiency and economy secured by the application of the remedies suggested.

(f) *Tendencies.* — The foregoing clearly shows the tendency towards *rationalisation* of health organisation based on that *utilitarianism* which was the primary object of the Conference. This appreciation of the utilitarian goes beyond the mere effort to secure maximum efficiency with minimum outlay. During the discussion, the idea was advanced that rural hygiene “pays” — that is to say, its rational organisation should result in real economies being achieved by public bodies.

The Conference recommended that the public authorities and groups concerned should take action for the solution of health problems. Such action is a duty, and this *interventionist* tendency increasingly limits the application of the doctrine of *laissez faire*, which even recently found many supporters. At the same time, there is a tendency to *extend the health responsibilities of public bodies and of individuals*, and, although the idea was not formally expressed, it cannot be doubted that the Conference recognised that rural populations have as good a *right to health* as children or urban populations. The Conference thus constituted one of the many manifestations of the international interest that is being shown in rural populations as a result of the crisis in agriculture.

* * *

Amongst the immediate results of the Conference, the fact that it directed the attention of public authorities and public opinion to the conditions of rural populations is not one of the least important.

Moreover, in each country taking part, the preparation for the Conference led to investigations and efforts to find new solutions for health problems and, finally, it resulted in valuable co-operation between the various services and groups concerned. Much valuable information was thus collected. The work of the experts and of the Preparatory Committee, followed by the discussions in the Conference, made it possible to compare the experience of different countries. The recommendations of the Conference are, in a very condensed form, the essential result of that comparison. These recommendations were

adopted *unanimously*, and thus have a moral weight and authority which will constitute a valuable support for the action of national and local health administrations.

In point of fact, the recommendations go far beyond the European limits originally assigned to the Conference, and their value for certain oversea countries was recognised by the observers appointed by those countries (Japan).

The Conference was both a happy attempt at co-operation between the representatives of the different professions and groups concerned and also a proof of the value and possibility of such co-operation. For the first time on such a scale, collaboration was witnessed between the representatives of public assistance, health insurance, agricultural associations, the medical profession and scientific agriculturists, architects, hygienists and engineers. "The Rural Hygiene Conference has furnished a striking illustration of the fruitful results of such collaboration, and this collaboration, begun under the auspices of the League of Nations, should be continued and extended."

The Conference was anxious to ensure the continuance of its work and the development of the first results of its recommendations. Before closing its discussions, it recommended that a new Conference on rural hygiene should be convened in five years' time to examine the results achieved and to adopt its recommendations to current problems and to the progress of public health technique.

CHAPTER II. — MEDICAL ASSISTANCE.

“Guiding Principles and Suitable Methods for ensuring Effective Medical Assistance in Rural Communities.”

SUMMARY: 1. Definition. — 2. Number of Doctors. — 3. Pharmacists. — 4. Nurses. — 5. First-aid Personnel. — 6. Centres of Diagnosis; Liaison. — 7. Hospitals; Means of Transport and Communication. — 8. Laboratories. — 9. Specialists; Liaison. — 10. Means of Realisation: (a) Collaboration; (b) Part played by Public Authorities; (c) Health Insurance; (d) Public Assistance.

1. *“In the largest sense, effective medical assistance may be considered as indicating a medical service organised in such a way as to place at the disposal of the population all the facilities of modern medicine in order to promote health and to detect and treat illnesses from their incipency.”*

Medical assistance must be concerned with the promotion and preservation of health as well as with the treatment and cure of disease. The importance of both aspects was emphasised by the Conference, which agreed that prophylaxis of disease was destined to receive more and more consideration.

2. *In order to furnish effective medical assistance to the rural population, the Conference is unanimous in the belief that 2,000 is the maximum number of persons who can be given proper medical attention by a duly qualified medical practitioner, on the understanding that, in proportion to the growth of the health services and the needs of the people, this number may be reduced to 1,000.*

The Conference recognised that the number of persons and the area which a physician might serve would vary considerably in accordance with local conditions, such as the distribution of the population, means of communication and transport, etc. As far as the number of persons was concerned, it was guided by information furnished regarding European countries. In Germany, for example, there is, on the average, one physician to 2,317 persons in rural districts, while in cities the proportion is one physician to 786 persons. In Italy, there was in 1930 one *medico condotto* to 3,603 inhabitants (not exclusively rural). This proportion is established in relation to the population of the whole country; but, when account is taken of that part of the population which has no recourse to the *medici condotti*, the number of persons served by each *condotta* is far less and approaches the standard proportion.

In Spain the *medico titular* cannot assume charge of more than 300 families (indigent). In extending the German system of health insurance to rural districts in 1914, insurance institutions and physicians agreed that one physician might suffice for the needs of 1,000 members.

In spite of the motor and the telephone, the average area served by a physician in rural districts in Germany declined from nearly 40 square kilometres in 1876 to about 10 in 1929.

Local conditions play such an important part in determining the area which a physician is able to cover, and this varies so considerably, even in a single country, that the Conference did not consider it feasible to make any general recommendation on this subject.

In making this recommendation, the Conference took into consideration only physicians duly licensed to practise medicine according to the laws of the State.

The need for the physician practising in rural districts to keep pace with the progress of modern medicine was emphasised, and various methods of making this possible were discussed. In one German State, a number of young doctors are employed to act as *locum tenens* for the rural practitioner who desires to take a post-graduate course. Lectures for physicians are also broadcast by wireless. Rural doctors who have access to hospitals are enabled to keep in touch with the progress of medical science by this means. The training of doctors in hygiene is insured in Yugoslavia by compulsory lectures and work at the Institutes of Hygiene before graduation. In Italy the *medici condotti* are entitled to periods of leave for the purpose of postgraduate courses. Scholarships are sometimes given for the study of certain "social" diseases.

The recommendation as to the number of persons who could be cared for by a rural doctor assumed that the district was suitably provided with medical and health institutions and that the morbidity was normal. The absence of medical and sanitary personnel and facilities would, of course, reduce the potentialities of the doctor, while an abnormal sickness rate would necessitate a larger number of physicians.

The effective work of a properly organised public health service would increase the demand for the doctor's services, and so reduce the maximum number of persons to whom he could give proper attention. This would result from the increased popularity of measures of personal prophylaxis (vaccination against various diseases, for example) as well as the reference to doctors of persons discovered by the Health Services to require treatment for incipient disease and defects.

3. *It is desirable that the number and distribution of pharmacists, and doctors who dispense their own drugs in rural districts should be such as to ensure that all medical prescriptions may be furnished rapidly to the rural population.*

In France, in the communes not possessing pharmacies, the law authorises doctors to deliver medicines to their patients, but they are not allowed to keep open laboratories.

The Conference merely emphasised the importance of prompt and accurate execution of medical prescriptions, whether of a pharmaceutical nature or not.

4. *Such medical assistance also requires a technically qualified auxiliary personnel comprising one or more nurses, or, provisionally, in the absence of qualified nurses, other persons possessing the minimum necessary technical training. However, it is essential that this auxiliary personnel abstain from all medical treatment, such treatment being only permissible under the direction of a qualified medical man.*

This recommendation refers to certificated public health nurses (health visitors), bedside nurses, midwives, etc.

Public health and visiting nurses are becoming increasingly numerous in nearly all countries. In 1930, there were 2,403 public health nurses in France of whom 894 were tuberculosis nurses, 1,053 child-welfare nurses, and 456 "generalised" nurses. Nurses employed by industries are not included in these figures.

In Germany, there are public health nurses (*Fürsorgeschwestern*) in the rural districts (*Kreis*) and visiting nurses in even the smallest rural communes (*Gemeindeschwestern*). The latter assist the former in their health work, but their principal task is to nurse the sick. The visiting nurse is employed by the commune and voluntary associations, but health insurance institutions contribute largely to their support.

In England, nurses are employed by the local authorities at such institutions as infectious diseases hospitals, hospitals and dispensaries for tuberculosis, treatment centres for venereal diseases, maternity hospitals and consultation centres for infant welfare, and at general hospitals when provision is not made by voluntary bodies. They are also employed for school medical work; nursing service is provided as part of the maternity and child-welfare scheme, and home nursing is arranged for certain infectious diseases in young children. Nursing service for members is also one of the additional benefits which approved insurance societies may provide out of surplus funds. In sparsely settled rural districts the duties of district nurse and midwife have been combined.

The recommendation that there should be one or more nurses refers to the number of persons attended by one physician in rural districts.

Midwives. — In 1930, there were 1,376 midwives of the first class and 10,026 of the second class in France. This is nearly half the number of practising physicians. Only in a few of the most remote rural districts in France are trained midwives lacking.

The annual report of the (English) Ministry of Health for 1929-30 states: "Eighty-two per cent of the rural population of England is now provided with the services of trained midwives, as compared with 68 per cent in 1921".

In Spain, every municipality is obliged to employ a midwife for the care of indigent pregnant women. In Italy, the midwife *condotta*, duly qualified, is employed by the commune, which is required by law to provide obstetrical care to women on the list of indigents. Midwives have performed good services in Italy in pre-natal care and in the prevention of puerperal fever, which occurs much less frequently to-day. They must take a three-year university course before becoming certificated, and are specially trained in child welfare by the *Opera nazionale per l'infanzia*.

In Germany, private practice is almost the general rule, but the commune frequently guarantees the midwife a minimum salary. The heavy decrease in the birth-rate in Germany, even in rural districts, has led to a decrease in the number of midwives from more than 33,000 in 1876 to 27,484 in 1929, or from 7.72 to 4.29 per ten thousand inhabitants. There is a larger proportion of midwives in Germany in rural districts than in cities: 2.92 in cities, 5.93 in rural districts per 10,000 inhabitants.

All midwives referred to above are duly qualified and licensed according to the law of the State in which they practise. In many European countries, the midwife is an employee of the commune. In view of the recommendation of the Budapest Conference¹ concerning the aid which midwives may render to the public health nurses in certain specified nursing activities (the new-born), the practice in England of combining the duties of nurse and of midwife is of interest.

The last phrase of the recommendation, in regard to less qualified personnel, refers to temporary conditions in remote rural districts and less well-developed countries. In nearly all European countries, untrained midwives have disappeared or are disappearing.

¹ Conference on Rural Health Centres. See the composition of Chapter III of Annex I of the second volume (Minutes)

5. *It is recommended that, in the smallest rural settlement, the patient should be able to find a person capable of rendering first aid and of carrying out the doctor's orders.*

Doctors and nurses are not stationed in remote and inaccessible rural settlements (mountain villages, etc.) and frequently these settlements have high accident rates on account of the occupations of the inhabitants. The first aid required can be furnished by persons with some slight training, such as former stretcher-bearers (Germany), students of Red Cross classes, etc. The Conference considered that such a service should be organised systematically in every rural settlement in such a way that it could be made available immediately the need arose.

6. *The rural population and rural doctors should be in a position to utilise the services of centres of diagnosis and, if necessary, of specialised treatment; such centres should be suitably equipped and provided with a qualified staff; anti-tuberculosis and anti-venereal dispensaries, etc.*

These services should maintain liaison with the patient's physician, who should be informed of the results of the examinations, or, if necessary, kept in touch with the treatment and its results.

These centres exist in nearly all European countries, for various purposes, maternal and infant welfare, tuberculosis, venereal diseases, cancer, school hygiene, etc. They are organised by the health authorities as a rule, but sometimes by private agencies. They are equipped with X-ray and other special apparatus and staffed by specialists. The Budapest Conference¹ considered that these and other rural health activities should be combined and co-ordinated in the interests of economy and efficiency.

There was no divergence of opinion in the Conference concerning the value of the services rendered by these centres, but the discussion revealed fundamental differences in the different countries concerning the part they should play in giving treatment. In Germany, for example, they give no treatment whatever; in France, anti-venereal treatment alone, while, in some countries, all necessary specialised treatment is furnished.

In Italy, the centre of diagnosis is often annexed to a dispensary or a sanitary station as well as to a hospital. Once the diagnosis is made, the patient receives appropriate treatment.

The representatives of health insurance institutions laid special stress on the necessity for the staff of these centres to keep in touch with the patient's physician, and to inform him of the results of the examinations and treatment, so that, when the patient came under his care again, he would be in a position to continue the treatment properly.

7. *Rural medical assistance also implies facilities for hospitalisation in appropriate suitably-equipped institutions.*

It is recommended that there should be such a hospital for a population of from twenty to thirty thousand people, a rational organisation requiring about two beds per thousand of the population.

However, each such institution should have not less than some fifty beds.

Permanent means of communication (telegraph, telephone, etc.) and constantly available means of transport should be at the disposal of patients and doctors to permit of rapid hospitalisation in urgent cases.

In the view of the Conference, suitable equipment for hospitals should include X-rays, a small laboratory, sterilisation apparatus, isolation, dressing and operating-rooms and

¹ Conference on Rural Health Centres. See the composition of Chapter III of Annex I of the second volume (Minutes).

instruments. These hospitals should have outdoor departments to which doctors could refer their patients for special examination and treatment. The question of small hospitals was thoroughly debated. There was agreement on the need for one hospital bed for every four or five hundred inhabitants, but it was the opinion of all that hospitals with less than approximately fifty beds are too small to function properly and the overhead cost is too great.

Obviously, the restriction of hospitals to institutions with not less than fifty beds would make difficult the provision of hospital facilities in certain remote rural districts. This difficulty is overcome in certain countries (Yugoslavia) by having a few beds at the health centre in districts where hospitals are not available, a practice which received general approval.

Methods of communication in the rural districts of European countries have progressed rapidly in recent years. Special arrangements are made in France for the use of the telephone in case of sickness or accident at night or on days when the exchange in remote rural villages is closed. In Germany, a public telephone is almost always available. In Italy, the "sanitary stations" of the *Agro romano* and of the Red Cross are equipped with several beds for preliminary attention, a vehicle for transporting the patients, and a telephone for communication with the town.

The Conference stressed the importance of having suitable means of transport instantly available, not only for purposes of hospitalisation, but also to bring the patient to the physician's consulting-room in case of accident or sudden illness. It particularly emphasised the utility of telephonic communication being always available, even at night and on public holidays.

8. Rural medical assistance should utilise the services of laboratories.

Simple examinations and analyses may be carried out in the hospital laboratories.

More complicated examinations and analyses (bacteriological, pathological, serological, etc.) should be carried out in large, specially-equipped laboratories.

Examples of the simple examinations and analyses referred to are: Examination of sputum for tubercle bacilli; analysis of urine for albumen and sugar; blood counts, etc. In France and one or two other countries, these are frequently carried out by qualified pharmacists. In Italy, the examinations are usually carried out in laboratories situated in the provinces or in the towns or those annexed to clinics, hospitals, dispensaries, "sanitary stations", etc. Recourse is sometimes had to qualified pharmacists.

The Conference agreed with the recommendation of the Conference at Budapest¹ that, instead of attempting to provide for the carrying out of more complicated laboratory work in rural districts, it would be better to concentrate such work in large, properly equipped, suitably staffed laboratories at a few centres. Specimen containers should be available to doctors throughout the rural districts and rapid means of transporting these to the laboratories should be provided. Such containers should be placed where they would be most accessible to doctors — for example, in health centres and pharmacies. In Italy, specimen containers are distributed throughout the country for the sending of samples (water, food matter, etc.) to the laboratory. Special facilities are granted for the rapid transport of these samples.

¹ Conference on Rural Health Centres. See the composition of Chapter III of Annex I of the second volume (Minutes).

The cost of laboratory examinations should be as low as possible, so that their use may be encouraged, and, in the case of examinations of public interest, the health authorities should bear the cost.

The Conference emphasised the importance of living tissue (biopsy) and post-mortem (autopsy) examinations in the interests of better diagnosis (cancer, for example) and the education of physicians.

Large, well-equipped laboratories are established in one group of countries by the public authorities (Germany, for example) and in another group (France, the United States of America) by private initiative. In Italy, no laboratory may be opened without the special authorisation of the prefect after a favourable inspection by the county doctor.

There is a laboratory in each county town in the provinces of Italy (92). In the big towns, there are also municipal laboratories which serve small communes within a certain radius. There are also laboratories annexed to university institutes, hospitals, "sanitary stations", etc., as well as private laboratories approved by the State. The general health administration possesses travelling chemical and biological services which can be used in time of need (epidemics). In Spain, there are institutes of hygiene in each province, which are equipped and staffed in such a way as to make laboratory diagnoses available in rural districts. These institutes have also a number of branches.

9. *Rural medical assistance should also be able to utilise medical specialists.*

The specialists should keep in touch with the patient's doctor, informing him of the results of the examination and of the treatment and its results.

The difficulty of providing specialist medical service to rural populations was appreciated by the Conference. Specialists cannot be expected to settle in sparsely-populated rural districts. Special measures must be applied to provide for such services.

This is done by the health authorities in the case of certain diseases — tuberculosis, venereal diseases, diseases of infancy and maternity, cancer, etc. The provision of specialist service in hospitals serving rural districts is another method, calculated to supplement the services provided by the health authorities, by the provision of surgeons, gynæcologists, oculists, aurists, dentists, etc. Specialists in these diseases may come from large cities to the hospitals at fixed periods.

The *governatorato* of Rome has established periodical consultations given by specialists (ophthalmology, oto-rhino-laryngology, venereal and nervous diseases) in the surrounding districts, and throughout the whole country anti-venereal, anti-trachoma, anti-malaria, etc., dispensaries give special treatment.

In view of the fact that such specialists come to rural districts only occasionally, it is essential that the general practitioner should be informed of the results of specialist examinations and treatment.

10. *Means of Realisation.*

A. Principles of Collaboration. — *The realisation of effective medical assistance in rural districts demands the collaboration of the public authorities — health and welfare (assistance) — of the medical profession, of health insurance institutions, of mutual benefit associations (sanitary, co-operative, etc.), of private agencies, etc.*

B. The Public Authorities. — *The public authorities should ensure that the entire population benefits from an effective medical assistance. By means of a rational organisation of the health services, adequately staffed with specialists, they should attempt to develop the preventive tendencies of rural medical assistance.*

In the interest of effective medical assistance, it would also be desirable for the public authorities to seek to organise a rational and co-ordinated health programme on a territorial basis, taking account of local conditions.

The public authorities should stimulate, assist and co-ordinate the efforts of agencies and groups which attempt to realise effective medical assistance. They should seek to fill the gaps and avoid the duplications which may occur in the organisation of this assistance.

C. Health Insurance.¹— *The Conference considers that, when health insurance applies to the entire body of agricultural labourers, it permits the realisation of effective medical assistance in rural districts under the best conditions.*

D. Public Assistance. — *Nevertheless, where health insurance has not yet been established, rationally organised free medical assistance may intervene usefully in completing a system which partially satisfies the needs of rural populations.*

Economy and efficiency require that the work of the agencies concerned in the provision of medical assistance should be co-ordinated.

The public authorities have the general responsibility for the provision of effective medical assistance, and it is their duty to organise the health services.

*Health Insurance.*¹— The important rôle played by health insurance institutions in providing effective medical assistance in rural districts was emphasised. In countries where such a system applies to all agricultural labourers:

(1) A sufficient number of qualified physicians is attracted to rural districts and they are assured of a sufficient compensation; the insurance institutions employ only qualified doctors.

(2) As the insurance institutions pay all hospital expenses and their members occupy 80 per cent of the beds, the financial support of hospitals is assured.

(3) Reserve funds of insurance institutions are used to enlarge hospitals when necessary, and are loaned to build new hospitals when public funds do not suffice.

(4) These institutions also pay the expense of the necessary laboratory examinations, thus aiding in the support of laboratories.

(5) The cost of transporting the assured to the hospital is borne by the insurance funds.

These advantages refer specifically to German rural health insurance, but they also apply in general to other countries with similar systems.

(6) Health insurance institutions give the mass of the population an interest in medical assistance and prophylaxis which makes of them admirable agencies for popular education in hygiene.

Public Assistance. — In almost all European countries, there are systems of public assistance providing medical attention gratuitously to the indigent. In France, the system, which is on a communal basis, permits free choice of physician, transport and laboratory expenses, treatment in the home or in the hospital, specialised treatment, etc.

¹ See in the Annexes to Volume II (Minutes) the report submitted to the Conference by the International Labour Office: "Sickness Insurance as a Factor in Rural Hygiene".

In 1928, more than three hundred million French francs were spent for such assistance by communes, departments and the State.

When rationally organised, and in the absence of health insurance, this system is useful in providing medical assistance to a part of the rural population.

Methods of ensuring Effective Medical Assistance to the Entire Rural Population. — In some countries, this is done by means of health insurance — Germany (60 per cent of the population), England, France, etc. Public assistance in all three cases applies to non-insured indigents. In other countries, reliance is placed on public assistance alone.

In Italy, the system of *medici condotti* is employed; these are doctors appointed by examination to treat the indigent, who alone are entitled to free medical treatment and medicaments. Out of 20,000 doctors, more than 10,000 were *medici condotti* in 1930. In Spain, there is the *medico titular*. Spain is predominantly agricultural; there are 14,367 doctors living in 5,700 of the 12,000 communes. There are also assistant practitioners of medicine and surgery who are given two-year courses and must work under the direction of qualified doctors.

Methods of attracting physicians to rural districts in various European countries are:

- (1) Employment by health insurance institutions;
- (2) Employment by public assistance to treat the poor;
- (3) Employment by the health authorities for vaccinations and other preventive work — maternal and infant welfare work, school inspections, etc.;
- (4) Employment by the authorities to treat the people in remote rural districts (highlands and islands of Scotland);
- (5) Provision of minimum salary — lodging, transportation, payment of mileage, payment of medical school fees on condition that the recipient will undertake rural practice for a given period;
- (6) Employment by private agencies.

Some of these methods are also used to ensure sufficient nurses and midwives in rural districts.

The distribution of physicians in nearly all European countries is also affected by the law of supply and demand.

In Italy, an endeavour was made to attract doctors to the country by raising their salaries and by limiting free treatment to the indigent. The doctor is entitled to a pension on retirement, and, in case of death by an infectious disease contracted during service, orphans are provided for by the State.

The Conference considered that the rôle of the central health authorities in respect of the provision of effective medical assistance must vary with the development of the country — the less developed the country, the greater the need for intervention.

The public authorities should have the principal responsibility for establishing hospitals and laboratories where none exist; if prices for laboratory examinations are too high, the authorities should intervene by means of subventions, etc. The greater the number of doctors, the less need will there be for auxiliary medical personnel apart from nurses and midwives.

CHAPTER III. — PUBLIC HEALTH SERVICES.

“The Most Effective Methods of organising Health Services in Rural Districts.”

SUMMARY: A. General Considerations: 1. Gradual Decentralisation. — 2. The Medical Officer of Health; His Status. — 3. His Field of Action. — 4. His Responsibility: Unity of Direction. — 5. Minimum Personnel. — 6. The Sanitary Engineer. — 7. The Health Programme. — 8. Committees for Propaganda and Co-ordination. — 9. Budget. — 10. Source of Funds. — 11. Co-operation with Health Insurance Institutions. — 12. Co-operation with the Medical Profession and Private Agencies. — 13. Co-operation with Agricultural Advisers and Associations. — 14. Education.

B. Rural Health Centres: 1. Definition. — 2. Relations with the General Health Organisation. — 3. Adaptation to Local Conditions. — 4. Two Chief Types: Primary and Secondary. —
I. *The Primary Health Centre*: Functions: 5. Health Information. — 6. Health Action. — 7. Treatment. — 8. Personnel: (a) Director; (b) Public Health Nurses; (c) Midwives; (d) Sanitary Inspector. —
II. *The secondary Health Centre*: 9. Definition. — 10. Programme. — 11. Personnel: (a) Doctor, (b) Nurses; (c) Midwives; (d) Sanitary Engineer; (e) Sanitary Inspectors; (f) Laboratory Technicians. — 12. Committees for Administration and Patronage. — 13. Equipment. — 14. Liaison.

A. General Considerations.

There are two principal forms of rural health organisation: the form in which the State administers the local services, and the form in which the State has only supervisory functions, the local authorities being responsible for the local health administration.

Both may give good results, and the form best suited to the rural districts of a given country depends on the manner in which the general administration of that country is organised.

When it is necessary to organise the rural health service, there is need for a State organisation which will assume control over local health work. As the country develops, its local administrative organisation becoming sufficiently strong to carry out public health work, and the education of its people in hygiene being sufficient to cause them to support the local health service, there may be a gradual decentralisation in health matters until the responsibility can be assumed safely by the local authorities.

Even when such a decentralisation has taken place, the State should preserve its right to frame the health policy which it is the duty of the local authorities to carry out, as well as its right to supervise the work and remedy the deficiencies of the local health service.

Sometimes the medical officers of health are appointed and paid by the State while funds for the work are drawn from local sources. In other cases, the health officers are appointed by the State and paid by the local authorities; while in still others, part of the salary is paid by the State, part by local authorities.

The advantages of a complete State Health Service are: Uniformity of programme throughout the country, stability of the service, continuity of policy and security of tenure for the staff.

The advantages of a decentralised health service are that the members of the staff are welcomed and aided in their work by the people, the local health problems are apt to receive more intelligent consideration, and, as health work is brought closer to the

people, they take more interest in its competent performance. In view of the greater interest taken in health work when administered locally, funds in support of the programme may be raised more readily.

In Hungary, it is proposed to substitute a State for the present local system, while in Yugoslavia, which had a purely State system in the beginning, the tendency is towards decentralisation.

The above recommendation does not apply necessarily to the method of financing the health services. There was general agreement that, in this respect, the local units, communes and provinces, for example, should participate, otherwise the financial burden would be too great for the State.

2. *The public health officer fully responsible for the promotion of the health work in a rural district should give his whole time to his official duties; the practice of medicine¹ in particular is incompatible with the work of such an official. He should be a doctor trained in hygiene and preventive medicine according to the recommendations of the Conferences of Directors of Schools of Hygiene at Paris and Dresden (document C.H.888). His compensation should be sufficient to assure him a comfortable living. He should enjoy security of tenure in office, subject to the proper discharge of his duties, and have the right to a reasonable pension when age or the completion of a fixed number of years of service makes it necessary for him to retire.*

The Conference was unanimous in recommending that the health officer should devote his whole time to his duties. An experience of four years in certain Hungarian districts demonstrated the great superiority of the full-time over the part-time health officer, particularly in respect of school hygiene work. The Danish delegate stated that it was hoped to transform the present part-time system in Denmark to a full-time system, by increasing the size of the rural health district. In Italy, the full-time medical officer of health is the rule. In small rural communes the prefect may provisionally charge the *medico condotto* with the duties of health officer. In that case, he becomes a part-time official.

The tendency to require full-time service of responsible health officers is growing fast in European countries, and whole-time officers are found in England, France, Germany, Hungary, Yugoslavia, etc. In some countries, the law provides for whole-time service, but the compensation is not sufficient, and the health officer is forced to undertake private practice.

The requirement of whole-time service does not necessarily apply to other doctors in the health services, such as specialists in tuberculosis, infant welfare, etc.

3. *The optimum size of a rural district² for which one full-time health officer may be responsible will vary with the density of the population, the means of communication, the prevailing diseases, and other local conditions. Subject to these variables, a population of from twenty thousand to one hundred thousand, or an average of fifty thousand, may be fixed,*

¹ This recommendation refers to the *private* practice of medicine. In some countries where medical assistance is a responsibility of the public health service, work in the field of medical practice may be a duty of the medical officer of health.

² In some countries the law requires every commune to employ a doctor. This recommendation deals only with the *district*. The Budapest Conference decided that village doctors might be employed in primary health centres. There is no implication in this report that the practising physician should do no health work. Indeed, the Conference considered that the services of the practising physician should be utilised wherever possible.

it being understood that one or more full-time assistant health officers will be needed for populations in excess of fifty thousand.

The rural health district should preferably correspond with the administrative district in view of the difficulties which would otherwise result. As, in European countries, such administrative districts almost always have populations in excess of fifty thousand, they may be suitably staffed by the appointment of one full-time health officer with the proper number of assistants.

The principle of a sufficiently large district combined with full-time service provides for efficiency and economy in administration.

In certain countries — the Netherlands, for example — the health officer or medical inspector is specialised, and, his work being restricted to certain subjects, he can serve a larger territory. In Italy, there is no subdivision corresponding to the rural health district defined above, and the health services are organised on a territorial basis (one commune or several adjacent communes constituting a district).

The Conference did not consider it possible to adopt a recommendation as to the area of the rural health district in view of the varying conditions in the different countries. In Denmark, the plan is to have districts of from 700 to 800 square kilometres.

4. *The Conference considers that the health authorities of the rural districts described above should be responsible for the protection and promotion of the public health in all its aspects. The district health officer, as executive officer of the health organisation, should be entrusted with the realisation of the entire programme in order to ensure the economy and efficiency resulting from unity of direction.*

5. *The minimum staff for such a rural health district should consist, in addition to the health officer, of one or more public health nurses, a sanitary inspector, and a clerk.*

The nurse should have a diploma in generalised public health nursing from a recognised school of health nursing or its equivalent. The Conference considers that the programme of such nursing-schools should be studied by the competent commission of the League's Health Organisation.

The sanitary inspector should have received suitable training at a school or institute of hygiene. Under the direction of the health officer, he should be able to inspect foods, investigate and abate nuisances and carry out the work of rural sanitation planned by the sanitary engineer.

The fact that the public health nurse should do generalised work in rural districts was also emphasised at the Budapest Conference. Such work is more suited to rural conditions for reasons of economy in addition to other advantages.

The qualifications of the sanitary inspector vary widely in different countries. In England, he may be a qualified engineer, while, in other countries, he may have received little or no technical training. Courses for such inspectors are now given in many schools of hygiene, and the required qualifications are being raised considerably. In Italy, these duties are discharged by the *vigili sanitari*, who receive special training and are often full-time officials. Sometimes, however, when they are officers of the municipality (which is also responsible for this work), they hold part-time appointments.

6. *Although, in many European countries, the rural district as defined above cannot alone afford to employ a sanitary engineer, the services of such an engineer should be available in all rural districts. Such engineers may be employed by the Central Health Organisation, the State or the province. Their work should be that described by the Conference at Budapest.*

It is important that the programme and methods of training these engineers in all countries should be perfectly adapted to the work they are required to do. The Conference believes that the study of this subject should be undertaken by the Health Organisation of the League of Nations.

7. The programme of the health services in such a rural district.

A. Branches of Work. — The programme of the rural health services should include measures for dealing with all the health problems which a survey of the district has revealed to be of real importance; in particular, it should relate to:

- (1) Infectious disease control;*
- (2) The campaign against the so-called social diseases;*
- (3) Maternal and infant welfare and school hygiene;¹*
- (4) Sanitation;²*
- (5) Hygiene of milk and foods;*
- (6) Education in hygiene;*
- (7) Sanitary supervision of medical institutions;*
- (8) Where there is no legislation providing for the supervision of medical practice³, the public health officer might be entrusted with the registration of medical personnel⁴.*

Provision should also be made for first aid and for the transportation of the sick in urgent cases.

Laboratory facilities should be available in accordance with the recommendations of the Budapest Conference.

The social diseases referred to include tuberculosis, the venereal diseases and all others which constitute important health problems in the district. Attention was directed to the fact that, in certain districts of some countries (the Netherlands, for example), non-tuberculous pulmonary diseases assume greater importance than tuberculosis.

B. Notifiable Diseases and Vital Statistics. — The effective work of rural health services depends on the completeness of their information on the prevalence of infectious diseases and on the accuracy with which causes of death are certified.

All doctors practising in rural health districts should be required by law to notify the health authorities immediately of every case of an infectious disease⁵ which they have examined. In special cases (absence of doctors), head of families, teachers and local officials should be required to notify suspected cases to the health authorities.

¹ Including the supervision and protection of sickly children (and sometimes the aged).

² Including the supervision of small rural industries (brickyards, vegetable-fibre work, etc.) that may be dangerous to health.

³ This paragraph does not apply to most countries in Western Europe, particularly England. In England, the practice of medicine is regulated by the General Medical Council, which is a statutory body composed of representatives of the teaching bodies, of the medical profession and of the State. It determines the course of study, supervises the examinations, places on the Medical Register all who are duly qualified and regulates their professional conduct.

⁴ The Medical officer of health might be entrusted with the supervision of private nurses.

⁵ Diseases required by law to be notified. Compulsory notification might be extended to include the auxiliary health staff (nurses, midwife, sanitary inspector, laboratory technicians).

The attending physician should be required by law to fill in a standard certificate of the cause of death and to transmit that certificate to the local health authorities without delay.¹

The health officer should utilise every means to keep in touch with the prevalence of infectious diseases in his district—routine epidemiological investigations of cases and contacts, charts and graphs, a diagnostic (consultation) service. The returns of causes of deaths should be studied regularly to the end that the general health programme may be suitably adapted to local needs.

C. * *Statistics on Social and Economic Conditions. — In addition to vital statistics, which permit the health authorities to appraise the results obtained and to adapt their programme to local needs, statistics relating to social and economic conditions (composition of the population, housing, hospitals and other medical institutions, etc.) collected by various agencies, in particular by health insurance institutions, should be utilised by such authorities.*

The representatives of rural health insurance institutions at the Conference emphasised the importance and scope of the statistics collected by such institutions.

8. *In order to ensure the interest and enlist the support of the public, the Conference considers it advisable to set up advisory councils or consultative committees, composed of leaders in the community or of representatives of agencies² which carry on health work.*

In the latter case this Committee should co-ordinate the work of the agencies concerned, and there is every reason to emphasise this recommendation.

The Conference considered that the *Zweckverband* system, utilised in Bavaria, was particularly useful. It is a union of the various agencies concerned, and the expenses are divided among them in proportion to the membership of each. This system permits the co-ordination of the work of these agencies and provides larger credits for health work.

9. *In view of the wide variations in health programmes in the different countries and the considerable differences in local conditions, it is not possible at present to recommend a model budget for a rural health district, or to state what should be the per capita expenditure for health purposes. It is also impossible to decide on the percentages of the budgets of States, provinces, districts and communes which should be allocated to the health services.*

The Conference considers it advisable to secure further information on the cost of rural health services and, to this end, recommends that studies on a uniform plan should be carried out in rural districts under the auspices of the Health Organisation of the League of Nations.

The purpose of these studies should be to determine which effective form of rural health organisation is most economical and, in particular, the cost of the method described by the Budapest Conference in comparison with other methods in use.

10. *Official funds for health work in rural districts are derived in varying proportions from the State, the province, the county, the district and the commune. While the State may have to provide the largest proportion when the rural health services are being organised,*

¹ Attention should be drawn to the system followed in Switzerland for notifying causes of death. (See document C. H. 669.) This system, which protects professional secrecy, has been adopted in Western Flanders (Belgium) and in certain departments in France.

² This recommendation does not apply to health insurance institutions, which are treated in paragraph 11.

or in the case of poor districts, it is essential that the proportion contributed locally should gradually increase.

This recommendation embodies the experience of European States which have developed effective rural health services.

II. In order to avoid deficiencies and prevent duplications in the promotion of the health of the rural population, it is desirable that collaboration should be established between the public health services and social insurance institutions.¹

This collaboration might relate particularly to the following work:

- Joint study of plans for the provision of sanitary equipment in rural districts;
- Establishment of vital statistics;
- Campaign against tuberculosis, venereal diseases, cancer, mental diseases, alcoholism, etc.;
- Maternal and infant welfare;
- Child welfare;
- Education in hygiene of the rural population.

The collaboration might be realised by means of "Committees of Co-operation" composed of representatives of the public health service and insurance institutions.

The term "sanitary equipment" is not used in its narrow sense, but is meant to include the facilities necessary for the effective performance of health work.

12. Collaboration between the health authorities, the medical profession and private health agencies (particularly the Red Cross) is indispensable in the interests of economy and efficiency. The work of private agencies is of great value in view of the interest they arouse in hygiene, and their contribution to the available health resources and equipment.

Useful collaboration between the health authorities and private health agencies within the fields of activity mentioned above presupposes:

(1) The existence of an effective rural health service and a health programme adapted to local needs.

(2) That the work of private health agencies should be set out in the programme adopted by the responsible local health authorities. In this way, the health officer will play an important rôle in the technical direction of the work of these and other similar agencies, as he is responsible for all public health work in his district.

(3) That, in each rural district, it would be preferable to have a single private health agency or at least a co-ordination of such agencies, thus avoiding dispersion of effort.

In making the last recommendation (3), the Conference referred particularly to districts in which private health agencies were to be organised. The economy and efficiency of a single private health agency were emphasised.

With regard to Red Cross organisations, Article 25 of the Covenant of the League of Nations should be borne in mind:

¹ See in the annexes to Volume II (Minutes) the report submitted to the Conference by the International Labour Office: "Sickness Insurance as a Factor in Rural Hygiene".

"Article 25. — The Members of the League agree to encourage and promote the establishment and co-operation of duly authorised voluntary national Red Cross organisations having as purposes the improvement of health, the prevention of disease and the mitigation of suffering throughout the world."

Attention should also be directed to the value of co-operation by the medical profession in the work of promoting public health.

13. *Co-operation between the public health authorities, the various agricultural technical advisers and the agricultural associations of all kinds is also highly desirable. Inspired by the desire to raise the standard of life in rural districts, these associations offer a valuable means of securing the co-operation of the rural population. The results of their work are reflected in health as well as in economic and social conditions, and they are concerned with housing and sanitation as well as with other hygienic measures.*

14. *The Conference desires to draw attention to the higher health standard in rural districts which is obtained by the improvement of general education by such means as the folk high schools in Denmark. Raising the general level of education by such means results in a greatly increased appreciation of hygiene and provides a fertile soil in which to implant ideas of health and sanitation.*

Schools of domestic economy and housewifery and professional schools play a similar part (Denmark).

B. Rural Health Centres.

1. *Definition. — The rural health centre may be defined as an institution for the promotion of the health and welfare of the people in a given area, which seeks to achieve its purpose by grouping under one roof or co-ordinating in some other manner, under the direction of the health officer, all the health work of that area, together with such welfare and relief organisations as may be related to the general public health work.*

In rural districts where such public health work has been organised for some time, it may be difficult to group all health activities under one roof or in the same organisation. Nevertheless, an attempt should be made to co-ordinate the work of existing agencies in the most effective way.

On the other hand, where a modern public health organisation is to be created in new territory,¹ the health centre, as defined above, is the best method of attaining the desired result.

There are two chief methods for the organisation of modern health services: the method known in England as the "county health unit method" and the method of health centres. Both give good results. The objects of both methods are fundamentally the same, but it is clear that each country will adopt the method that is best adapted to its system of local administration.

In England, the local administrative unit is the urban or rural district. Each urban or rural district has its own health committee and, either alone or with one or more other districts, it has a full-time medical officer of health. As a general rule, the district councils (urban or rural) are responsible for health conditions in their district.

¹ The term "new territory", as employed here, implies that an effective health service in the modern sense does not exist.

The county is a group of urban or rural districts and may comprise a large number of those districts. The county council has a county medical officer of health with a staff of assistants. This council is responsible for organising school medical inspection services, maternal and infant welfare, child welfare, the campaign against tuberculosis and venereal diseases, mental prophylaxis, etc. Each county council, therefore, has a large number of health centres of varying size; but these centres are not concerned with sanitation, which is a matter for the urban and rural district councils. The greater the number of urban and rural district councillors on the county council, the closer is the co-operation between the county and the districts. In many counties there are large towns which are, either in theory or in fact, completely autonomous as regards health services. These towns have primary and secondary health centres.

In Italy, a similar system has been in force since the law of 1888. The health officer is paid by the commune, and, after two years' probation, is permanently appointed by the prefect. Health officers are found even in the smallest districts and their duties vary with the size of the district. As small health centres grow in importance, they still retain their connection with organisations of increasing complexity (laboratories, centres of diagnosis, isolation hospitals, dispensaries, "sanitary stations", etc.). They thus constitute a closely knit system which co-ordinates and directs towards the same object the work of all units engaged in the promotion of public health.

In Germany, every rural health district has its own district medical officer, who is the real head of the health service and is responsible for the promotion of public health. He is particularly concerned with the prophylaxis of infectious diseases, school hygiene, the sanitary inspection of houses, drinking-water, etc.

Approximately, the same duties are discharged by the *médecin délégué sanitaire de circonscription* in France.

The same is true of Austria, where there is a medical health officer (*Bezirkarzt*) for each rural health district, Latvia, Norway, etc.

2. It is necessary at the outset to specify that rural health centres; considered as agencies particularly adapted to the promotion of public health in rural districts, constitute an integral part of the general health organisation. They are, in consequence, closely related to and dependent on all the elements which form that organisation—in particular, the State or Provincial Institutes of Hygiene, which, in several countries, constitute the most fully developed centre on which all others may depend for technical guidance.

It became evident that the two main types of health centres, designated hereafter as primary (village, communal) and secondary (district, *arrondissement*) must vary greatly in size, personnel, equipment and scope of work in the different countries and in the different parts of the same country.

3. It is to be understood that the considerations which follow relate to average centres, and that, in addition to these, there may be a large number of different types, the development of any particular centre being necessarily conditioned by local exigencies.

In view of the confusion in the classification of the two main types of health centres, the Conference decided to adopt the following nomenclature:

4. There are two methods of classifying rural health centres; they may be designated as small or primary centres and as larger or secondary centres, according to their varying

organisation and development; or they may be divided into village or communal, corresponding to primary, and district (arrondissement), corresponding to secondary, centres, according to the administrative subdivisions in which they work.

The Conference expressed its preference for the first of these classifications — that is, their subdivision into primary and secondary health centres.

There should also be branch health centres of the most simple type to enable the work of such primary centres to be carried into the smaller villages.

I. THE PRIMARY HEALTH CENTRE.

5. In the general public health armament of a given country, the primary health centre with its branch centres represents the terminal stage; it is the smallest agency adapted to serve the public health needs of the smallest rural area.

The working programme of this centre should be established on the basis of a preliminary survey concerning:

1. The topographical conditions of the district — density of the population, distribution (dispersion) of homes, means of communication. This information will facilitate the selection of the sites, and the determination of the number of health centres and branch health centres required.

2. The health and epidemiological conditions among the people; this information will be equally useful in establishing the centre's programme of work.

The minimum programme must vary according to the importance of the health problems brought to light by the survey. Should one health problem overshadow all others in the area, the centre would naturally give it first consideration. Among such health problems the following might be mentioned: malaria, tuberculosis, hookworm, acute infectious diseases, etc.

6. The Minimum Programme of a Rural Health Centre.

In addition to the campaign against those diseases which the survey has shown it to be of the first importance to prevent, the minimum programme of work will consist of:

- (a) Maternal welfare;
- (b) Infant welfare, including pre-school and school hygiene;
- (c) Popular health education; a practical example may be furnished by the provision of shower-baths;
- (d) Sanitation; in general, the centre should deal with all the sanitary conditions affecting the people;
- (e) Finally, provision of first aid in urgent cases.

The primary health centre is of an educational character, and its work is of great value for propaganda purposes.

The first essential is to secure the help of the population by all possible means (the provision of medical treatment in case of need, the installation of shower-baths, the use of the cinema, museums, etc.).

It was not thought necessary to specify that the primary centre should undertake tuberculosis work. The general conception of the duties of a primary health centre

in this respect was that it would act as a rough filter, sorting out suspected cases of tuberculosis and sending them on to the more fully equipped secondary centre

In connection with infant welfare, the advisability of providing a "social consultation" to gain supplementary information concerning the environment of the infant and child was emphasised.

Sanitary work was considered to be of first importance. The Conference felt it would have to be planned and guided technically by the sanitary engineer attached to the secondary centre, the work of the primary centre being to locate the problems, bring them to the attention of the sanitary engineer and carry out his recommendations.

The Conference considered that no public health agency of this character could afford to ignore the provision of first aid in urgent cases, as such indifference would result in public criticism.

The Conference believed that health centres generally would do well to follow the example set in the Netherlands, where such institutions are provided with equipment for the sick, to be loaned out to families in their homes.

7. In areas where the absence or insufficient number of physicians prevents the adequate provision of medical treatment, and in the case of patients unable to receive proper treatment elsewhere, the health centre should undertake this work.

On the other hand, in areas where medical care and treatment are adequately provided, the centre should limit itself to such treatment as may be necessitated by the requirements of social prophylaxis.

The adoption of this policy by the health centre will assist in securing the co-operation of the practising physician, who will be all the more disposed to co-operate, as the centre, in view of its equipment, is in a position to provide him with valuable assistance in his daily practice.

In discussing the phrase "necessitated by the requirements of social prophylaxis", the Conference had in mind such diseases as tuberculosis, malaria, syphilis, trachoma, hookworm, etc., in which treatment bears an important relation to prevention.

Every attempt should be made to bring the practising physician within the influence of the health centre. It would be to the interest of the population, as well as of the physician, if the latter were to be provided by the primary or secondary centre with X-ray and laboratory facilities for the diagnosis of tuberculosis. In any case, a close connection should be established between the practising physician and the health centre.

Provision of Medical Treatment. — The question as to whether health centres should give medical treatment was discussed from various points of view and different opinions were expressed. There was the danger that the centre might be overwhelmed by chronic cases, that the emphasis would shift from prevention to treatment, that the medical profession might refuse to co-operate. On the other hand, the Conference recognised that one of the first responsibilities of a governmental health agency was to make provision for the treatment of the sick where such provision did not exist or was inadequate — that is to say, in cases which are exceptional in Western European and German speaking countries. In districts far removed from hospitals it was felt that the centre should have a few hospital beds.

8. Personnel.

(a) *The Director.* — *The primary health centre, like all other health organisations, is under the general direction of the public health officer and of the health administration of the State.*

Its actual administration may be entrusted either to an expert medical officer of health (trained in a school of hygiene) or to a general practitioner with a satisfactory knowledge of medicine and the necessary supplementary training (refer to the reports and conclusions of the Conferences of Directors of Schools of Hygiene). This training should, in particular, relate to social hygiene and preventive medicine on the one hand, and on the other to the knowledge required to meet the specific needs of the centre he directs.

In most instances the smaller primary health centres and branch health centres will be directed by the village general practitioner. In order to ensure that he will administer the centre properly, he must have a sound knowledge of general medicine and have received supplementary training in public health. The Conference of Directors of Schools of Hygiene which met at Dresden in July 1930 directed attention to this matter in the following recommendation:

“For those communal health officers who are only appointed as part-time officials, post-graduate instruction in the various branches of public health and preventive medicine is urgently required, especially for those who had no opportunity of obtaining specialised training prior to their appointment.”

Finally, he must have special knowledge concerning the principal health problems with which the centre has to deal.

In the different countries, various methods of providing such training have been adopted. Courses are given for this purpose in schools of hygiene, and these are supplemented in some cases by practical work, sometimes at secondary health centres (Yugoslavia). In Hungary and Warsaw, special courses are given to medical officers in charge of health centres, but these have been restricted mainly to officers in charge of larger secondary centres.

(b) *The Public Health Nurse (Health Visitor)*. — The Conference emphasised the value of public health nursing-work. In regard to the question of generalised and specialised health nursing in rural districts, it was unanimous that the generalised type of nursing should be the rule — in particular, because of its greater efficiency and economy in budget and personnel.

No organisation concerned with social hygiene can afford to dispense with the services of the public health nurse.

Generalised (polyvalent), rather than specialised, public health nursing should be the rule in rural districts.

No final conclusion was reached concerning the area and population to be served by a primary health centre; these vary in each country and are determined in each case by the preliminary survey. Nevertheless, population figures were given in respect of several countries, and these varied from 400 to about 4,000, the average being 2,000.

Useful information on the population which a general health nurse could serve in rural districts was supplied by the health nursing-service in Hungary.

This was based on the following conditions:

(a) Birth rate 25 (150 births a year in a population of 6,000);

(b) Tuberculosis death rate: 200 per 100,000 of population (48 patients);

- (c) Number of elementary school-children: 600;
- (d) Suitable means of communication;
- (e) An 8-hour day and a 44-hour week.

Her work would consist of:

- (1) Visits to homes of the new-born and infants;
- (2) Visits to homes of the tuberculous;
- (3) Visits to infectious-disease patients;
- (4) Assisting the physician in the examination of school-children;
- (5) Holding infant welfare and tuberculosis conferences once a week.

Of her time, 48.2 per cent would be spent in home visiting, 25.9 per cent in schools and clinics, 14.8 per cent in travelling and 11.1 per cent in office work, keeping records, etc.

If more than 20 per cent of her time is spent in travelling, the nurse's district is too large (either because of the size of the area, the population, or because of lack of proper means of communications — good roads, motors, etc.).

Under these circumstances, a nurse might serve a population of not more than six to eight thousand. In Denmark, a visiting nurse deals with numbers as low as 1,600 to 2,000, whereas the child-welfare nurse (specialised) can serve 10,000.

Naturally, the size of the population served effectively by a nurse depends on the health conditions obtaining and the work she undertakes.

Depending upon the various activities of the centre, and the amount of work to be done, one nurse may serve one or more centres.

By means of an intelligent adaptation of her work to the minimum programme of the centre, and taking into consideration such varying factors as the number of families and of patients requiring her-attention, the density of the population, the distribution (dispersion) of homes and the means of communication, a nurse may undertake to serve a population of between six and eight thousand.

Nurses whose training and experience have been acquired solely in cities lack knowledge of rural districts and sometimes experience of the conditions of rural life and knowledge of the dialects spoken in those districts.

The nurses employed in the primary and secondary centres should be in possession of diplomas as general public health nurses (from a recognised or State school) and should have received, during their professional education, theoretical and practical training which would fit them for their rural work.

In several countries, the demands for the organisation of modern public health work have been in excess of the supply of suitably trained public health nurses.

When it becomes necessary to organise or extend the rural health service, in the absence of sufficient graduate nurses possessing diplomas in general public health nursing to fill all the vacancies, is it wise to resort as an emergency measure and only temporarily to the services of a personnel which has received only elementary and partial training?

Without doubt, but this method should be applied only on condition that it is altogether provisional, and on the understanding that the personnel so employed shall leave the service at the end of a fixed period (at the latest as soon as such personnel can be replaced by graduate public health nurses), unless they undertake to complete the training leading to the award of the diploma mentioned above.

The Conference felt that the health authorities themselves were morally bound to provide such supplementary training in the case of temporarily employed nurses, so that there is a reciprocal obligation.

(c) *The Midwife.* — The Conference felt that the midwife might be utilised to supplement the work of the visiting nurse, providing she had received proper training and her work was strictly defined. The danger of permitting a midwife to come into contact with infectious cases was pointed out.

Should the services of midwives be utilised in the work of the centre, and, if so, under what conditions and in what way?

The fact that the midwife is in a position to render important services to the centre in the care of pregnant women (pre-natal care), as well as in the supervision of the infant during the first days of life, is beyond question.

In these respects, the midwife will become a useful assistant to the nurse entrusted with this work, solely on the condition, however, that she possess the proper qualifications, not only as a result of her training (diploma in midwifery), but also on account of the special instruction she has received in the work entrusted to her.

Under these conditions, the midwife may be attached to the personnel of the centre, to carry out these well-defined tasks, under the direction of the medical director of the centre. The possibility of utilising her services in this capacity will be facilitated in the case of midwives already in the employ of villages (communes).

(d) *The Sanitary Inspector.* — Experience has shown that the resources of the primary health centre do not permit the employment of trained sanitary engineers. It is essential, however, that the sanitary inspector should be under the technical direction of such experts, while working under the general direction of the chief of the centre.

In some countries, the sanitary legislation provides for the employment of *disinfectors*, and these, after receiving supplementary instruction, may be utilised as sanitary inspectors.

The sanitary inspector will be entrusted with the supervision and execution of minor sanitary improvements (under the technical supervision and direction of the sanitary engineer attached to the secondary centre) as well as of the measures having to do with general health work, such as disinfection, etc.

II. THE SECONDARY HEALTH CENTRE. ¹

9. *The secondary health centre is a more fully developed organisation than the primary centre on account of its greater completeness of equipment, its larger personnel and the wider scope of its work.*

¹ In some countries in Europe, there are provincial or county health officers who have jurisdiction over areas larger than those served by secondary health centres. Such health officers may co-ordinate the work of the secondary health centres.

The secondary centre directs and co-ordinates the work of primary centres and, at the same time, ensures liaison between them and all other health and welfare agencies — in a word, with all agencies connected with the promotion of public health.

10. Programme. — *In addition to its work as a primary centre (in its immediate neighbourhood) and to the prevention of those diseases which have been shown to be important problems by the preliminary survey already mentioned, the secondary centre should deal with the following:*

- (1) *The campaign against tuberculosis;*
- (2) *The campaign against venereal diseases;*
- (3) *Maternal welfare work;*
- (4) *Infant welfare work (including the child of pre-school age) with special emphasis on the welfare of the child of school age (school polyclinics);*
- (5) *Health education — first, for the general population; second, by means of special courses and field work for (a) doctors, (b) nurses, (c) midwives, (d) sanitary engineers and inspectors;*
- (6) *Sanitation;*
- (7) *Laboratory analyses, of a simple and routine character.*

The Conference was of the opinion that, in addition to this work, the centre might undertake the provision of first aid in urgent cases and ensure the prompt transport of sick and accident cases by supervising the proper organisation of this service.

The Conference noted with approval that secondary centres in some countries (Yugoslavia, etc.) made use of museums of hygiene (stationary and mobile) and the cinema, and that these centres were utilised for giving practical training to public health personnel.

The outline of the sanitary work to be undertaken by the two classes of centres was considered by the *Conference on Health Centres*.

This outline (document C.H.942) may be summarised as follows: Rural sanitary work should include supervision of:

- (a) *Water supplies, individual and communal; wells, springs, cisterns, water purification;*
- (b) *Sewage disposal — latrines and excreta disposal in unsewered districts, drainage of villages with sewers, treatment and disposal of sewage to prevent pollution of water-courses;*
- (c) *Disposal and utilisation of garbage, and other solid sewage;*
- (d) *Dairies and milk production, food factories; their cleanliness, sanitary efficiency, suitability of machinery;*
- (e) *Laundries and laundering-facilities; where streams, etc., are used for this purpose in rural districts, facilities should be supplied and the installations supervised;*

- (f) Drainage (bonification) of the soil to prevent malaria; draining and filling of marshes and pools, correction of water-courses, etc.;
- (g) Bathing-facilities — school, public, open-air and covered baths;
- (h) Housing — damp prevention, ventilation, illumination, heating, material utilised in construction, sanitary fittings, etc. (this includes schools and other public buildings, hotels, shops); housing of animals;
- (i) Factories and workshops — sanitation and prevention of risk;
- (j) Transport facilities; sanitary condition of public conveyances, etc.;
- (k) Settlements in general — choice of site, orientation, water supplies, sewage and waste disposal, playgrounds and parks;
- (l) Sanitary institutions, such as construction of health centres, dispensaries, preventoria, sanatoria, hospitals, etc.;
- (m) Enforcement of all sanitary laws.

II. Personnel.

(a) *Medical Director.* — *The medical director of the secondary centre should be a full-time physician trained in public health; this work should preferably be entrusted to the medical officer of health in charge of the district.*

(b) *Nurses.* — *The rules set out above concerning public health nurses also apply here, it being understood, however, that, in view of the greater development of the secondary centre, the nursing staff attached to it should be in proportion to the work.*

(c) *Midwives.* — *The considerations set out above concerning the employment of midwives apply also to the secondary centre.*

(d) *The Sanitary Engineer.* — *Sanitary engineering work forms an integral part of the work of the secondary centre.*

This service should be directed by a sanitary engineer with special training for rural work who will be attached to the staff of the centre or seconded for that purpose from the Central Institute, according to local conditions.

The sanitary engineering work in the district served by the secondary centre will, in general, deal with all matters concerning major and minor sanitation, such as provision of pure water, sewage and refuse disposal, housing, etc.

(e) *The Sanitary Inspector.* — *As many as may be necessary, in view of local conditions (see the considerations above respecting these inspectors).*

According to the sanitary engineers invited to attend the Conference on Health Centres, sanitary engineering work should be divided as follows among the different classes of centres (including here the State Institute of Hygiene) (document C.H.942).

The Sanitary Engineering Division of the Central Institute would be responsible for:

- (1) The general organisation and supervision of sanitary engineering, and its co-ordination in the whole of the Institute's territory;
- (2) Direction and policy of that service;
- (3) Collection of main data, study of existing conditions, definition of problems to be solved;
- (4) The solution of such problems; preparation of standard schemes for the main problems, such as water supply, sewage disposal, housing, manure storage and disposal;
- (5) Preparation of material for educational purposes, such as photographs, lantern slides, models, exhibitions, etc.;
- (6) Preparation of model plans for public health institutions, such as health centres, hospitals, etc.;
- (7) Laboratory work connected with sanitary engineering, routine of control of water supplies, sewage disposal, etc. Studies of special scientific and practical problems;
- (8) Training of sanitary engineering staff;
- (9) Study and approval of plans made by public and private agencies for sanitary work — water supplies, etc.;
- (10) Preparation of draft laws and regulations governing sanitary matters for the use of State, provincial or communal legislative bodies;
- (11) Research into problems of sanitation.

The engineer in the secondary health centre is to be charged with the actual executive work. He is the supervising and law-enforcing agent of the service, in control of the territory served by the centre, under the direction of the head of the centre.

(f) Laboratory Technicians. — In the administration of the public health services, it should be emphasised that, as a general rule, the laboratory investigations (which not only necessitate the most careful technique, but also a fully experienced staff and the most complete equipment) should be undertaken at the Institute of Hygiene, and that only analyses of the most elementary and routine character should be made at the secondary centre.

Consequently, it will not be necessary in most cases to secure for the centre the services of an expert laboratory technician, as it should be possible to utilise the existing staff for the elementary work which may have to be done.

The State Institute or central hygienic laboratory will utilise the secondary centre as a depot and centre of distribution for its sample containers.

* * *

This is the personnel essential for the administration of such a centre, but in case of greater development of one or more of its sections, it may become necessary to secure the services of other technicians (for X-rays, etc.).

Naturally, a suitable subordinate personnel will be required for its internal administration.

12. *Committees which might assist the Primary and Secondary Health Centres.* — The Conference was of opinion that the work of these centres might receive greater support through the establishment of committees; first, the official health committee provided for by the sanitary legislation of the State; secondly, a non-official committee, including in its membership representatives of the local administration, the medical profession, social insurance organisations, the teaching profession, the clergy, private welfare agencies, and, in general, of all who might contribute to the development and the prosperity of the centre on account of their moral, political or financial influence.

The present health laws of Yugoslavia provide for the establishment of the official committees which are usually constituted as above.

The attention of the Conference was directed to the value of certain committees in connection with public health nursing work, in bringing the nurse into close touch with certain classes of the public and in enlisting their interest and support in her work. Such committees might be: *pre-natal* (to refer pregnant women to the nurse; help with the household work of lying-in mothers, etc.), *child hygiene* (to bring sick infants to the clinic, assist at the clinic, etc.), *school hygiene* (assist during health examination of school-children, etc.), *tuberculosis, social work, health education*, etc. (document C.H.940).

The following principles concerning *equipment and relationship* were adopted.

13. *Equipment.* — The secondary centre should be fully equipped in accordance with the requirements of public health and modern medicine. In particular, there should be: a standard Röntgen ray outfit (a mobile outfit as well, if necessary); shower-baths; motors for the transport of the staff.

The Conference considered that failure to provide the staff with the means of transport to enable them to do their work rapidly and to reach all parts of their district would reduce greatly the scope of their technical work.

14. *Relationship of the centre to other health agencies.* — Certain of the agencies with which the primary health centre should be in relationship (secondary health centres, specialised dispensaries, institutes of hygiene) also form integral parts of the general health organisation of the country. In such cases, the proper relationship already exists. With others (establishments for treatment and prevention, hospitals, sanatoria, preventoria, social insurance institutions) relationships should be established which will permit the centre to obtain their help either directly or through the secondary centres.

CHAPTER IV. — SANITATION.

“Sanitation in Rural Districts: The Most Effective and Economical Methods.”

SUMMARY: General Considerations.

A. Disposal of Sewage and Refuse : 1. Dangers of Sewage. — 2. Sewerage Systems. — 3. Disposal of Sewer Effluents. — 4 and 5. Purification of Sewer Effluents. — 6. Disposal of Sewage and Refuse in Unsewered Districts. — 7. Disposal of Manure. — 8. Disposal of Garbage. — 9. Animal Carcases.

B. Water Supply: 1. Public Water-Supply Systems. — 2. Purity of the Water. — 3. Supervision. — 4. Individual Water Supplies. — 5. The Central Organisation. — 6. Financial Assistance.

C. Housing: 1. Needs. — 2. Housing Defects. — 3. Methods of improving Housing. — 4. Housing of Agricultural Workers. — 5. Reconditioning of Existing Houses.

D. Land Improvements or Bonifications : 1 to 3. Definition. — 4. Results. — 5. Drainage by Water-courses.

GENERAL CONSIDERATIONS.

The Conference considers that the improvement of rural sanitation which tends to raise the standard of life in rural districts is dependent, in the first instance, on economic conditions and education in hygiene.

School-children in rural schools and students in agricultural and normal schools should receive health instruction adapted to rural needs and conditions.

The health authorities, whose work may be facilitated by the private propaganda organisations, should strive to spread the knowledge of hygiene among the people by every available means.

The Conference recommends particularly the practice of providing examples of good hygiene and sanitation, which should be located where their advantages may be seen and appreciated by the people — e.g., model houses.

Courses in hygiene for builders, contractors and leaders among the rural population are particularly effective.

Education stimulates the desire for sanitary improvement; suitable legislation provides the means by making cheap credit accessible by grants, bonuses and loans.

Legislation is not effective without proper enforcement and competent and enlightened supervision.

While the local authorities may be responsible for sanitation, there should be central direction, supervision and stimulation.

It is essential that there should be co-ordination of the work of all agencies concerned in rural sanitation. This co-ordination implies the co-operation of the technical personnel concerned (agricultural experts, architects, hygienists, engineers, medical men, doctors of veterinary medicine, etc.).

The work of rural sanitation should be based on a close study and appraisal of all the factors at play.

Particular emphasis should be laid on the necessity for rapid and constant means of transport and communication (telephone) in rural districts for the purpose of rural housing and health services.

Associations and institutions for the improvement of rural life in many fields and, in particular, associations organised on a technical agricultural basis are potent means of

paganda and achievement and should be led to take an interest in water supply, good housing and other aspects of rural sanitation. The health authorities should co-operate with such associations to this end.

A. Disposal of Sewage and Refuse.

I. DANGERS OF SEWAGE AND OTHER WASTES.

Sewage and other wastes are not only objectionable but dangerous, because they frequently contain organisms causing disease in man (chiefly intestinal disease). This is also true of liquid household wastes. The danger is in inverse proportion to the age of the material.

These wastes should either be removed rapidly from human habitations by drains so as to prevent danger of contamination or they should be retained for a sufficiently long period to ensure the destruction of pathogenic organisms.

2. SEWERAGE SYSTEMS.

The Conference is of opinion that a water-carriage sewerage system is, in principle, the best method of removing sewage.

Sewers are usually installed in rural communities only where public water supplies exist.

The practicability of installing sewerage systems depends on the density of the population, the character of the soil and the existing economic conditions.

Open drains, intended to remove rain water and street washings, may, under special conditions and when no better system is possible, be used for slop water and other house wastes. Excreta must be excluded from such drains.

Such conditions are found in industrial rural areas where wastes like phenol exert a disinfecting action on the contents of the drains. Open drains may also be used for this purpose in rural districts other than industrial when nothing better offers, providing they are properly fenced off, regularly supervised and the configuration of the surface of the soil permits of a rapid flow (hilly districts).

In making these and other recommendations, the Conference gave due recognition to practicability and economy as well as to efficiency. It would be too costly in many instances to instal sewers in rural districts where the formation is rocky, or where the houses are scattered.

3. THE DISPOSAL OF SEWER EFFLUENTS.

Sewer effluents may be disposed of by permitting them to flow into a water-course, lake or tidal basin.

Such a method of disposal is satisfactory, providing:

(a) *That the quality of the water at a given distance below the sewage outfall is equal to the quality of the water above the point where sewage enters;*

(b) *That the dilution is sufficiently great: the rule that the volume of the stream should never be less than 100 times the volume of the sewage previously cleared of solid matter gives good results in practice.*

The system of disposing of sewer effluents described above is the simplest and may be used under the prescribed conditions. Obviously, unpurified sewage should not be permitted to flow into a stream above or in the neighbourhood of the point at which water is taken for drinking-purposes.

4. PURIFICATION OF SEWER EFFLUENTS.

When it becomes necessary to purify sewer effluents as in :

- (a) *Closely populated rural districts ;*
- (b) *Districts without an abundance of surface water ;*
- (c) *Districts where it is desirable to limit stream pollution to a certain maximum,*

a number of methods may be adopted in rural districts. These should be simple, adapted to local conditions and require a minimum of care by unskilled staff. These methods are mechanical and biological.

A. Mechanical Methods.— *The simplest mechanical method is the use of fixed racks intended to retain the solids.*

Settling-tanks also effect a certain amount of purification depending upon the condition of the sewage and the velocity of flow in the tank.

With these methods, only matter in suspension is removed. If the water-course which receives the effluent is not too small, this treatment is generally adequate, particularly in rural districts where the volume of sewage is slight. It should be remembered that the most harmful substances passing into the water-course consist of matter in suspension.

The simplest mechanical method is to retain matter in suspension by means of fixed racks.

A higher degree of purification may be obtained by using settling-tanks. The time required for settling depends on the kind of sewage, but two hours is generally sufficient. To avoid evil-smelling fermentations, the period should not exceed four hours. In practice, a tank with a capacity of 0.62 of the daily volume of the dry-weather flow, the width equalling one-third of the length, gives good results. Care must be taken to avoid sludge being carried from the settling-tank into the water-course which receives the effluent (production of hydrogen sulphide).

The disposal of sludge offers a difficult problem in towns, but is a simple matter in small rural installations.

B. Artificial Biological Methods. — *These are always preceded by mechanical methods. The principal artificial biological methods are :*

(1) *Sprinkling filters : this is one of the methods best adapted to rural conditions, being inexpensive to instal and maintain, requiring little attention and no trained personnel and being capable of easy repair ;*

(2) *The remaining methods — such as activated sludge (as at present constituted), contact beds or sand filters — are not adapted to rural conditions.*

The biological methods (both artificial and natural) remove matter in suspension from the effluent, partly dissolve such matter and prevent the putrefaction of the sewage.

Moreover, the number of disease germs is much more reduced than with mechanical methods. Nevertheless, the effluent may still be infectious.

In addition to the use of sprinkling filters, certain recent filters known as aerobic filters (Emscher) may be recommended. Their chief advantage is that they give a partial biological purification, if desired and may be adapted to very varying conditions.

5. OTHER METHODS.

The following methods may also be mentioned:

A. Subsoil Irrigation; Leaching Cesspools: — *These methods can only be used where there is no possibility of contaminating the ground water which may be used as a source of water supply.*

Subsoil irrigation should be limited to the treatment of small amounts of sewage (effluents from single houses, institutions or small settlements) and should not be used where there are fissures in the soil.

Subsoil irrigation should be preceded by some form of mechanical or biological purification.

When the soil is very fine, it is recommended that sludge should be removed from sewage water, so as to maintain the permeability of the soil.

B. Surface Irrigation. — *This method is one of the best for rural conditions if the soil is suitable, the area sufficiently large, the treatment properly supervised and the cultivation of vegetables and fruits, which grow close to the ground, prohibited.*

The main consideration should be the proper disposal of the sewage rather than the raising of good crops.

C. Use of Fish-ponds for Sewage Purification. — *This method might be of some value in rural areas.*

The Conference confined its recommendations to simple methods, as the more complicated ones require expert supervision and considerable attention, both of which are beyond the reach of many rural districts.

6. DISPOSAL OF SEWAGE IN UNSEWERED DISTRICTS.

The main objects of proper sewage disposal in unsewered districts are:

- (1) *The protection of the surface of the soil;*
- (2) *The protection of the subsoil water;*
- (3) *The protection of the sewage from access of flies.*

These objects can best be attained by the use of water-tight receptacles in a fly-proof superstructure.

As fresh excreta may contain pathogenic micro-organisms and intestinal parasites, provision should be made for storage of sufficient duration to destroy such organisms.

Methods of providing for such storage are water-tight tanks with two compartments for alternate use, or double compartment tanks of which only the second can be emptied.

Another method is the use of pails. As these contain fresh material, some form of disinfectant should be used, or the contents should at least be covered with dry earth, peat or other deodorant.

The pail system operates more satisfactorily when there is a public system of collection under proper supervision. As such a system is difficult to maintain in rural districts, the disposal of the material must unfortunately be left to the householder, whose education in hygiene is not usually sufficient.

Single-compartment tanks may be used in villages where a proper system of collection exists. The contents should be transported in water-tight containers to a suitable distance and properly treated, as, for instance, by placing alternate layers of sewage and dried peat in a large open tank.

In rural districts where it is not necessary to prevent the contamination of ground water, ordinary unlined pits may be used.

The Java type of privy, consisting of a deep hole of small diameter, into which basket work is inserted, is apparently suitable. It requires further study.

Whatever the method of sewage disposal adopted for individual houses, the privy should be located as far as possible from the well or other source of water supply.

Methods of sewage disposal in unsewered rural districts are the subject of regulations in many countries. In some cases, the central health authorities prepare model codes suitable for adoption by the competent local authorities. The study of the most suitable methods and the preparation of plans and construction of model privies have given good results.

These codes should regulate the minimum distance of the privy from the source of individual water supply. In existing codes, this varies from five metres (Netherlands) to ten metres (Prussia).

7. DISPOSAL OF MANURE.

Solid and liquid stable manure should be stored in water-tight pits situated as far as possible from the house and arranged in such a way as to expose only the smallest possible surface to flies. The pits should also be so arranged as to prevent the contents being subject to the washing action of rain-water.

Manure pits should be provided with a special water-tight compartment for the liquid manure.

The Conference recommends that the prevention of fly-breeding by measures tending to promote the development of heat in manure piles should be made the subject of further experiment and study.

In Germany, a process known as *Heissvergärung* (heat digestion) has been developed. The pit is of smaller area, and the manure pile is thus built up more rapidly and to a greater height than usual, the sides being protected by boards. The temperature in the interior due to fermentation reaches from 50° to 60° C., which is sufficient to destroy fly larvæ. This and other methods of preventing fly-breeding require further study. Attention was drawn to the need for covering liquid manure pits (danger of drowning).

8. DISPOSAL OF GARBAGE.

In built-up rural villages, the regular collection and systematic disposal of house garbage and refuse is the most effective method.

This material may be disposed of by dumping frequently in thin layers and covering with earth, ashes or other dry refuse. Such a method of collection and disposal requires careful and competent supervision.¹

Garbage is also a prolific source of flies, and measures should be taken to prevent fly-breeding.

A safe rule to adopt is to treat garbage as infectious matter and to dispose of it in such a way as to prevent the pollution of the surface of the soil, the subsoil by percolation (ground-water) and the houses in the neighbourhood by flies which breed in the garbage and to avoid bad odours.

The Conference draws the attention to methods of treating garbage by tanks permitting of the development of heat.

Incinerating and utilisation plants, while satisfactory, hardly come within the means of rural communities. Home incinerators give satisfactory results.

At Florence, a special concrete tank has been devised which is easy to build and can be made in various sizes. The cell is filled with garbage and refuse, moisture is added and digestion is allowed to go on for from four to six weeks. Temperatures of from 50° to 60° C. are developed.

The Conference draws attention to methods of treating manure by high temperature digestion, which prevents the breeding of flies, and it recommends that this subject should be studied.

9. ANIMAL CARCASSES.

The Conference also draws attention to the necessity for treating carcasses of animals in accordance with veterinary regulations.

Veterinary questions were not included in the agenda, but the Conference desired to emphasise the importance of animal carcasses as sources of contamination of ground water, the soil and the neighbourhood (flies). Attention was also drawn to the need for destroying rats.

B. Water Supply.

An abundant supply of pure water in rural districts is not only an important factor in the protection of the health of human beings and of cattle, but is also of great value in the promotion of agriculture.

The more immediately accessible the supply, the more freely will it be used by consumers. The best solution is to connect the house or farm to the water supply or, more generally, to bring the supply within easy reach.

An abundant supply of pure water has a direct influence on the public health, as it prevents the spread of water-borne disease. It has also an important influence due to the cleanliness it promotes in houses, stables, dairies, etc.

Water-supply systems aid the farmer by permitting the watering of market-gardens, and furnishing means for irrigation and for extinguishing fires.

¹ Another method of disposal is to feed the garbage to pigs, either collectively or on the individual farms. When this method is adopted collectively, the collection and disposal is usually let out to a contractor whose sole object is the fattening of the pigs and who is apt to neglect sanitary considerations.

I. PUBLIC WATER-SUPPLY SYSTEMS.¹

(a) For a Number of Settlements. — *The central water-supply system distributed to a number of settlements is, when practicable, to be preferred to a smaller system. This system is to be recommended, particularly in the more populated areas, and for districts in which suitable water sources are few, as it permits of the most advantageous utilisation of the potable water.*

The co-operation of a number of villages to secure a joint water-supply system permits of a more adequate plant, gives the opportunity to employ skilled personnel, and also permits the use of methods of purification when necessary. In the case of these central water supplies, any modern method of purification may be adopted, as it will be carefully applied and supervised.

Collective water-supply systems for groups of villages have developed rapidly in recent years in a number of European countries.

These regional or collective water-supply systems are especially numerous in the Netherlands, where nearly five million persons, or 63 per cent of the population, benefit from the use of a water-supply system. There are twelve collective water systems in operation supplying more than 350 communes and two more systems for seventy-seven communes are being installed. In addition, plans for reclaiming the land now under the Zuider Zee provide for large collective water-supply systems.

This system is also being applied in France; the plant at Santerre in the Aisne, which supplies eighty-nine communes, is one of many.

In Germany, a good example is found in the State of Saxony where the development of sources on the rivers Mulde and Wilzsch will, in the first instance, provide running water for fifteen communities.

At the end of 1929, there were forty-three group supplies in Czechoslovakia supplying 214 communities, with a combined population of 206,000.

The province of Brabant in Belgium has a group supply for eleven communities.

Group systems are also being constructed in other countries, including Yugoslavia.

A typical example of a great rural aqueduct is furnished by the "Acquedotto Pugliese".

The water for this aqueduct is drawn from springs in "Capo Sele" on the Tyrrhenian slope of the Apennines, and it is carried to the opposite slope, the Adriatic slope, passing through the Apennines by means of tunnels 100 kilometres in length. The chief canal is 254 kilometres long, and there are eighty-seven reservoirs.

This aqueduct serves districts (Puglia, the Basilicate and Irpinia) with an area of 20,000 square kilometres and a population, chiefly agricultural, of 2,200,000.

In Italy, also, the law of 1928 has encouraged the construction of rural aqueducts. Among those the construction of which was made possible through the provisions contained in the law on the *Bonifica Integrale*, the following should be mentioned: the aqueducts of Istria, Monferrato and Sarcidano. The State contributes 75 per cent when the cost of constructing the channels exceeds the cost of tapping the supply. Otherwise, the State contributes only 40 per cent.

(b) For Individual Settlements. — *The source of the village water supply should be selected after appropriate investigations in order to secure a water free from the possibility of any dangerous contamination.*

¹ Volume II (Minutes) contains a report by M. Krül, which gives considerable information on water supplies in many European countries.

The necessity for any system of purification is to be avoided, as such systems require technical supervision, which is not usually available in rural districts.

Village water supplies should be constructed with due regard for simplicity of design, economy and ease of operation and maintenance.

2. PURITY OF THE WATER.

When treatment is necessary, it must be safeguarded in every possible way. The lines of defence to ensure the purity of the water should be, in order :

- (1) Protection of the source ;*
- (2) Mechanical purification (sedimentation, filtration, etc.) ;*
- (3) Chemical purification (disinfection) ;*
- (4) Inspection and supervision.*

Protection of the source and supervision of the supply are necessary in any case.

When the water is drawn from rocky formations in which fissures exist (limestone, karst), it should be adequately purified. Disinfection by chlorine is at present a practical solution.

When contamination occurs only at rare intervals and for short periods, it is advisable to apply chlorine throughout the year, otherwise, when the occasion arises, the apparatus may be out of order. When no danger threatens, very small amounts of chlorine may be used, and these may be increased when necessary.

When there is any possibility that a water supply may be responsible for an outbreak of intestinal disease, chlorine should be applied immediately as an emergency measure and continued until the investigation is completed.

Portable chlorinating plants should be available at central institutions for use in case of emergency (such as the threatened pollution of a normally pure water supply).

3. SUPERVISION OF WATER SUPPLIES.

Constant supervision of all public water supplies is necessary. This supervision should relate to the source of the supply, the plant and the distributing system, as well as to the effluent, and should be closest during the seasons when the supply is most likely to be contaminated (dry season, floods, etc.).

The personnel engaged in this supervision should be trained in the hygiene of water.

Water-supply systems for individual villages in European countries have also developed rapidly in recent years. Thus, in the county of Essex, England, the number of houses supplied from water mains increased from 2,801 in a total of 6,897 in 1925 to 3,735 out of 8,270 in 1929.

In Czechoslovakia, from 1918 to 1928, 1,287 kilometres of mains were laid in Bohemia, Moravia, Silesia and Slovakia, excluding those in large cities. In 1930 and 1931, 304 water supplies were constructed in the whole country.

In Denmark, the number of rural waterworks increased from 62 in 1900 to 1,200 in 1924. As ground water is abundant and electric power available everywhere, small systems are the rule.

In France, in 1930, 8,604, or 23 per cent, of the communes had waterworks in operation or under construction, and new requests are being received so rapidly as to overwhelm the competent services.

In accordance with the law of December 24th, 1928, on the *Bonifica Integrale*, the Italian Government has given subsidies to the extent of 75 per cent for constructing rural aqueducts, the cost of which amounts to 210,000,000 lire.

These examples suffice to show the great development of water-supply systems in European countries in recent years. Progress in the matter of waterworks has followed closely the spread of electricity to rural districts. The use of electric current and machinery permits of the use of sources otherwise difficult to develop, and it is cheaper and simpler to maintain, requiring practically no skilled supervision.

4. INDIVIDUAL WATER SUPPLIES.

These may take the form of wells, springs and cisterns. They should be constructed by qualified persons who have received proper instruction in the elements of hygiene of water; otherwise, they are apt to be dangerously located, badly constructed and improperly protected.

The competent authorities should adopt regulations providing for the location, construction and protection of individual supplies, and these regulations should be adequately enforced.

For the guidance of local authorities, a model code should be prepared by the central health services.

Even in the most highly developed countries, most of the rural population must depend on individual water supplies — wells, springs and cisterns. It is a very serious undertaking for the health authorities to supervise such supplies. Their first attention might well be given to individual supplies, which are used by numbers of people — school wells, public wells, water supplies of shops which deal in food products, etc. The construction of model wells at places where they will be seen and used by large numbers of people is to be recommended. The example of the Prussian Institute for the Hygiene of Soil, Air and Water, which gives courses in the hygiene of water to contractors who construct wells, might well be followed.¹ Where resort must be had to cisterns, the use of lead conduits is to be avoided.

5. THE CENTRAL ORGANISATION.

Progress in matters of water supply must be based on scientific research centralised in a suitable organisation, which thus constitutes a hydrological and geological intelligence service for the purpose of locating suitable sources of water supply and for the collection of all other relevant data.

Such an organisation should, as far as possible, have jurisdiction over all matters affecting water supply in the State or administrative unit.

It would be difficult to overestimate the advantages of a central organisation of this kind. In view of the information at its disposal for the entire State or province, and the expert knowledge of the specialists attached to it, such an organisation would be in a position

¹ The grant of a diploma for these studies would be desirable.

to ensure that the existing water sources are utilised to the best advantage and that partial solutions of water-supply problems are avoided.

Such an organisation would place at the disposal of individuals, societies and communities technical information and expert advice on matters of water supply and would act as a centre for the education of the people in the hygiene of water.

Examples of the central water-supply organisation recommended by the Conference are the Netherlands Government Office for the Supply of Drinking-Water and the Prussian Institute for the Hygiene of Water, Air and Soil. Institutes of hygiene in other countries do much the same work.

The Netherlands Government Office advises the Government on all matters relating to the water supply — the grant of subsidies, the examination and preparation of plans, supervision over construction and operation of subsidised water systems, the preparation of legislation, etc.

The office also places its services at the disposal of the provincial and municipal authorities in matters of water supply; it acts as a centre for propaganda and education in hygiene and carries out hydrological and geological enquiries.

The Prussian Institute carries out similar work. The courses it gives annually to contractors who construct wells have been mentioned.

There is no doubt that central organisations of this kind promote safety, economy and efficiency in matters of water supply.

One of the most valuable services they can render is to impress upon rural populations the necessity for abundant supplies of pure water.

6. FINANCIAL ASSISTANCE.

Many countries have encouraged the installation of rural water supplies by affording financial assistance, and have secured excellent results by this means. In the absence of such assistance, many municipalities could not have secured a public water supply. Account should be taken of this experience.

C. Housing in Rural Districts.

I. NEEDS.

There is urgent need for improvement in the housing conditions of rural districts. Progress in this respect is hindered by the lack of cheap credit and the fact that education in hygiene in rural districts has not reached a sufficiently high level.

The housing shortage in cities has led in most countries to concentration on the housing problem in industrial areas, and the needs of rural districts have not always received the attention they deserved.

Good housing is a fundamental requirement for rural hygiene. It is influenced by social and economic conditions and in its turn exerts a strong influence on these conditions, resulting in better health and a general elevation of the standard of life.

2. HOUSING DEFECTS.

The principal defects of rural housing from the point of view of hygiene are:

(a) *Overcrowding.* — *Good houses are too few. There are too few bedrooms in the existing houses. The house may be too small or, in planning it, the existing space may have been insufficiently utilised. Apart from considerations as to the necessary cubic space, attention should be drawn to the height required for living purposes.*

- (b) *There is inadequate provision of toilet and sanitary facilities.*
- (c) *The living-quarters are insufficiently protected from the stables.*
- (d) *Manure and other sources of pollution and odours are in too close proximity.*
- (e) *The house is so located and constructed as to be damp.*
- (f) *There is a lack of proper ventilation, lighting and heating.*
- (g) *There is insufficient protection from mosquitos, flies and dust.*
- (h) *There is insufficient exposure to the sun.*

There should be sufficient bedrooms in the houses to permit of separation of adults and children, as well as of the sexes.

Stables may be under the same roof as the house, providing there is proper protection or separation. The custom of having the living-quarters over the stables is not to be recommended.

If the building is not properly constructed, capillary attraction will cause dampness of walls and floors.

The area of the windows in proportion to that of the floors is not usually sufficient for the admission of light and air.

Open fires without vents are unsatisfactory and should be replaced by other methods of heating. The use of closed stoves in fire-places, as in Belgium and the Netherlands, makes for better heating, less air pollution and economy in fuel, while the advantages of fire-place ventilation are preserved.

Shady trees are often placed so as to prevent the access of sunshine.

Water supplies, cesspools and privies are sometimes lacking and frequently inconveniently situated and badly constructed. If properly planned and built, there is no reason why they should not be situated nearby or even adjacent to the house.

Systems of individual water supply under pressure, if properly designed, are not expensive and offer many sanitary advantages.

The entrance of mosquitos and flies may be prevented by screening windows and doors, planning the house without recesses where mosquitos may shelter, placing the stables between the house and breeding-places, etc.

3. METHODS OF IMPROVING RURAL HOUSING

These are:

- (a) *Education;*
- (b) *Cheap credit and improvement of the economic condition of the farmer;*
- (c) *Co-operation;*
- (d) *Legislation, by-laws and regulations, and their proper enforcement.*

The practice of making public buildings models from the point of view of hygiene and sanitation is highly recommended.

The construction of model houses at numerous strategic points encourages imitation.

Good housing will appeal more readily to the rural population if the plans are prepared after a study of local customs and social and economic conditions, so as to preserve features characteristic of the district.

Loans at low rates of interest, grants, as well as freedom from taxation, may be provided by legislation, and are potent means of improving rural housing. The award of bonuses for proper construction yields a large return for the investment of small sums.

There should be building codes prescribing minimum requirements in respect of sites, exposure, lighting, ventilation, etc. Technical supervision and enforcement are required to make these effective, as well as proper preparation by measures of education.

Such enforcement should not be left altogether to the local authorities.

The health authority should have jurisdiction over all sanitary aspects of housing.

The preparation and distribution of standard plans satisfying sanitary requirements and local needs has given good results and should be encouraged. Such houses should be of simple design and economic construction.

In ascribing to education an important influence on good housing, one has in mind general culture as well as education in hygiene. The folk high schools and professional schools of Denmark furnish a particularly striking example of the influence of general education on rural housing.

Legislation which provides for grants, bonuses and loans has played an important part in the promotion of good housing in all important European countries.

In England, in 1926, the Housing (Rural Workers) Act was passed "to secure a contribution to the improvement of housing conditions for agricultural labourers and other country workers by facilitating the reconditioning of old houses in such a way as to bring them up to modern standards of comfort and sanitation".

At the end of 1928, 2,070 requests for grants or loans had been received and more than £100,000 disbursed.

An Agricultural Credits Act was passed in 1928 providing for advances towards the construction of cottages, and a new Housing Act adopted in 1930, which entitles County Councils, which undertake rehousing, to grants from the Exchequer repayable in forty years.

The Act of 1902 (Woningwet) regulates housing in the Netherlands. This requires every commune to adopt by-laws regulating housing, contains provision for the elimination of houses unfit for habitation, and provides for advances for the purchase of land and the building of houses to companies, societies and institutions. Up to the end of 1923, these advances amounted to about 1,400,000,000 gold francs for 121,595 houses.

In 1916, a law was passed providing loans to agricultural workers for the purchase of small holdings and the construction of houses. From 1919 to August 1929, 3,164 loans were granted for these purposes.

The Central Authorities in 1925 prepared a model by-law for adoption by the local authorities.

The Central Health Service has prepared a series of plans of small houses, substantial but economical, which satisfy the requirements of the law.

The effect of all these measures may be judged from the following:

In communities with less than 10,000 inhabitants in December 1899, 36.2 per cent of all houses had three or more rooms, while in December 1927 the percentage had risen to 57.

As far back as 1886, the problem of proper housing conditions for agricultural labourers was made the subject of legislation in Germany. From 1921 to July 1929, loans for this purpose in Prussia alone were granted for 41,534 houses. In 1930, thirty million Reichsmarks were provided for this purpose by the Central and State Governments.

Between 1923 and 1930, some 472,200,000 Reichsmarks were utilised for the colonisation of agricultural workers, 26,343 colonies being established. In 1930, the "Deutsche Siedlungsbank" was created to facilitate financial transactions in connection with such colonisation.

In France, the "Loi Loucheur" of 1929 provides for the construction or rebuilding of 260,000 houses in a five-year period; one-third of the credits are reserved for rural districts.

The Law of 1929 also deals with housing for agricultural workers.

In Italy, the budget of the Ministry for National Economy for 1929-30 contained a credit of 2,500,000 lire for payment of interest on loans for the construction of houses in colonies and for agricultural labourers. The various institutions for agricultural credits granted loans of nearly 100,000,000 lire for these purposes between 1922 and 1928. In connection with "bonifications", Italy has made other important contributions to good housing in rural districts.

In 1919, a law was passed in Belgium creating the "Société nationale des habitations et logements à bon marché", which advances at 2 per cent credit to local and regional societies. In 1927, there were 274 such societies, with a capital of about 36,000,000 gold francs. The State has advanced the sum of 100,000,000 gold francs to the National Society, and the credits available have been utilised for the construction of 29,877 houses.

The Government of Czechoslovakia, in 1930, adopted a law to facilitate the construction of 20,000 small houses before the end of 1931, by guaranteeing second mortgages at low interest, and by additional grants in certain cases. Both forms of assistance may also be obtained for reconditioning and repairs. New houses are tax-free for a varying number of years; this measure is common to a number of countries.

In almost all the European countries there are building codes and by-laws regulating methods and details of construction. The value of such regulations depends entirely on the methods of supervision and enforcement. Supervision by the health authorities appears to give the best results.

An excellent method of improving housing conditions is illustrated by the work of the "Génie rural" in France. Plans for a series of improved types of rural buildings for properties of various sizes and for different districts were published by the Ministry of Agriculture in 1913. Similar work has been carried out in Germany, Italy, the Netherlands, etc.

Agricultural associations in various countries have done excellent work along this line.

The Institutes of Hygiene in several countries have played a prominent part in the promotion of good housing by educational measures, the construction of model houses, the preparation of model plans, etc.

4. HOUSING OF AGRICULTURAL WORKERS.

The improvement of housing for agricultural workers presents difficulties which cannot be solved by education and persuasion alone. The agricultural worker is in a particularly weak position in this respect, and suitable legislation, with proper enforcement, as well as public financial assistance, are needed to cope with this problem.

Poor housing for this class accelerates the exodus of the best workers to the cities, where in many cases more attention has been given to housing for industrial workers, and this in turn lowers the standard of rural life and prevents hygienic improvement.

The organisation in the different countries of sanitary inspection services is desirable. Such services should have the authority necessary to secure satisfactory housing conditions for agricultural workers and to enforce the relevant regulations.

The Conference draws attention to the recommendation of the International Labour Office (1921) on this subject.

The following is the text of this recommendation, which was adopted by seventy-four votes to twelve with four abstentions on November 15th, 1921, by the third session of the International Labour Conference:

“The General Conference of the International Labour Organisation recommends:

“I. That each Member of the International Labour Organisation, which has not already done so, take statutory or other measures to regulate the living-in conditions of agricultural workers with due regard to the special climatic or other conditions affecting agricultural work in its country, and after consultation with the employers' and workers' organisations concerned, if such organisations exist;

“II. That such measures shall apply to all accommodation provided by employers for housing their workers either individually, or in groups, or with their families, whether the accommodation is provided in the houses of such employers or in buildings placed by them at their workers' disposal;

“III. That such measures shall contain the following provisions:

“(a) Unless climatic conditions render heating superfluous, the accommodation intended for workers' families, groups of workers, or individual workers, should contain rooms which can be heated;

“(b) Accommodation intended for groups of workers shall provide a separate bed for each worker, shall afford facilities for ensuring personal cleanliness, and shall provide for the separation of the sexes. In the case of families, adequate provision shall be made for the children;

“(c) Stables, cowhouses and open sheds should not be used for sleeping-quarters;

“IV. That each Member of the International Labour Organisation take steps to ensure the observance of such measures.”

Full information in regard to this recommendation may be found in the report of the International Labour Office on Agricultural Workers' Housing (document C.H. 1020).

✓ 5. RECONDITIONING OF EXISTING HOUSES.

Rural housing may sometimes be improved by suitable reconditioning of existing houses. When properly directed and supervised, such reconditioning may yield excellent results, sometimes at comparatively small cost.

The construction of model villages and agricultural colonies is of particular interest and importance in respect of rural housing. The tendency to locate industrial plants in rural districts should be encouraged, such new construction offering opportunities for the building up of model villages and the application of all sanitary safeguards.

In the planning of these villages and colonies, the Health Authorities should have jurisdiction over all matters of hygiene and sanitation.

The Conference recommends the further study of this problem.

D. Land Improvements or Bonifications.

1. *Bonifications may be defined as the complete sanitary reconditioning of the land in areas where the general living conditions of the people are bad, more especially on account of malaria and other endemic diseases which endanger the vitality of the people.*

2. *This complete sanitary reconstruction is not limited to land drainage, but includes all measures required to bring the land under cultivation, and the provision of hygienic living conditions for the population by means of a network of good roads, suitable rural housing, a good water supply, sewage and waste disposal.*

3. *Under certain conditions it also includes the irrigation necessary for farming purposes, which enables the cattle to be housed throughout the year, this practice being indicated in view of the campaign against malaria.¹*

4. *Bonifications thus bring about a marked improvement in the standard of living, both economic and hygienic, and should accordingly be regarded as one of the most striking examples of rural hygiene.*

The application of the system of bonifications requires the help of the hygienist. This is particularly necessary during the execution of the work.

5. *The Conference draws attention to the importance of proper drainage by water-courses, and to the serious consequences resulting from the neglect to maintain these properly, not only in respect of agriculture, but also in regard to hygiene.*

The term "bonifications" is borrowed from the Italian, as it was in Italy that this idea originated, and the word has no exact equivalent in French or English. Bonifications are utilised primarily as a means of combating malaria, but this method might also be applied against other endemic diseases which act as a serious drain on human vitality.

Beginning simply as drainage of marshy areas, bonifications have developed into the complete sanitary and agricultural reconstruction of a given area, the Italian authorities having found that the prevention of malaria required a radical transformation of the living conditions of the people in an area where malaria prevails. The combination of intensification of agriculture with the application of all necessary prophylactic measures is known as *bonifica integrale*. This includes engineering work on a large scale and all measures necessary to render the area fit for agriculture — roads, good water, electricity, good housing and sanitation in general.

Various laws on this subject have been passed in Italy to define the object, regulate the procedure and provide financial assistance in respect of bonifications. The Law of December 24th, 1928, provided the necessary credits and set out the programme from 1930 to 1944 as follows:

Hydraulic bonification with complementary work such as construction of roads, aqueducts, irrigation, etc.	Lire 4,500,000,000
Irrigation	800,000,000
Rural settlements and housing	500,000,000
Rural aqueducts	210,000,000
Roads and water supply (not aqueducts).	1,000,000,000
Total	<u>7,010,000,000</u>

¹ By irrigation the pasturage may be improved and the cattle may accordingly be kept on the farm during the malarial season. The mosquitos, which convey the malaria, attack the cattle in preference to human beings. The latter are thus protected to some extent.

The State will contribute a total of 4,300,000,000 lire. The law provides that rural water supplies may be subsidised by the State in the amount of 75 per cent, and that the construction of rural houses in regions subject to bonification may be subsidised by the State up to 30 per cent of the cost. The amounts to be paid by the State in subsidies is fixed at over four billion lire. From the beginning until 1928, a total of 2,720,000,000 lire was expended for bonifications. This work not only assists in bringing malaria under control, but also results in the reclamation of large areas of waste land, and promotes good housing and other sanitary improvements.

In Italy, great importance is attached to "small scale bonifications". These are minor anti-larva measures (drainage of canals and the keeping in order of their banks and beds; sprinkling of "paris green" in stagnant waters; weeding and cleaning; breeding of mosquito-eating fish — e.g., the gambusia). These measures enable the campaign against malaria to be carried into the smallest districts. They are subsidised by the State, and are carried out either by the local authorities or by the landowners.

In Belgium, about six per cent of the area requires improvement on account of marshes or periodic flooding. Some 200,000 hectares have been reclaimed from the sea or protected from invasion by the sea. There are laws on these subjects which are now in course of amendment and improvement.

Agricultural associations, such as the Belgian "Boerenbond", have done much to assist in this work by furnishing technical advice, giving examples of the value of this work, educating landowners, etc. The work itself is done by associations of landowners. The result of such land improvements is seen in improved agriculture, better economic status of the rural population, better housing, the possibility of draining sewage and the improvement of public water supplies.

In France, a distinction is drawn between collective measures and individual measures. Collective measures are carried out by the communes with the financial assistance of the State. The plans are prepared by private experts or by engineers attached to Government departments (roads and bridges department, highways department, rural hygiene department) when the communes apply for this assistance. It is paid for in accordance with scales of charges, or sometimes is entirely free (rural engineering service). Plans for work carried out by the communes must be approved by the competent ministry after consultation with the Higher Council of Public Health. On the other hand, the persons concerned may form associations for carrying out such work. The State assists and supervises such associations in the same way as it does the communes. Individual work is planned and carried out by the person concerned, subject only to the condition that it is in conformity with the regulations. For purposes of example and propaganda, private individuals may obtain the free assistance of the rural engineering service in preparing and carrying out schemes of work. The *Conservatoire des Arts et Métiers* provides advanced theoretical and practical instruction in sanitary technique, and grants a diploma on the results of an examination.

The Netherlands is famous for such reclamation projects and is now engaged on the drainage of the Zuider Zee, which will provide for a population of some 400,000. The plans provide for collective water-supply systems, regional planning, and a high level of general sanitation.

In Spain, the problem is one of irrigation rather than of drainage. Special organisations have been created for the drainage areas of each of the principal rivers, and these organisations are concerned with the most effective utilisation of the available water, and problems of agriculture, sanitation, etc. Malaria exists in these areas and must be

combated. Water supplies are being constructed where none existed previously, housing is being studied and improved, and, in general, the opportunity is being taken to raise the general level of sanitation. The results obtained by the organisation in charge of the drainage area of the Ebro have been particularly good on account of the co-operation which exists between this organisation, the sanitary administration and the agricultural services.

These will serve as examples of work of this kind which has been carried out in many European countries. When competent sanitarians are consulted and due regard is paid to hygienic considerations, such work results in important sanitary improvements in rural districts.

CHAPTER V. — SUBJECTS FOR STUDY.

SUMMARY: 1 and 2. Training of Health Personnel (Public Health Nurse. Sanitary Engineer). — 3. Problems studied by the Schools of Hygiene: (a) Cost of Medical-Social Services; (b) Manure and Flies; (c) Typhoid Infections; (d) Milk. — 4. Study of Housing Conditions. — 5. Rapid Transport of the Sick.

After stressing the importance of the technical qualifications of public health personnel and asserting the need for public health nurses and sanitary engineers, the Conference dealt with the question of their professional training.

(1) *The Conference considers that the programme of public health nursing-schools should be studied by the competent commission of the League's Health Organisation, and suggests that the Council of the League of Nations should refer this study to the Health Committee.*

(2) *The Conference considers that the programme and methods of training of sanitary engineers in the different countries should also be studied by the Health Organisation, and suggests that the Council of the League of Nations should refer this study to the Health Committee.*

The chief object of the Conference was to discover economical and effective forms of health organisation; it was naturally bound to recommend investigations as to the cost of medical-social services in relation to their efficiency.

(3) *The Conference considers it would be advisable to secure further information on the cost of rural health and medical services, and recommends that such studies on a uniform plan should be carried out in rural districts by the various schools of hygiene under the auspices of the Health Organisation of the League of Nations.*

The Conference dealt with other subjects of a technical and economic character relating to sanitation: (a) the disposal of human excreta, (b) the campaign against flies coming from manure and (c) the expert examination of drinking-water and sewage.

4. *The Conference recommends that the study of the following subjects of particular interest to rural sanitation should be undertaken under the auspices of the Health Organisation of the League of Nations by the various schools of hygiene and institutes for the hygiene of water:*

(1) *The treatment of excreta of human origin (types of privies, particularly¹ the Java type privy);*

(2) *Heat treatment of garbage and manure to prevent fly-breeding;*

(3) *Methods of testing and analysing water and sewage in use in the different countries.*

The meeting of the directors of European schools of hygiene considered these different suggestions and decided to take up (under the auspices of the Health Organisation of the League of Nations) the study of the following problems with the collaboration of the different schools of hygiene and research institutions:

¹ The text in italics is the only one formally approved by the Conference.

(a) The cost of rural health services as compared with their efficiency. — This amounts to a practical demonstration, on the spot, of the economic value of the recommendations made by the Conference;

(b) Manure and flies. — This is a big problem connected with the housing problem and comprising the disposal of human excreta, experiments in high temperature digestion of solid sewage and all methods employed for preventing the breeding of flies in manure and garbage.

(c) Milk in rural districts. — This problem is connected with the hygiene of foodstuffs, infant mortality and many diseases (infectious or due to weakness). This problem was not included in the agenda of the Conference, but is sufficiently important to deserve special study.

(d) Typhoid infections. — This important rural problem is connected, on the one hand, with the problem of milk and, on the other hand, with those of water supplies and flies.

(e) Methods used for the analysis and expert examination of water supplies and sewage. Description and comparison of the standards employed in different countries; improvement of methods.

5. *The Conference adopts the report of the meeting of directors of schools of hygiene, which proposes that, under the auspices of the League of Nations, the following problems should be studied by various schools and institutes:*

- (a) *The cost of health services;*
- (b) *Manure and flies;*
- (c) *The milk problem in the countryside;*
- (d) *Typhoid infections;*
- (e) *The expert examination of drinking-water and sewage.*

6. *The Conference recommends that the study of housing conditions in rural districts proposed by the Third Committee should be referred to the International Labour Office and the International Institute of Agriculture, in collaboration with the Health Organisation of the League of Nations, when questions of hygiene are involved.*

7. *The Conference draws attention to the importance of the rapid transport of the sick in rural districts, and considers there would be advantage in the international adoption and use of a special sound signal for motor ambulances. The Conference suggests that the Council of the League of Nations might refer the study of this subject to the League's Organisation for Transit and Communications.*

CHAPTER VI. — VALUE OF COLLABORATION BETWEEN THE PROFESSIONS AND GROUPS CONCERNED.

8 *The Conference desires to emphasise the importance for rural hygiene of close collaboration between administrators of public health and assistance, agricultural experts, engineers, architects, medical officers and practitioners, representatives of health insurance institutions, agricultural associations and private health agencies.*

The Rural Hygiene Conference has furnished a striking illustration of the fruitful results of such collaboration, and this collaboration begun under the auspices of the League of Nations should be continued and extended.

[Distributed to the Council and the Members of the League.] Official No: **C.473. M.202.** 1931. III (Vol. II)

Geneva, July 31st, 1931.

LEAGUE OF NATIONS

Health Organisation

EUROPEAN CONFERENCE ON RURAL HYGIENE

(June 29th - July 7th, 1931)

Volume II

MINUTES

Series of League of Nations Publications

III. HEALTH
1931. III. 11 II

CONTENTS.

	Page
FOREWORD	7
<i>Chapter I.</i> — PREPARATION FOR AND CONSTITUTION OF THE CONFERENCE	9
<i>Chapter II.</i> — MINUTES OF THE PLENARY MEETINGS :	
First Meeting (June 29th, 4 p.m.)	16
Opening Speeches by M. Avenol, Deputy Secretary-General of the League of Nations, and Professor Pittaluga, President of the Conference. — Constitution of the Bureau. — Speech by Professor Léon Bernard, Vice-President. — Appointment of the Committee on Credentials. — Constitution of Three Committees. — Rules of Procedure of the Conference.	
Second Meeting (June 30th, 10 a.m.)	26
Bureau of the Conference. — Opening of the General Discussion on the First Item on the Agenda (Medical Assistance) : Statement by the Rapporteur, Professor Parisot. — Statement by Dr. Unger on the Relations between Health Insurance and Rural Hygiene.	
Third Meeting (June 30th, 3.30 p.m.)	34
Continuation of the Discussion on the First Item (Medical Assistance) : Speeches by M. Andronesco (Roumania), Dr. Jitta (Netherlands), M. Garcia Tornel (Spain), M. Prohaska (Yugoslavia), M. Santiago (Spain), Dr. Pelc (Czechoslovakia), Dr. Lutrario (Italy). — Replies by Dr. Unger (Germany) and Professor Parisot (France).	
Fourth Meeting (July 1st, 10 a.m.)	43
Credentials. — Opening of the Discussion on the Second Item on the Agenda (Health Services). — Statement by Professor Stampar, Rapporteur. — Speeches by Professor Puntoni (International Institute of Agriculture), Dr. Chodzko (Poland), Dr. Ferguson (Great Britain) and Dr. Johan (Hungary).	
Fifth Meeting (July 1st, 3.30 p.m.)	48
Continuation of the Discussion on Item 2 (Health Services) : Speeches by M. Sarraz-Bournet and M. Vimeux (France), Dr. Lutrario (Italy), Dr. Kacprzak (Poland), Dr. de Buen (Spain), Dr. Vasile (Roumania), Dr. Canal-Comas (Spain), Dr. Miemietz (Germany). — Proposals to set up a Fourth Committee and to convene a Meeting of the Directors of European Schools of Hygiene. — Resumption of the Discussion on Item 2 : Speech by M. Prohaska (Czechoslovakia).	

	Page
Sixth Meeting (July 2nd, 9.30 a.m.)	57
Draft Resolution (Fourth Committee and Meeting of the Directors of Schools of Hygiene) : Speeches by M. Gautier (France), Dr. Pelc (Czechoslovakia), Dr. Jitta (Netherlands), Dr. Lutrario (Italy). — Continuation of the Discussion on Item 2 (Health Services and Centres) : Speeches by Dr. Konrich (Germany), M. Andronesco (Roumania), Dr. Ismail (Turkey), M. Pallis (Greece), Dr. Berry (Irish Free State), M. Garcia Tornel (Spain), M. Spaas (Belgium), Dr. Kolar (Czechoslovakia) ; Reply by Professor Stampar (Yugoslavia).	
Seventh Meeting (July 2nd, 3.30 p.m.)	65
Constitution of the Fourth Committee. — Opening of the Discussion on Item 3 on the Agenda (Sanitation) : Statements by the Rapporteurs, Mr. Bürger (Sewage and Refuse), M. Krul (Water Supplies), Mr. Ross Hooper (Housing), M. Buttini (Bonifications).	
Eighth Meeting (July 6th, 4 p.m.)	66
Submission and Adoption of the Reports of the First, Second and Third Committees.	
Ninth Meeting (July 6th, 6 p.m.)	67
Submission and Adoption of the Report of the Fourth Committee.	
Tenth Meeting (July 7th, 11.45 a.m.)	68
Closing Meeting.	
<i>Chapter III. — CONSTITUTION, MINUTES AND REPORT OF THE FIRST COMMITTEE (MEDICAL ASSISTANCE)</i>	72
List of Members of the First Committee. — Minutes of the First Meeting (July 2nd, 3.30 p.m.) and of the Second Meeting (July 3rd, 3.30 p.m.). — Report.	
<i>Chapter IV. — CONSTITUTION, MINUTES AND REPORT OF THE SECOND COMMITTEE (HEALTH SERVICES)</i>	79
List of Members of the Second Committee. — Minutes of the First Meeting (July 3rd, 10 a.m.) and of the Second Meeting (July 4th, 10 a.m.). — Report.	
<i>Chapter V. — CONSTITUTION, MINUTES AND REPORT OF THE THIRD COMMITTEE (SANITATION)</i>	100
List of Members of the Third Committee. — Minutes : First Meeting (July 2nd, 5.30 p.m.) : Procedure : Opening of the Discussion on Water Supplies. — Second Meeting (July 3rd, 10 a.m.) : Close of the Discussion on Water Supplies ; Opening of the Discussion on Housing. — Third Meeting (July 3rd, 3.30 p.m.) : Continuation of the Discussion on Housing ; Discussion on Bonifications ; Opening of the Discussion on the Disposal of Sewage. — Fourth Meeting (July 4th, 10 a.m.) : Close of the Discussion on Sewage and Refuse. — Report.	
<i>Chapter VI. — MINUTES AND REPORT OF THE FOURTH COMMITTEE AND OF THE MEETING OF DIRECTORS OF SCHOOLS OF HYGIENE</i>	135

ANNEXES. — *Documents and Reports submitted to the European Conference on Rural Hygiene :*

	Page
1. Technical Recommendations by the Preparatory Committee	142
2. Sickness Insurance as a Factor in Rural Hygiene : Report submitted to the Conference by the International Labour Office	161
3. Extracts from the Report on Water Supplies in Rural Districts : submitted to the Conference by M. Krul, Director of the National Bureau for Water Supply at The Hague	171
4. List of Documents distributed to the Conference	180



FOREWORD.

The Report of the proceedings of the European Conference on Rural Hygiene is contained in two volumes :

Volume I is devoted to the *Recommendations* made by the Conference ;

Volume II contains the *Minutes*.

The present volume (*Minutes*) consists of an introductory chapter on the preparation for and constitution of the Conference, followed by a series of chapters containing the *Minutes* of the plenary meetings of the Conference and of the Committee meetings.

Annexes concerning the reports and documents distributed to the Conference appear at the end of this volume.

CHAPTER I. — PREPARATION FOR AND CONSTITUTION OF THE CONFERENCE.

Volume I (Chapter I) gives a brief history of this question. Preparations for the Conference were made by the Preparatory Committee.

This technical work is summarised in the printed report entitled : " Principles governing the Organisation of Medical Assistance, the Public Health Services and Sanitation in Rural Districts " (document C.H.1045). This report served as a guide to the Conference. The Preparatory Committee's technical recommendations are reproduced as Annex 1, so as to make intelligible the reading of the Minutes of the Committees.

The *agenda* of the Conference included three chief questions :

- (1) Guiding principles and suitable methods for ensuring effective *medical assistance* in rural districts ;
- (2) The most effective methods of organising the *health services* in rural districts ;
- (3) The *sanitation* of rural districts : the most effective and economical methods.

The first volume (Chapter I) shows how the Preparatory Committee sub-divided these three great problems and describes the methods adopted in studying them.

The Preparatory Committee also considered the preparation for the Conference from the administrative standpoint and drew up Rules of Procedure.¹

The Rules of Procedure of the Assembly were adopted for the Conference, except in regard to certain provisions suggested by the Preparatory Committee (document C.H.1037). To facilitate the discussion, it was decided that consideration of the three items on the agenda should be divided between at least three committees. At their request, representatives of private international associations concerned in the promotion of rural health were allowed to address the committees.

Seven Rapporteurs were appointed to report in the following subjects :

1. Medical Assistance (Professor Jacques PARISOT, Professor of Hygiene and Preventive Medicine at the Faculty of Medicine, Nancy) ;
2. Organisation of Public Health Services (Professor STAMPAR, Inspector-General of Health, Belgrade) ;
3. Co-operation of Health Insurance Institutions as regards (1) and (2) (M. UNGER, Director of the Union of Rural Health Insurance Funds of the Reich) ;
4. Disposal of Sewage (M. BÜRGER, Prussian National Institute for the Hygiene of Water, the Soil, etc., Berlin) ;
5. Water Supplies (M. KRUL, Director of the National Bureau for Water Supply, The Hague).

¹ The complete text of the proposals made by the Preparatory Committee is given in documents C.L.301.1930 (Annex) ; C.H.952, C.H.1037 and C.H.1045.

6. Housing Problem (Mr. H. R. HOOPER, Engineer, Chippenham) ;
7. Land Improvements (" Bonifications ") (M. BUTTINI, Technical Adviser to the Ministry of Labour, Rome).

It was decided that the members of the Preparatory Committee should hold themselves at the disposal of the Conference.¹

LIST OF DELEGATIONS AND OBSERVERS.

President :

Professor Gustavo PITTALUGA, Director of the National School of Hygiene, Madrid.

Austria :

M. Karl LERCH, Representative of the *Tiroler Landeskulturrat*, Innsbruck.

Belgium :

M. Julien VAN DER VAEREN, Secretary-General, Ministry of Agriculture, and Member of the Health Council, Brussels.

Dr. Jacques SPAAS, Government Health Inspector, Hasselt.

Dr. Jean-Baptiste Hubert GULDENTOPS, Government Health Inspector, Vilvorde.

Czechoslovakia :

His Excellency, Mr. Z. FIERLINGER, Permanent Delegate to the League of Nations, Geneva.

Dr. H. PELC, Chief of Social Hygiene Division of the State Institute of Hygiene, Prague.

M. J. LANGER, Professor of Pediatrics at the German Medical Faculty, Prague.

Dr. R. KOLAR, Head of Division, Ministry of Agriculture, Prague.

M. M. ZELENKA, Director of the Institute for the Construction of Houses for Agricultural Workers, Prague.

Denmark :

M. Soren SORENSEN, Agricultural Councilor, Danish Legation, London.

Dr. Abraham METZ, County Medical Officer, Holbaek.

¹ The members of this Committee were :

Professor G. PITTALUGA, *President*, Director of the School of Hygiene, Madrid ;

Dr. H. CARRIÈRE, Director of the Federal Public Health Service, Berne ;

Dr. A. LUTRARIO, Former Director-General of Public Health, Ministry of the Interior, Rome ;

Professor J. PARISOT, Director of the Institute of Hygiene, Nancy ;

Dr. A. STAMPAR, former Inspector-General of Health, Belgrade ;

Dr. CHODZKO, Director of the School of Public Health, Warsaw ;

Dr. Th. MADSEN, Director of the State Serological Institute, Copenhagen ;

M. M. HESELTINE, Assistant Secretary, British Ministry of Health, London ;

Dr. C. HAMEL, President of the *Reichsgesundheitsamt*, Berlin ;

Professor J. G. FITZGERALD, Director of the School of Hygiene and Connaught's Laboratories, Toronto ;

Professor V. PUNTONI, Representative of the International Institute of Agriculture, Rome ;

M. A. TIXIER, Chief of the Section of Social Insurance, International Labour Office.

Finland :

- M. Evald GYLLENBÖGEL, Chargé d'Affaires p. i. of Finland at Berne and Permanent Delegate to the League of Nations, Geneva.
M. Paul HJELK, Secretary of Legation, Geneva.

France :

- Professor Léon BERNARD *President of the Conseil supérieur d'Hygiène publique* of France, Paris.
M. Jules GAUTIER, *Président de Section au Conseil d'Etat*, Paris.
M. Maurice VIGNEROT, Chief Engineer of Rural Engineering, Ministry of Agriculture, Paris.
Professor Jacques PARISOT, Professor of Hygiene and Preventive Medicine at the University of Nancy.
M. Marius SARRAZ-BOURNET, Associate Inspector-General of the Administrative Services, Ministry of the Interior, Paris.
M. Georges DABAT, Rural Engineer, Chief Assistant, Ministry of Agriculture, Paris.
M. Martial BONIS-CHARANCLE, Director of the Committee *Hygiène et Eau*, Paris.
M. Michel AUGÉ-LARIBE, Secretary-General of the National Federation of Rural Hygiene Associations, Paris.
M. Samuel DE LESTAPIS, General Director of the French Society of Agriculturists, Paris.
M. Paul VIMEUX, General Director of the National Union of Agricultural Mutual Benefit Societies, Paris.

Germany :

- Dr. C. HAMEL, President of the *Reichsgesundheitsamt*, Berlin.
Professor Friedrich KONRICH, Member of the *Reichsgesundheitsamt*, Professor of Hygiene at the University of Berlin.
Dr. Walther MIEMIETZ, Vice-President of the Medical Association, Province of Brandebourg-Wriezen (Delegate of the German Association of Medical Practitioners), Wriezen.
Dr. Gustav SEIFFERT, Counsellor to the Bavarian Ministry of the Interior, Munich.
M. Karl UNGER, Director of the *Reichsverband der deutschen Landkrankenkassen*, Perleberg, Potsdam.
Dr. Bernhard BÜRGER, Director of the State Institute for the Hygiene of Water, Soil and Air, Berlin.

Great Britain :

- M. Herbert Ross HOOPER, Consulting Civil Engineer, Chippenham.
Dr. Alexander SHEARER, Medical Officer, Department of Health for Scotland, Edinburgh.
Dr. James FERGUSON, County Medical Officer of Health, Surrey.

Greece :

- M. Alexander PALLIS, Secretary-General of the Ministry of Health, Athens.
M. Daniel E. WRIGHT, Sanitary Engineer, School of Hygiene, Athens.
Dr. Norman WHITE, Director of the School of Hygiene, Athens.

Hungary :

- His Excellency Mr. Jean PELENYI, Resident Minister accredited to the League of Nations, Head of the Permanent Delegation, Geneva.
Dr. Bela JOHAN, Director of the State Institute of Hygiene, Budapest.
Dr. Nicolas SIEGESCU, Secretary in the Hungarian Ministry of Agriculture, Budapest.

Irish Free State :

- Dr. Winslow Sterling BERRY, Medical Inspector, Department of Local Government and Public Health, Dublin.

Italy :

- His Excellency Mr. Giuseppe DE MICHELIS, Senator, Ambassador, Delegate to the Permanent Committee of the International Institute of Agriculture, Rome, President of Delegation.
Dr. A. LUTRARIO, former Director-General of Public Health, Ministry of the Interior, Rome.
M. Antonio LABRANCA, Inspector-General, Head of the General Public Health Division, Public Health Department, Ministry of the Interior, Rome, Technical Delegate.
Dr. Dino RIO, Head of the Medical Assistance Section, Public Health Department, Ministry of the Interior, Rome, Technical Adviser.
M. Giuseppe ZAMBELLI, Chief Inspector of Civil Engineering, Rome, Technical Adviser.
M. Casimiro BUTTINI, Engineer of the Civil Engineering Department, Rome, Technical Adviser.
M. Roberto ROBERTI, Secretary-General of the National Federation of Agricultural Workers' Health Insurance Funds, Rome, Technical Adviser.
M. Guido GIORGI, Delegate of the Ministry of Corporations, Rome, Technical Adviser.
M. Constantino GORINI, Professor at the University of Milan, Technical Adviser.
M. Pietro SOLARI, Consular Attaché, Ministry of Foreign Affairs, Rome, Secretary of Delegation.

Latvia :

- His Excellency Mr. Jules FELDMANS, Minister Plenipotentiary, Permanent Delegate accredited to the League of Nations, Geneva.

Luxemburg :

- M. Charles VERMAIRE, Consul of Luxemburg at Geneva.

Netherlands :

- Dr. J. M. N. JITTA, President of the Health Council of the Netherlands, The Hague, Head of Delegation.
Dr. Jan Harm TUNTJER, Inspector of Public Health, Groningen.
M. E. C. VAN LEERSUM, Professor of Medicine, Amsterdam.
M. Wilhelms F. J. M. KRUL, Director of the National Bureau for Water Supply, The Hague.
M. Johan BEIJERMAN, Director of the Central Office of the Green Cross and Secretary-General of the Netherlands Green Cross Association, Utrecht.

Norway :

M. P. H. BIRKELAND, Chargé d'Affaires, Norwegian Legation, Berne.

Poland :

Dr. W. CHODZKO, Director of the School of Hygiene, Warsaw, Chief of Delegation.
Dr. M. KACPRZAK, Chief of the Medical Statistical Section, School of Hygiene, Warsaw.
Dr. S. TUBIASZ, Counsellor to the Ministry of the Interior, Warsaw.

Portugal :

M. A. FERRAZ DE ANDRADE, First Secretary of Legation, Head of the Portuguese Delegation to the League of Nations, Geneva.

Roumania :

M. M. ENESCO, General Director of the Ministry of Labour, Bucarest.
M. P. VASILE, Inspector-General, Ministry of Health and Labour, Bucarest.
M. C. ANDRONESCO, Professor of Hygiene, Post-graduate Agricultural Academy, Ministry of Agriculture, Bucarest.

Spain :

Dr. Sadi DE BUEN, Inspector-General of Health Services, Madrid, Head of the Delegation.
Dr. Lorenzo G. TORNEL, Vice-President of the General Council of Spanish Medical Societies, Barcelona.
Dr. A. CANAL-COMAS, Delegate of the Spanish Medical Association, Municipal Inspector of Health, Granollers (Barcelona).
Professor Lazzaro URRA, Professor of Sanitary Engineering at the School of Hygiene, Madrid.
M. Gutierrez DE ARROYO, Rural Engineer, Delegate of the Hydrographical Society of the Ebro.
Dr. Innocencio JIMENEZ, Professor at the University of Saragosse, Delegate of the Institute of Social Welfare, Madrid.
M. Enrique SANTIAGO, Delegate of the General Workers' Association, Ministry of Labour, Madrid.
M. G. ARROYO, Representative of the Labour Ministry, Madrid.
M. J. COLL CREIXELL, Ministry of Labour, Barcelona, Representative of Rural Co-operatives.
M. R. MAYCAS DE MEER, Ministry of Labour, Madrid, Delegate of Employers.

Sweden :

M. N. H. WRANNE, County Medical Officer, Mariestad.

Switzerland :

Dr. H. CARRIÈRE, Director of the Federal Public Health Service, Berne.
M. R. RUBATTEL, Chief of Section of the Division of Agriculture, Federal Department of Public Economy, Berne.

Turkey :

Dr. A. ISMAIL, Director-General of Health, Ankara.

Yugoslavia :

Dr. I. ANDRITCH, First Secretary of the Permanent Delegation, Geneva (substitute for the Head of the Delegation, Mr. Choumenkovitch).

Dr. M. RANKOV, Director of the Public Health Institute, Skoplje.

Dr. I. PIRC, Director of the Public Health Institute, Ljubljana.

M. M. PETRIK, Chief of the Division of Sanitary Engineering, School of Public Health, Zagreb.

M. K. SCHNEIDER, Head of the Union of Sanitary Co-operatives, Belgrade.

M. L. PROHASKA, Head of the Department of Agriculture, Belgrade.

OBSERVERS.

Bolivia :

Dr. BILBAO, General Director of Health, La Paz.

China :

M. C. N. LOU, Secretary of the Permanent Office of the Chinese Delegation to the League of Nations, Geneva.

Colombia :

Dr. L. F. CALDERON, Paris.

Cuba :

M. G. DE BLANCK, Permanent Delegate of Cuba to the League of Nations, Geneva.

India :

M. B. M. ROY, Assistant Malaria Officer to the Government of the United Provinces, Lucknor.

Japan :

Dr. M. TSURUMI, Member of the Health Committee of the League of Nations.

Professor MIYAJIMA, Professor of Preventive Medicine, Kitasato Institute, Tokio.

Dr. HAMANO.

Mexico :

Dr. N. CAMARHA-VALES, Consulate of Mexico, Vienna.

United States of America :

Dr. J. G. TOWNSEND, United States Public Health Service, American Consulate-General, Naples.

International Institute of Agriculture, Rome :

Professor V. PUNTONI, Professor of Bacteriology at the University of Rome.
M. F. BILBAO, Chief Agricultural Engineer, Delegate of the International Institute of Agriculture, Rome.

League of Red Cross Societies :

M. F. R. HUMBERT, Director of the Health Section of the League of Red Cross Societies, Paris.

International Association of Medical Officers :

Dr. DECOURT, Secretary-General, Paris.

The Health Committee of the League of Nations appointed its President, Dr. MADSEN, as observer.

The International Labour Office was represented by M. TIXIER, Chief of the Section of Social Insurance, assisted by his colleagues, M. ABRAMSON, Dr. PRYLL, Dr. STEIN and by M. GORNI, Member of the Agricultural Section.

Dr. L. RAJCHMAN, Medical Director of the Health Section of the League of Nations, assisted by Dr. F. G. BOUDREAU, member of the Health Section, acted as Secretary of the Conference.

CHAPTER II. — MINUTES OF THE PLENARY MEETINGS.

FIRST MEETING (JUNE 29TH, 4 P.M.)

Opening speeches by M. Avenol, Deputy Secretary-General of the League of Nations, and Professor Pittaluga, President of the Conference. — Constitution of the Bureau. — Speech by Professor Léon Bernard, Vice-President. — Appointment of the Committee on Credentials. — Constitution of Three Committees. — Rules of Procedure of the Conference.

President : Professor G. PITTALUGA

Welcome to Members of the Conference.

M. AVENOL (Deputy Secretary-General) spoke as follows :

Mr. President and Gentlemen, — It is a pleasure to be able to welcome the numerous delegates from various European countries, as well as the observers nominated by non-European countries, met to study the immense problem of rural hygiene under the three aspects of medical assistance, the organisation of health services and the sanitation of rural districts.

The Health Organisation of the League of Nations, under whose auspices you meet, has already had occasion to deal with rural hygiene problems ; but this, if I am not mistaken, is the first international Conference convened to discuss such questions, and this meeting, due to the initiative of the Spanish Government, seems to me a further proof of the League's interest in agricultural life and economy.

Why, in the case of this international Conference, has the League of Nations restricted its scope to Europe ? I believe it is due to the technical motives which apparently swayed those responsible for the Conference.

Men of your experience do not need to be told that no public health organisation can possibly afford to ignore two primary factors — social customs and the organisation of public administration ; and it is my belief that, despite the differences of language and the divisions due to national frontiers, you will elicit and keep before you throughout your proceedings, the fact of the essential unity of Europe — in your case, agricultural Europe.

Modes of life, geographers say, cannot be segregated into water-tight compartments by frontiers, and, whether they represent the closely populated towns of the Mediterranean or the pastoral population of the Alps, Carpathians and Balkans, or the scattered villagers or big land-owners of the plains, there will always be a number of delegations capable of amalgamating their experiences and co-operating in the search for practical improvements in rural hygiene and housing.

Nor will any of you be perplexed by the form or the mode of action of public authorities which can all be reduced to a few standard types, differing only very slightly from one another. Your task, gentlemen, will therefore be correspondingly simplified. You have not met to draw up international conventions, but merely to co-operate with

one another and to find, in the common fund of collective experience you are about to create, the strength needed to speed up progress in your own countries. That will be a very valuable international achievement.

I referred a moment ago to the unity of European life which is at the basis of our Conference ; but this unity is not perfect, it contains serious inequalities. The conditions of rural life have not progressed to the same degree everywhere ; some countries are a hundred years behind, and the level of economic life is by no means uniform.

Nothing, perhaps, can better adjust the inequalities in European rural conditions than the profound changes which you will introduce into everyday life — better ventilation, better lighting, greater comfort and better health, larger requirements, and thence more extensive economic relations, narrower margins between poverty and wealth among peasant populations ; such, gentlemen, may be the result of your deliberations and recommendations. I am confident that your work will be an effective contribution to enhancing European stability, and that you will identify yourselves closely with the League's efforts to consolidate peace.

The President's Opening Speech.

The PRESIDENT spoke as follows :

May I express the unanimous feeling of all the delegates and members of the Conference and thank you for the noble sentiments that you have just voiced in the name of the great institution which has convened our Conference here ?

Ladies and gentlemen, I do not think that my only task should be to repeat the usual formula and merely welcome you here. We are assembled in this place in order to accomplish a common task. Our personal endeavour becomes insignificant in comparison with the great object which has brought us together. It is our intention not to separate until this first Conference on Rural Hygiene, limited though it be to European countries, has given the whole world, and particularly the Governments and their technical or administrative organisations, concrete guidance on certain points which will enable them to arrive at an actual change in the present state of things so far as concerns all matters connected with the hygiene of the rural population.

Let us therefore consider more closely what is, in fact, the task of our Conference. Is it a task of a technical character, of a purely scientific character, or rather of a social and political nature ?

It is only too obvious that these various forms of activity of the human spirit, these different ways of dealing with facts and directing our efforts in order to adapt the external reality and our environment to our aspirations and our ideal, are constantly approaching each other. It is, indeed, too evident that to-day it is impossible for us to contemplate a task such as ours unless the technique and the scientific data which are at the basis of the culture and activities of all of us are directed or turned towards aims of a social and political nature ; or, if you like, unless questions of a social and political character exercise an influence over our thoughts, even when we are endeavouring to solve problems which we regard as exclusively technical or scientific.

I would even like to remind you that the *sine qua non* for actually carrying out part of our aspirations in the field of public health consists in never losing sight of the reciprocal influence and limitations of these two different forms of our mental activities — on the one side, scientific and technical knowledge and activities ; on the other side, knowledge and activities of a social and political character.

If we closely examine the history of the successive changes and improvements which have been brought about in the life of mankind during the last fifty years, we see that the

development of the towns and the attempts of health experts to solve the greater part of the problems connected therewith have been primarily influenced by political and social laws, and have been the logical consequence of the predominance of the working-class factor and of the phenomenon of industrial life during this period, under the pressure of the requirements of the mass of mankind in the neighbourhood of the great industrial centres, and later under pressure from, or as a result of, the needs of the working-class communities and even of the political parties which have represented them. I would remind you that we largely owe the solution of the problems of urban hygiene to the simultaneous existence of these factors of a social character and the improvement of sanitary technique on the basis of biological science. Urban hygiene, at least from the theoretical point of view, has already been given almost all that science and technique can put at the disposal of administrators and organisers for the purpose of solving the great problems connected therewith.

Let us, on the other hand, consider the situation from the point of view of rural hygiene. During the eighteenth century, the myth of the happiness of rural life was glorified. The joys of village life, the quiet existence in the country, and the advantages of agricultural work were set forth as an ideal situation from the point of view of mind and body. This ideal picture, conjured up by means of traditions dear to those who remember Virgil from their college days, has not stood the criticism of a more positive examination. Unfortunately, the real facts are quite different.

We are now in a position to assert that, if the rural population had not the great natural health-producing factors (the light of the sun and fresh air), their conditions of life, in so far as these depend on domestic or social factors, would be worse and lead to conditions of an organic character involving much more hardship than the conditions of the town populations.

In most European countries, almost all problems connected with the living conditions of the agricultural populations are still unsolved. There is always congestion. Direct contact between mankind and animals in rural life gives frequent occasion for infection and dirt. The bodies of children and of adults are constantly liable to be contaminated by the earth, by utensils and by work.

As always, the great stages of the history of the world are marked by sudden revelations which, at a given moment, display realities which were concealed by the illusions derived from traditions and myths.

It was the great war which brought out the sad and painful realities of peasant life and the serious hygienic requirements of the rural population ; since the great war brutally emphasised, from a demographical point of view, the primary importance of the rural population, and, through statistical data relating to the mortality and morbidity of certain infectious diseases, obliged the Governments to realise the great danger which arises if one does not give all the attention that they deserve to the problems of public health in agricultural and rural populations.

We also owe the demonstration of the enormous advantages and positive results which we may achieve by dealing seriously with these problems to the work carried out after the war by Governments and agricultural organisations in certain countries of Europe which were amongst those which suffered most from the storm.

It was necessary to remedy this state of things ; we are going to make an effort ; we are going to contribute to the solution of these problems.

When on this point, I need hardly remind you of the words of Lessing : " Men should not be judged by their success, but by the effort that they make in order to succeed ". This should be our motto ; we are met here to make that effort. We cannot yet say whether we shall succeed in our difficult and complicated task. Nevertheless, we are going to set to work, and I am sure we all hope that the results of our labours will be accepted by the

Governments that you represent, and that they will enact effective legislation based on what we are doing here.

The Spanish Government — that is to say, the Government of a nation whose agricultural life is extremely developed, being much struck by the *de facto* situation that I have just briefly outlined before you, was desirous of defining the principles and methods according to which technical steps should be taken to ameliorate the life of the agricultural worker.

That Government realised that a rational programme should form the basis of the reconstruction of rural districts in accordance with the conceptions of modern hygiene ; and that, in a harmonious programme of this kind, sanitary conditions should be given their full importance in the same manner as financial and economic considerations, means of transport and means of communication, public education and popular instruction.

This Conference has met as the result of the effort to remodel her internal life undertaken by Spain and of the proposal which the Spanish Government submitted to the League of Nations and which the Council accepted. I am of opinion that this Conference should study the problem of rural hygiene without, however, omitting to take account of its relations with the factors which I have just enumerated and which have a very great influence on the health of the peoples of the world.

Other bodies and other Commissions belonging either to the League of Nations or to the two great international organisations which are represented here are dealing with these other factors, the study of which has been subdivided under various heads — agricultural credits, wheat markets, education, health insurance, improvement of communications and transport, etc.

Such an international technical co-operation cannot but be to the benefit of the rural population and, indeed, to the benefit of all the populations of Europe and of the whole world.

Future historians will note as a characteristic of our epoch this evolution towards a closer and closer organisation of international relations. We are living in a period in which it is recognised for the first time that a nation cannot live in complete isolation outside the community formed by the worldwide body of nations.

I have certain reasons to think that health experts will not lag behind this movement and that the results of this Conference, when utilised by certain Governments, will not only improve health conditions among rural populations but will also serve as an example to show once more the fruitful results of an international collaboration in a technical sphere.



Let us remember that we are not going to lay down rules and principles with a view to stabilising an existing state of things, but that we are going to change the existing state of things in so far as we are able to do so and to promote progress. We are going to endeavour to lay down a programme calculated to enable the various countries to do better than the best that has been done before. We are faced by a high death rate, by a very large morbidity, by the absence of sanitary organisation and by the fact that country people do not understand rural hygiene.

It is impossible to provide for every detail of a programme which can be applied to the rural districts of all countries. Conditions differ too much as between one country and another, and even in different parts of the same country.

What we should do and what we shall do is to lay down the general principles which, in accordance with modern conceptions of hygiene, should form the basis of health organisation and of work for the promotion of public health in all countries.

We do not pretend to be able to solve every problem of rural hygiene ; there are some of them which will require further study and research.

It is very fortunate that the Health Organisation of the League of Nations constitutes a permanent organisation, thanks to which the health administrations of Europe — and of the whole world — are enabled to continue the study of these questions until they are ripe for a solution.

Some of these problems are mentioned in the report of the Preparatory Committee, which is before you. I should like to draw your attention both to these problems and to the report itself, which I am sure will assist you considerably in your work at the Conference. This report puts a lofty ideal before you. I am sure, however, that your sole desire is to seek an ideal even more lofty. The report does not confine itself to defining this high ideal, it also takes account of the conditions, both economic and practical, which we must always bear in mind when carrying out our schemes in daily life, particularly during a period of crisis. The Preparatory Committee is firmly convinced that, in most countries, the application of the principles set forth in this report will not increase the cost of work for promoting public health, but, on the contrary, make it more efficient. I allude here rather to methods of organisation than to strictly sanitary work. It is obvious that improvement of water supply, better housing, and increase in the number of hospitals in rural districts, will lead to an increase in the amount of money that is spent on promoting health. This, however, is no longer true when we consider the organisation of health services in itself. Experience has always shown that, for the same expenditure, the work is better done when you substitute a small number of highly qualified officials who give all their time to their work for a large number of imperfectly qualified persons who only do this work during part of their time.

Furthermore, you will find all through this report the recognition of the principle that the country dweller should be helped in such a way as to make him able to help himself. Explain to him, for instance, how desirable it is to have a healthy house, and lend him money at a low rate of interest and he will improve his own housing conditions. Make him understand the value of good medical advice, post an adequate number of efficient doctors in rural districts, and, whenever he is at all ill, he will call in the doctor. The value of education, of encouragement, of propaganda and of incentive is shown on almost every page of this report. The success of our health work in every country depends on popular education in health matters. No one can deny this axiom.

You doubtless desire to know how this report was prepared. The Council of the League of Nations entrusted the task of preparing the documents for the Conference to a Preparatory Committee composed of twelve experts belonging to ten different countries. Some of these experts are directors of their national health administrations, others are in charge of important health institutions, and one of them, Dr. Madsen, is the President of the Health Committee of the League of Nations. The Preparatory Committee prepared an agenda for the Conference, which was adopted by the Council. It also suggested the subjects that might be included under each head of the agenda, since the Conference was to deal with the study of the more important aspects of rural hygiene. When the reports on each of the items of the agenda were being prepared, the Preparatory Committee decided to call in experts. It was of opinion that it would be most desirable to lay down on a basis suitable for international acceptance the guiding principles to be followed in respect of medical assistance, health services, and sanitation in rural districts. For this reason, the Preparatory Committee asked the Health Organisation of the League of Nations to convene groups of experts with a view to preparing reports on the three questions on the agenda.

The experts who prepared the report on medical assistance met at Geneva in May. Their chairman was Dr. Konrich, of the Reichsgesundheitsamt of Berlin. There were nine experts present representing health services, public relief organisations, the medical profession, and rural health insurance institutions. After a careful study and a detailed

discussion, the experts prepared a report which was unanimously adopted and which you will find in the memorandum of the Preparatory Committee. It deals with staff, institutions and methods ; it shows the value of health insurance institutions in connection with free medical assistance ; it fixes the responsibility of the various organisations in respect of medical assistance and it quotes examples which fully illustrate the conclusions at which the experts arrived. This report will be the practical basis on which you will discuss medical assistance. It may be extended and amplified, but I am sure you will not disagree with its conclusions, which I trust you will regard as being the documentary basis for your discussions.

The report on the organisation of health services (second item on the agenda) was prepared by one of the Committees of the Health Organisation of the League of Nations, the Committee on Rural Health Centres, under the chairmanship of Professor Chodzko, member of the Health Committee and Director of the National School of Hygiene at Warsaw. This Committee held two meetings, one at Budapest and one at Geneva. Seventeen experts collaborated in the work of the Committee, and I am sure that, after studying its reports, the Conference will agree that the Committee has done its work well. For the first time, the guiding principles of modern health services in rural districts have been clearly laid down. This is an extremely difficult question, as in many countries the organisation of the health services is based on the general system of health administration and professional assistance, which is rooted in the traditions, customs and mentality of the nations concerned. Contrary to what might have been expected, instead of finding themselves divided in their opinions, the experts succeeded in laying down the principles applicable in all countries, the realisation of which will certainly improve the results achieved in the sphere of health. I am sure the Conference will agree that this is the most difficult question with which we have to deal, and I will ask the delegates to weigh most carefully the views of the experts who have done such arduous work on such a difficult question.

Finally, a group of experts on sanitation in rural districts met at Geneva under the chairmanship of M. Vignerot, Chief of Rural Engineering in France, to prepare a report on the disposal of sewage, water supply, housing and bonifications. This meeting was attended by thirteen experts from twelve different countries, and you have the results of their work before you in the report of the Preparatory Committee. They call for certain comments. Based as they are on recent experience in the most advanced European countries in connection with one or more aspects of sanitation in rural districts, they lay down the principles which might be applied by any Government or administration desirous of obtaining good results economically. We can scarcely overestimate the value of some of these principles from the point of view of human welfare in rural districts.

A good supply of drinking-water and good housing, or, in certain circumstances, the complete system of sanitation of the soil, which is called in Italy *bonifica*, will, if rendered general in the rural districts, make it possible to improve the standard of life and mitigate the ravages of disease.

After examining these various reports, the Preparatory Committee unanimously decided to adopt them and submit them to the Conference. For this reason, they are included in the printed document prepared by the Committee for your use. The principles and conclusions contained in this document represent the work of more than fifty experts in the various branches of hygiene, and the document is based on the study of some sixty reports on health and sanitary conditions in various European countries. However, these documents call for certain explanations and comments, and the Preparatory Committee therefore decided to ask the Rapporteurs to explain in rather more detail the conclusions of the experts.

In submitting these proposals, the Preparatory Committee did not desire to restrict

in any way the liberty of action of the members of the Conference. I beg to propose, on behalf of the Preparatory Committee, that, after taking note of its report, hearing the Rapporteurs and holding a general discussion in plenary meeting, the Conference should refer the detailed examination of each question on the agenda to a special committee or section.

Professor Parisot, of the University of Nancy, will be Rapporteur for medical assistance, the first item on the agenda ; and Dr. Stampar, of Yugoslavia, for the organisation of health services, the second item on the agenda. As the work of the social insurance organisations is connected with both these points, Dr. Karl Unger, Director of the National Union of Rural Health Insurance Institutions of Germany, has kindly consented to report to you on this aspect of the question. Professor Bürger, of the Prussian State Institute for the Hygiene of Water, Soil and Air, will discuss the conclusions of the experts on the disposal of sewage. M. J. M. Krul, Director of the National Bureau for Water Supply at The Hague, will report on water supply ; and Mr. Ross Hooper, of the British Ministry of Health, will speak on housing, and Dr. L. Bonamico on bonifications.

For obvious reasons, the examination of rural conditions and the technical means of improving them has, for the moment, been confined to Europe. In spite of the considerable differences which exist even between the various countries of Europe, and will always exist in view of climatic, agricultural and ethnological diversity, etc., it is safe to say that the type of agricultural life in the various countries can be made the subject of a general critical examination such as will allow us to lay down general rules and indications. It was difficult for the moment to apply this criterion to the other continents in which rural conditions are still widely different from those which characterise Western civilisation, with all its drawbacks and defects.

I am happy, nevertheless, to be able to say that many other countries in America, the Far East, Africa, etc., have sent qualified health experts and administrators who propose to follow the work of our Conference in the capacity of observers. This doubles our responsibility, as we shall not only have to give clear expression to the conclusions at which we arrive, for the benefit of our administrative departments and Governments, but must also bear in mind that the interest and attention of the whole world are concentrated on us and that our efforts are expected to yield the broad outlines of a programme capable of being carried out in the future, even in the countries farthest removed from us.

Ladies and gentlemen, the great honour done me by the Council of the League of Nations in appointing me President of this European Conference on Rural Hygiene has placed a heavy responsibility on my shoulders, of which I am sure I shall be able to acquit myself with your wise help.

I should like to point out that certain countries of Europe have reached a really high level in the matter of rural hygiene and agricultural conditions. But we must not aim too high. We must not listen to counsels of perfection during this Conference. I would, however, like to express the hope that the proposal made by the Government of that great agricultural country, Spain, the scope of which has been appreciated and extended by the Council of the League of Nations, which has identified itself with it and organised this Conference, will be eminently successful, under the inspiration of the historic industriousness and intense vitality of the admirable little country which is giving us hospitality and which supplies a microcosm of all the memories, traditions and hopes of our civilisation.

Vice-Presidents of the Conference.

The PRESIDENT, speaking on behalf of the Preparatory Committee, asked the Conference to proceed with the appointment of Vice-Presidents, and submitted the following names :

Professor KONRICH, of the *Reichsgesundheitsamt* ;
Professor LÉON BERNARD, President of the Superior Health Council of France ;
Senator DE MICHELIS, Italian Government Delegate on the Permanent Committee of the International Institute of Agriculture ;
Dr. CHODZKO, Director of the School of Hygiene, Warsaw ;
Dr. CARRIÈRE, Director of the Swiss Federal Health Service ;
His Excellency M. FIERLINGER, Permanent Delegate of Czechoslovakia accredited to the League of Nations.

M. DE MICHELIS thanked the President, but asked to be replaced by Dr. Lutrario, member of the Health Committee, who was, he thought, better qualified to collaborate with the other Vice-Presidents.

The PRESIDENT said that, if the Conference agreed, the request would be complied with.

The President's proposal, amended as requested by M. de Michelis, was approved.

Professor LÉON BERNARD said all the delegates proposed by the President were glad to accept the offices entrusted to them, particularly as under Professor Pittaluga's effective chairmanship their task would undoubtedly be a light one. It was nevertheless a great honour, and he felt he was speaking for all his colleagues in thanking the President.

They were equally grateful to the President for the valuable observations he had made regarding the purpose of the Conference. Among all the meetings held on the initiative or under the auspices of the League, none could better serve the moral interests entrusted to it and none was more in consonance with the special aim of the Health Organisation — to help to increase the well-being of the nations ; that explained the appropriateness of a member of the Health Committee of the League expressing his Government's desire that the present Conference should be convened. He was referring, of course, to their President, Professor Pittaluga, and it was a great pleasure to him, speaking on behalf of all his colleagues, to congratulate and thank the Spanish Government and the President — who was doubtless responsible for his Government's proposal — for the action they had taken, action in which they were all proud to participate. From his personal knowledge of the distinguished services the President had already rendered to the Health Organisation, Professor Bernard felt convinced that their proceedings would be conducted so as to achieve the maximum that could be expected in this particular connection. The President's services to his own country were equally distinguished and he was destined to render even more valuable services in the future now opening up before Spain.

In conclusion, he assured the President that he could reckon on their wholehearted support.

The PRESIDENT said he was deeply moved by Professor Bernard's speech. With their help, he hoped to be able to discharge the duties entrusted to him in the same spirit of devotion to a great ideal which inspired all the other members, and he was confident that the work would be accomplished without unduly swerving from their objective.

Appointment of a Credentials Committee.

The PRESIDENT asked the members to appoint a Credentials Committee, and, on behalf of the Preparatory Committee, suggested that the following should be appointed :

Dr. JITTA, President of the Health Council of the Netherlands (Chairman);
M. GYLLENBOGEL, Permanent Delegate of Finland accredited to the League of Nations ;

M. SORENSEN, Director of the Municipal Water Service, Copenhagen.

Agreed.

Organisation of the Conference.

CONSTITUTION OF THREE COMMITTEES.

The PRESIDENT said that, after a general discussion lasting perhaps two or three days, the Conference would no doubt split up into three Committees, each of which would deal with one of the points on the agenda — namely :

Medical assistance in rural districts ;

Health services in rural districts ;

The sanitation of rural districts.

Each delegation would appoint its representative or representatives to each of these Committees, taking into account the desire of the various members to contribute to the solution of these three questions, and their special qualifications.

Each of the Committees would appoint its own chairman. For the moment, the President ventured to nominate three members of the Bureau, who would preside provisionally over the Committees — namely :

Professor LÉON BERNARD, for the First Committee ;

Dr. CHODZKO, for the Second Committee ;

Dr. CARRIÈRE, for the Third Committee.

The Committees would also have to set up their respective bureaux and decide on their rules and other questions of procedure.

RULES OF PROCEDURE OF THE CONFERENCE.

The PRESIDENT said that the Preparatory Committee, in accordance with the precedents mentioned in the opinion obtained from the Legal Section of the Secretariat, decided to propose that the Conference should apply, in general, the Rules of Procedure of the Assembly of the League of Nations, with the exception of the provisions mentioned below.

The majority required for decisions should consist of at least two-thirds of the votes of the delegations present at the time of voting, each delegation having one vote.

The President of the Conference, the Vice-Presidents and the Chairmen of the three Committees would form the bureau of the Conference.

The bureau of the Conference could admit to the meetings of the Committees the representatives of private international associations concerned with rural health organisation who applied for admission. These representatives could, on their application, be heard by the Committees, subject to the consent of the Chairman of the Committee. Three of these international associations had already made an application in this sense, and the Preparatory Committee considered that it was voicing the opinion of the Conference in inviting them to take part in the meetings of the Committees. These associations were the League of Red Cross Societies, the International Professional Association of Medical Practitioners and the Conference of National Unions of Mutual Benefit Societies and Health Insurance Funds.

Apart from the above questions, for which the Committee considered it advisable to give definite indications, all other questions of procedure would be settled in accordance with the Rules of Procedure of the Assembly.

In reply to a question whether the three organisations mentioned had been invited to the Conference, or whether their application was spontaneous, the President explained that these three organisations requested the Preparatory Committee to admit them to the Conference. After full discussion the Preparatory Committee was of opinion that they should be admitted so that their representatives might be heard by the Committees, subject to the consent of the Chairman of the Committee concerned.

M. BILBAO (International Institute of Agriculture) asked whether the representatives of international organisations, such as the International Institute of Agriculture, which had been invited to the Conference would take part only as observers or whether they could take part in the discussions either in the Committees or in the plenary meetings.

Dr. RAJCHMAN (Medical Director) explained that there was an essential difference between the representation at the Conference of the two great international institutions — namely, the International Labour Office and the International Institute of Agriculture, on the one hand, and that of the voluntary organisations, on the other hand. As the President had explained, a request would have to be addressed in the first place by the latter organisations to the President; this had been done by the three organisations mentioned by the President. This application, to which the Conference would no doubt agree, would be transmitted to the Committee to which the representatives of the organisation in question wished to make a statement.

The two great international institutions were represented in the Preparatory Committee, all the members of which should, in accordance with the Council's resolution, be at the disposal of the Conference itself. Consequently, the representatives of the International Labour Office and of the International Institute of Agriculture were entitled to take part in all the discussions like any other member of the Conference.

The President's proposals regarding the Rules of Procedure were adopted.

VARIOUS ARRANGEMENTS.

The PRESIDENT said that the general discussion with which the Conference would begin would naturally be based, in particular, on the experts' reports, and that the Rapporteurs were prepared to give any additional information which might be necessary.

The Preparatory Committee had decided that a daily bulletin should be distributed to the members of the Conference, containing the programme and agenda for each day and a summary of the questions already dealt with, so that the members of the Conference might be kept informed of the progress of its work.

Dr. LUTRARIO asked in what order the three questions on the agenda would be dealt with in the general discussion.

The PRESIDENT replied that the delegations would be quite free to discuss these three subjects in the manner they thought fit. Possibly at the second meeting the discussion might be more clearly defined and it might be possible to fix a more definite agenda for the following meetings. It should be remembered that the preparatory work already accomplished might not coincide with the opinions of the various delegations, who must therefore be allowed to express themselves freely and to state the results of their own experience or the experience gained in their countries.

SECOND MEETING (JUNE 30TH, 10 A.M.)

Bureau of the Conference. — Opening of the General Discussion on the First Item on the Agenda (Medical Assistance) : Statement by the Rapporteur, Professor Parisot ; Statement by M. Unger on the Relations between Health Insurance and Rural Hygiene.

President : Professor G. PITTALUGA.

Bureau of the Conference.

The PRESIDENT stated that the Bureau of the Conference had been constituted. It consisted of the six Vice-Presidents of the Conference elected at the first meeting, and the Chairmen elected by the three Committees — viz., the First Committee (Medical Assistance), Dr. Alexander SHEARER, Medical Officer, Department of Health for Scotland ; the Second Committee (Organisation of the Rural Health Services), Dr. Bela JOHAN, Director of the Institute of Hygiene, Budapest ; the Third Committee (Sanitation), M. VIGNEROT, Chief of Rural Engineering, France.

He further stated that these three Committees had elected Vice-Chairmen — viz., the First Committee, Dr. Assim ISMAIL, Director-General of Health, Turkey ; the Second Committee, M. A. PALLIS, Secretary-General of the Ministry of Health, Athens ; the Third Committee, M. Milivoj PETRIK, Chief Sanitary Engineer, School of Hygiene, Zagreb.

Credentials Committee.

The PRESIDENT stated that this Committee, which had been elected at the first meeting of the Conference, had not yet finished the verification of credentials. It would report to the Conference later.

General Discussion.

The PRESIDENT requested any delegates wishing to make statements in the general discussion to send in their names and the subject of the statements. Naturally, this only referred to prepared statements, and any other delegates wishing to take part in the discussion could do so without previous notification.

He called upon Professor Parisot, the Rapporteur on Medical Assistance, to give his views on the first point of the agenda and on the discussions on this subject which had taken place in the Committee of Experts.

Professor PARISOT (France), in referring to the title of his report, " Guiding Principles and Suitable Methods for ensuring Effective Medical Assistance in Rural Districts ", said it was necessary to define, in the first place, what was meant by " effective medical assistance ".

Formerly, this expression implied almost exclusively relief of the sick ; but, with the progress of medical science, it had come to include more and more the prevention of disease and the methods of detecting the first symptoms of disease. He thought medical assistance should be regarded in its broadest sense as representing a medical service placing at the disposal of the people all the facilities of modern medicine, in order to promote and protect health, and to diagnose and treat disease from the beginning. He referred to the necessity of health supervision by means of periodical examinations of persons of

all ages. While this method was not yet sufficiently used, its undoubted advantages were demonstrated by health insurance institutions, particularly in the United States, Germany and Switzerland. French health insurance institutions were also endeavouring to apply this system. The realisation of a system of medical assistance complying with these requirements necessitated the existence of essential elements whose importance and value should be proportionate to the progress of medical science.

Such a conception of medical assistance did not apply exclusively to rural districts, but should, in general, guide the application of all public health protection for the entire population and should be adapted to the local conditions of different rural districts.

In his report, he had considered the general principles governing this system and had dealt with (1) personnel, (2) health equipment and (3) the measures applying to the people. With regard to the third point, he emphasised the importance of training the population to understand the benefits of medical assistance, not only as a means of treating illness, but as a preventive measure.

He attached special importance to the co-ordination of the various efforts for bringing such a system into effect. Medical assistance should also be co-ordinated with other parts of the public health system, and should take its place in its proper relationship to the various elements making up the whole. Only in that way would the most effective result be obtained.

The personnel should include doctors, pharmacists, nurses and midwives. Of these, the most important were the doctors, of whom there should be a sufficient number, and who should possess adequate qualifications. It was impossible to decide in theory how many doctors there should be in proportion to the population. Local conditions varied greatly in different districts. The experts had, however, stated that 2,000 was the maximum number of persons who could be given proper medical attention by one medical practitioner. With the growth of the health services and the needs of the people, this number might be reduced to 1,000. These figures represented only general ideas and would have to be adapted to local conditions. If the health services were inadequate and there was an abnormally high sickness rate, a greater number of doctors would be required. On the other hand in districts where health organisations were well developed and where educational work had increased the popularity of individual methods of prophylaxis (vaccinations, etc.), more work would be thrown on the medical practitioners.

It might appear unnecessary to refer to the professional qualifications of doctors ; but it was a fact that, if there was to be effective and fruitful co-operation with the health services, the practitioners must have an exact idea of the part they were called on to play in the general scheme. In the case of young doctors, the value of preventive work was inculcated in their university training. The position was very different with the older doctors, whose isolation in rural districts prevented them from keeping abreast of medical progress. But there were methods such as wireless lectures, " medical days " held in university and hospital centres, etc., by which they could add to their knowledge and be kept informed of new scientific developments. He would not go into details of those methods. The Conference held at Dresden in July 1930 had given many useful indications regarding the training in hygiene of medical students, and the supplementary training of practitioners.

In addition to general practitioners, specialists were also required for diseases of the ear, nose, throat, eyes, etc. Naturally, such specialists could not be permanently established in rural districts, but it would be possible for them to visit such districts periodically and give consultations. It was also essential to establish close co-operation between the specialist and the local doctor, so that the latter could bring his patients for specialist examination and be enabled to treat them in the manner prescribed by the specialist.

The question of pharmacists was not mentioned in the experts' report. Nevertheless, Professor Parisot thought this question should be taken into consideration. In spite of improved communications in rural districts, he thought pharmacists should be sufficiently numerous so that drugs might be readily obtainable and prescriptions quickly made up.

The methods used in some countries might be imitated — e.g., the *Farmacista Condotta* in Italy and the *Propharmacist* in France. It was advisable to have emergency depots of drugs, and particularly sera, in rural districts. They could be kept, not only at the doctors' homes, but also in health centres, hospitals, dispensaries, etc. Naturally, all precautions should be taken for the preservation and employment of such preparations, particularly those which were poisonous.

The question of veterinary surgeons was also not mentioned in the experts' report. Professor Parisot regarded this question as of special importance in view of the possible transmission of diseases from animals to human beings. In the struggle against disease, there must be close co-operation between all who were working for the same aim.

It had been agreed that medical assistance also called for a qualified auxiliary personnel consisting of nurses and midwives. The nurses were divided into two categories, i.e., health visitors, with whom Dr. Stampar had dealt in his report on the local health organisation, and trained nurses. The experts had arrived at the conclusion that there should be one or more nurses in proportion to the population served by one doctor.

With regard to midwives, Professor Parisot considered that their co-operation was indispensable in the rural districts and that they should be duly qualified and authorised in accordance with the law of the State in which then practice. It was impossible to fix their number, but they must be in proportion to the population and to the local birth rate. The number should, however, be sufficient to provide obstetrical care in rural districts, particularly for indigent women. In many countries, such as Spain, Italy, Germany and France, the midwife was employed by the commune. Professor Parisot considered this a good practice, as it guaranteed her a minimum salary.

The question arose whether, as in England, it was possible to combine the work of midwives and nurses. This system had the advantage of ensuring adequate compensation for midwives, while increasing the limited number of nurses. The Budapest Conference was opposed to such a broad conception of the assistance of midwives. On the other hand, it might be wise to entrust to midwives certain clearly defined and limited tasks for which they were adapted, such as assisting at pre-natal consultations and supervising the newborn, for which work they would be paid by the health services. Such work could only be assigned to them on the condition that it be carried out in close co-operation with the visiting nurses of the areas and that their general and technical training had been adequate.

With regard to the less qualified temporary personnel, Professor Parisot considered that, even in the smallest rural settlements — for instance, in isolated or mountain villages there should be a person capable of giving first aid and of carrying out the doctor's orders. In various countries, useful assistance had been given by persons who had taken short courses, such as stretcher-bearers, Red Cross students, etc. Moreover, the increasing development of first-aid posts (in telephonic communication with a medical centre) might render useful service, especially in the case of motor-car accidents.

Having thus dealt with the staff required for effective medical assistance, Professor Parisot turned to the question of sanitary equipment. As medical assistance had both a preventive and a curative aim, its sanitary equipment should suffice for both purposes by means of special establishments for prevention, hospitalisation and treatment.

Centres of diagnosis and prevention existed in almost all European countries. They were no doubt more numerous in the towns than in rural districts and took the form of dispensaries, which were either specialised — that was to say, dealing with a single subject, such as maternal and infant welfare, tuberculosis, venereal disease, cancer, etc. —

or were generalised and covered several of these subjects. The Budapest Conference considered that the centre with multiple work, combined and co-ordinated with other health work, was the type best adapted to rural districts. As this type was described in Dr. Stampar's report, Professor Parisot did not go into details. His object was to ascertain how such centres should co-operate with the local practitioner and what was their special rôle as a factor in medical assistance. Such a centre established by the health authorities should be a centre for examination and diagnosis; it should be well equipped — for instance, with X-rays and should be staffed with a specialised medical personnel. It should work in close co-operation with the medical practitioner. This co-operation, which was of advantage to the patient, the health service and the doctor, should be established in such a way as to keep the doctor regularly informed concerning the treatment of his patient by the specialist attached to the centre.

The question arose whether such a centre of diagnosis should also give medical treatment. In some countries, all necessary specialised treatment was given; in Germany, this was not the case; in France, the centre of diagnosis restricted the treatment to venereal and certain other diseases which presented difficulties for the medical practitioner. Under such circumstances, it was impossible to generalise, and arrangements should be made which would take account of exceptional local conditions. Professor Parisot personally thought that, in view of the difficulty of attracting specialists to rural districts, means should be found of providing a suitable living for the doctors. The health centres should treat the indigent population and utilise the local doctors in infant welfare work, school hygiene, pre-natal consultations, etc. This would call for supplementary theoretical and practical training for the medical practitioner in order to qualify for this work. He would thus become one of the elements of the local health organisation and would be remunerated for the special work entrusted to him. Moreover, by this co-operation he would learn more readily the medical and social value of the organisation in whose work he was participating, and would establish closer relations with the specialists attached to the health service.

In addition to the centres of diagnosis and prevention, there should also be centres for hospitalisation and treatment. Rural medical assistance implied the existence of hospital facilities in properly equipped establishments. The experts had come to the conclusion that a hospital was necessary for a population of from 20,000 to 30,000, that there should be about two beds per 1,000 people and that hospitals with less than about fifty beds were too small to operate satisfactorily and economically. In the case of isolated rural districts without rapid means of communication, the health centre might have a small number of beds, as was the case in Yugoslavia.

Rural hospitals should be general hospitals. As a temporary measure, they might possess specialist services, but the final aim was to centralise the special services in such a way as to serve a whole region.

This question was closely connected with the development of rapid communications.

The third element in health equipment was the laboratory. It had been found that modern medicine required the use of laboratories to an ever-increasing extent in order to confirm the diagnosis and to obtain guidance for the treatment. Laboratories were also of value in assisting the rapid application of prophylactic measures and aiding in general in the development of hygiene and preventive medicine. While simple analyses could be carried out at the rural centres described above, the more complete analyses should be carried out in larger, well-equipped laboratories, which might be either private or official. In any case, they should be subject to official supervision. The existence of a well-equipped central laboratory or institute of hygiene was of undoubted value, as it could carry out, free of charge or at very low rates, the analyses necessary for the poorer classes, who would thus gain the advantage of a proper diagnosis.

For practical purposes it was necessary to organise the work in such a way as to place the necessary specimen containers at the disposal of doctors in the rural districts, to provide for the rapid transport of specimens to the laboratory, and to submit reports on the analyses as quickly as possible. Such a system already existed in many countries.

In addition to establishing such a service, the doctors must also be given the necessary instruction as to the technique of taking suitable specimens, the conditions in which laboratory assistance should be sought, the information they might hope to obtain and the conclusions which they might draw. All these were important factors which would permit the use of laboratories and contribute to the proper development of co-operation between laboratories and rural medical assistance.

Professor Parisot then came to the third part of his report dealing with measures relating to the living conditions of the people. If preventive and curative medical assistance were to be fruitful, it was essential that the people for whom it was established should seek its benefits. They would do this in proportion to their understanding and appreciation of its value. Here, again, co-operation must be sought—namely, that of the rural population itself, despite their general level of education, their isolation and their indifference to matters not directly concerned with their work, which frequently constituted obstacles to their understanding of the most elementary ideas of hygiene. For this purpose a programme of education and propaganda adapted to rural conditions should be applied. For instance, carefully selected members of the population might be given special training, as was done at the schools of hygiene at Zagreb, Warsaw, etc. On returning to their rural districts these persons would themselves become propagandists in respect of disease prevention.

However, the results of preventive and curative medicine might easily be sterile or very restricted were they not supported and supplemented by all general health measures, sanitation and bonifications directed towards the improvement of the living and working conditions of the people. For instance, the campaign against tuberculosis would be ineffective if it only consisted in locating cases and taking preventive measures, while no steps were taken to improve housing conditions and to get rid of rural slums. This brought Professor Parisot to a subject which, strictly speaking, came within the sphere of other rapporteurs. He only mentioned it in order to demonstrate the necessity for that close co-ordination and mutual support which should characterise the various measures of health protection, if the object of each was to be attained.

Professor Parisot then came to the second part of his report dealing with the principles governing the organisation. He had traced the various factors which entered into the organisation of rural medical assistance. It was now necessary to consider how those factors should be brought together—*i.e.*, what principles should govern the organisation and completion of the service and what practical methods and means would make such a service possible. Such an organisation should be considered from different points of view, depending on whether it was established in a new district or whether certain of its elements already existed and had to be merely improved and adapted in accordance with the principles previously laid down. In the first place, therefore, it was necessary to study local conditions as regards : (a) the situation of the area, its size, means of communication, situation and population of settlements, etc. ; (b) health and medical requirements, sanitary conditions, epidemiology, etc ; (c) existing resources in respect of personnel and equipment, not only in the district under consideration, but in the entire administrative unit.

When this preparatory work had been done, it would be possible to secure a general idea of the task. The provision of effective medical assistance in rural districts demanded the co-operation of the public health and welfare authorities, the medical profession, health insurance institutions, associations such as agricultural co-operative societies, etc., and private institutions.

The public authorities, by means of a rational organisation of the health services with an adequate specialised staff, should attempt to develop and maintain the preventive aspects of medical assistance. They should stimulate and co-ordinate the efforts of the institutions and groups concerned with medical assistance and should try to remedy deficiencies. In their efforts towards the creation of a health system or the improvement of a poorly equipped system they should aim at encouraging local initiative and supporting it by subsidies.

Professor Parisot paid a tribute to the assistance given by the health insurance institutions, and thought that co-operation with those bodies should be increased.

One of the main difficulties was the provision of a sufficient number of doctors in the rural districts, and a question arose as to how medical practitioners could be encouraged to settle in such districts. In some countries the doctor was an official. This had the advantage of providing him with a salary. The system was not practicable in all countries, and he thought a solution might be found which would satisfy the requirements of a complete organisation for the promotion of public health. Doctors should be offered advantages, such as free dwellings, transport facilities, etc., in rural districts. They should be assured of an immediate revenue proportionate to the cost of living, thus enabling them gradually to develop a practice among the well-to-do classes in the district. In Italy, the *medico condotto* was apparently in a fairly good position when the various fees and other revenue were taken into consideration. In France, public assistance was similarly organised, although it worked by different methods.

Finally, the compensation received by the medical practitioner was an advantage which, together with those offered by the commune and associations and particularly by health insurance institutions, might cause him to settle in districts which hitherto had not attracted doctors.

In short, Professor Parisot thought that, through the co-operation of all those interested in the development of the health services of a given district, it was possible to encourage doctors to establish themselves in localities where there were none. When the co-operation of the medical societies with the health organisations was effective, the former might be instrumental in advising and directing young practitioners to posts offered to them in such districts.

Professor Parisot attached great importance to co-ordination in the efforts of the various sections of rural health work. He considered it better to have perfect co-ordination, even if some of the elements were lacking, than to have perfect elements working independently of each other. By means of co-operation, he thought it possible to organise the effective promotion of the health of rural populations.

The PRESIDENT felt that all present would wish him to thank Professor Parisot for his clear and accurate report and the valuable comments accompanying it. He would now call on M. Karl Unger, Director of the National Union of Rural Health Insurance Institutions of Germany, to address the Conference.

M. UNGER (Germany) said his report on the relations between health insurance and rural hygiene fell into three sections. The first dealt with the aims and objects of rural health insurance institutions, which were to maintain health, prevent disease, and restore the working capacity of the insured. The second explained the part played by health insurance in the organisation of a rural health service. Without in any way encroaching on the work of public health services, sickness insurance institutions could, and did, do valuable work in diagnosing ailments and preventing the development of disease. The third section described the co-operation between rural health insurance institutions and rural health services, the best guarantee, he thought, for the welfare of the rural population.

The purpose of social insurance institutions was to safeguard health, the most valuable asset a nation had, by concentrating and making the best possible use of the contributions paid by individuals on the principle of "all for each and each for all". As the International Labour Office's report had emphasised, health insurance funds were institutions for safeguarding those whose health was most endangered, based on the principles of mutual help and enjoying considerable independence. The function of the State was merely to exercise supervision. Initially, the aim pursued was to compensate members in cash for wages lost through sickness; but, recently, the tendency had been to give increasing prominence to benefits in kind. Originally, also, sickness insurance had applied mainly to industrial workers, the assumption being that agricultural labourers, from the circumstances of their employment, were less in need of insurance benefits. It was speedily realised, however, that living conditions on the land were by no means ideal, that agriculture was becoming more and more mechanised, and that the former patriarchal relations between employer and labourer were gradually disappearing. Health insurance, therefore, had to be extended to cover rural workers, and had helped considerably in stemming the flight from the land. There were now five to six million agricultural labourers in Europe compulsorily insured against sickness, exclusive of those who had voluntarily joined the insurance institutions.

According to the International Labour Office report (contained in document C.H. 1045) agricultural labourers had to be insured against sickness in the following countries :

Austria	France	Netherlands
Bulgaria	Germany	Norway
Czechoslovakia	Irish Free State	United Kingdom,

while in Poland, Roumania and Russia insurance was compulsory only for certain categories of agricultural labourers.

After describing the basic conditions under which rural labourers were liable to compulsory insurance, M. Unger stressed the way in which benefits were extended to the members of workers' families. The effect was to bring a very large proportion of the rural population under medical supervision, thus procuring them the advantages of timely diagnosis and prophylactic treatment and the possibility of effective recovery. The benefits extended consisted mainly of cash payments in lieu of the wages lost and medical services. The latter were given free of charge by fully qualified doctors and specialists; in addition, medicine was supplied and members could claim hospital treatment and the services of midwives. Women wage-earners, moreover, were also entitled to money benefits during and after confinement.

Health insurance societies had always considered the organisation of adequately equipped rural health services as one of their primary obligations, and had accordingly arranged for their members to obtain medical advice free of charge either at the doctor's consulting room or in their own homes. Where necessary, members could also have hospital treatment and be admitted to convalescent homes in order to restore their normal working capacity. In the International Labour Office report already mentioned, figures were given of the expenditure of rural health insurance funds in Czechoslovakia which demonstrated his point regarding the predominating part played by benefits in kind nowadays. It appeared that, on an average, members of those funds drew 70 Kr. in doctors' fees, 34 Kr. in medicine and 64 Kr. in hospital treatment—*i.e.*, 168 Kr. in benefits in kind—as against actual cash benefits of 110 Kr. It would be realised that the extent and variety of these activities of health insurance funds implied better prospects of employment for country doctors. The report of Dr. Miemietz (document C.H. 965), as well as his own report to the Committee of Experts, mentioned this as one of the gratifying consequences of the growth of rural health insurance. As regards the specific proportion of

doctors to population, he would refer them to the finding of the experts as given in document C.H. 1045, page 10, paragraph 2.

Health insurance funds further provided for specialist assistance, dental treatment, X-ray examinations and laboratory analyses of all kinds. Hospital treatment, in particular, was highly appreciated, in view of the inadequate housing accommodation usual in country districts, the considerable distances to be covered by the doctor, and the risk of infection incurred in the case of home treatment. In Germany, for example, rural health insurance funds expended on hospital treatment 22.1 per cent of their total outlay. In this connection, he wished to stress the necessity for a system of motor transport for the insured population. Latterly, insurance funds had acquired their own motor ambulances, etc., for the use of members in case of accidents and emergencies, and these means of locomotion were equally at the service of the uninsured population. Mention should also be made of the practice of contracting with the relevant institutions for members of health insurance funds to be given special treatment for tuberculosis, rheumatism, etc. The report referred to auxiliary personnel. It was therefore unnecessary for him to dwell further on the services of such personnel, which was also a feature of the organisation of health insurance institutions:

M. Unger was particularly grateful for the opportunity of emphasising the great importance of co-operation between rural health insurance associations and public health services. Evidence of such co-operation could be seen in the willingness of the associations to make advances from their reserve funds for the construction of hygienic dwellings for labourers. Furthermore, common action was being taken to combat insanitary practices and to enlighten the rural population on the dangers of superstition and fanaticism. The fact that health insurance associations only employed doctors who were fully qualified and held State diplomas was convincing evidence of their attitude on those questions, and he would be very glad if the representatives of the medical profession present would confirm that fact. There was co-operation also between insurance associations and public health services in issuing pamphlets, displaying films and organising permanent or travelling health exhibitions. Such propaganda work was as necessary among independent peasants or agricultural employers as among labourers. He need only instance the regrettable fact that infant mortality rates in rural districts had not fallen to the same degree as in towns to prove that close co-operation in such educational work was extremely necessary if the indifference to hygiene so common in rural districts was to be overcome. Similarly, co-operation between doctors and private agencies was essential to combat tuberculosis, venereal diseases, cancer and alcoholic addiction. It should be remembered that a nation's capital resources were drawn from the land and there were serious risks involved in neglecting the rural population. Anything that served to maintain this source of national health and wealth would be well worth the effort expended.

In conclusion, he thought that the presence of health insurance fund representatives from various countries at the Conference was the best proof of their determination to co-operate in promoting the cause of rural hygiene.

THIRD MEETING (JUNE 30TH, 3.30 P.M.)

Continuation of the Discussion on the First Item (Medical Assistance) : Speeches by M. Andronesco (Roumania), Dr. Jitta (Netherlands), M. Garcia Tornel (Spain), M. Prohaska (Yugoslavia), M. Santiago (Spain), Dr. Pelc (Czechoslovakia), Dr. Lutrario (Italy) ; Replies by Dr. Unger (Germany) and Professor Parisot (France).

President : Professor G. PITTALUGA.

Continuation of the Discussion on the Reports by Professor Parisot and Dr. Unger (First Question on the Agenda).

M. ANDRONESCO (Roumania) wished to submit, in connection with Professor Parisot's report, a suggestion relating to the rural health organisation. He thought it might be desirable to request the clergy to take an active part in supervising the health conditions in which the rural populations lived ; formerly, the priests exercised constant and effective action in this sense.

He thought it would be useful to organise local associations uniting all the medical personnel of the district or locality under the direction of the doctor, in order to supervise the practical fulfilment of suggestions such as those made by Professor Parisot.

Dr. JITTA (Netherlands) thought it advisable to communicate to the Conference some information on the special position of rural hygiene in Holland ; conditions varied in different countries in accordance with their size and their communications, etc. The small area of Holland made it possible to transport sick persons and the medical personnel without difficulty.

He thought it would be difficult to distinguish between the treatment of sick persons and the problems of prevention and rural hygiene. In any case, a great number of conferences such as the present one would have to be held in order to eliminate a great number of diseases by preventive means. Until that time, it might be necessary to deal separately with the question of the treatment to be given to sick persons.

He would not waste time in fixing the number of persons who might be under the care of one doctor. Professor Parisot had recognised that it was at present impossible to settle this question, as the number was affected by too many different conditions.

One of the most important problems of rural hygiene was the training of young doctors as health officers. In Holland, where the technical studies were especially long, the doctors were anxious to begin their career as soon as their diplomas entitled them to do so. It was nevertheless necessary to give them adequate instruction in social and preventive medicine. Holland had not a model organisation in this respect, but in various universities there were optional courses which were fairly well attended and institutions for preventive medicine whose work in this respect was valuable.

Dr. Jitta agreed with Professor Parisot and with the Committee of Experts on the necessity of separating the work of midwives from that of nurses. The former had very irregular work which made it impossible for them to give constant attention to patients of various categories ; moreover, there was a danger that midwives nursing other patients might infect women lying-in, and this made it impossible to entrust nursing work to midwives.

As the distances between the various places in Holland were short, it was almost always possible for patients to consult competent specialists. The dentists made frequent visits to the country districts in the Netherlands; their work would be more effective if the rural population fully appreciated the value of dental treatment. Active propaganda was necessary in that connection.

Rural nurses should receive special training. In Holland, they first had the compulsory training common to all nurses in the hospitals, and afterwards special courses for rural visitors and lessons relating to mental diseases.

Dr. Jitta pointed out the danger of having recourse to voluntary assistance for the treatment of patients. Although such measures could only be exceptional and temporary, it was inadvisable that sick persons should be treated by persons not possessing sufficient experience. The case was different in respect of first aid. In Holland, there were courses for persons wishing to have elementary training in dressing wounds, transporting the sick and injured, etc. But these persons should be given refresher courses; a preparatory course alone was insufficient.

The Netherlands delegate gave additional information on the laws in force in his country. A recent law on infectious diseases compelled each commune or group of neighbouring communes to provide special buildings reserved for infectious cases or for cases which required immediate attention and had to be isolated. This law had only been in force for five years, so that all the communes had not yet installed the necessary premises. Their activity was regularly supervised by official inspectors, who had to inspect the premises provided for the patients.

Under another law, the communes were obliged to disinfect whenever necessary. The State made them special grants for this purpose.

Health insurance was a recent measure in Holland. Employers' organisations and health insurance institutions had to create two funds, to which contributions were, for the most part, made by the employers. It was provided that the first of these funds, which was used for prophylactic measures, should amount to 7 million gold francs; the second, which was to amount to 12 million gold francs, would be used for the treatment of the insured persons. On account of the financial crisis, these funds were not yet complete, but they would shortly be so.

In Holland, there were several associations known as "Crosses" for giving assistance to sick persons. Dr. Jitta had had occasion to show these institutions to some of the members of that Conference who had visited Holland. The "Crosses" of various colours worked in harmony and supplemented each other. The principal ones — the "Green Cross" and the "White and Yellow Cross" — maintained especially competent nurses throughout the country. They worked in consultation centres for persons affected with tuberculosis, for children, etc., and kept stores of materials to be used for treating sick persons. All sick persons in Holland could have recourse to these voluntary organisations.

M. Garcia TORNEL (Spain) attached special importance to the question of rural health centres. He was in entire agreement with Professor Parisot as to the necessity of protecting the legitimate interests of rural practitioners. He therefore thought those centres should only give a diagnosis and an indication of the treatment, and should work in connection with the local doctors. They should only apply treatment requiring special equipment which the doctors were unable to give, as in the case of pneumothorax.

He thought the agreement to be adopted on this question by the Conference would be very far-reaching.

The part played by the rural pharmacists was important enough to consider granting them special housing allowances, as was done in Catalonia.

He communicated to the members of the Conference the scheme of the Barcelona

Health Organisation, which he had helped to establish as Health Adviser and which was in entire agreement with the ideas expressed in Professor Parisot's report.

M. VERMAIRE (Luxemburg) read a memorandum on rural hygiene in Luxemburg. The conditions of rural hygiene in that country were satisfactory. The small area of the country, its uneven surface, which was very suitable for building, the small number of farms, and the division of the properties into small plots resulted in the houses being mostly spacious and clean and separated from the out-houses. Conditions had changed from former times, when every village contained a number of landless people who were badly housed and led a miserable existence. Industry had recently absorbed this surplus labour, and the rural population now enjoyed a satisfactory standard of life. Moreover, the use of agricultural machinery had greatly reduced the strain of the labourers. Electrification had become general and had brought a certain amount of comfort to the most distant hamlets. Great efforts had been made to supply the population with drinking-water. Before the war, there were two collective associations for the inter-communal supply of water in the south and in the north. Practically speaking, the entire country had an abundant supply of drinking-water. Consequently, epidemics due to water had entirely disappeared.

General sanitation was promoted by means of financial help from the State in all health work.

Under the recent law on agricultural improvements, long-term loans were granted at a low rate of interest ; while, under the law on cheap dwellings, the State granted advances on favourable conditions to persons wishing to build houses.

The rural medical service was in the hands of local doctors, of whom there was a sufficient number. There was no special legislation on the subject, but State doctors pointed out any deficiencies in the service.

A great part of the population was insured with the Health Insurance Fund, and the communes, with the help of the local doctors, provided for assistance to the needy population ; in addition, there was a central hospital.

The work of the Luxemburg Red Cross was specially devoted to prevention ; in addition, there were anti-cancer and anti-tuberculosis leagues and associations for mental prophylaxis, etc., whose work had already given appreciable results.

Lastly, the State took on itself all expenses for the treatment of contagious venereal diseases in the case of indigent persons, and even patients of modest means.

M. PROHASKA (Yugoslavia) thanked the Conference on behalf of the Yugoslav health co-operative societies, who followed its work with great interest and expected to receive great encouragement in their co-operative work.

After hearing the report by Professor Laur at the Prague Congress, M. Prohaska had been able to appreciate the active part played by the Swiss co-operative societies in the agricultural development of the country.

In Yugoslavia, the agricultural co-operative societies were the most active agricultural organisations even in the restricted pre-war territory of the country. Their founder, M. Kojitch, had conceived the idea of entrusting them with the task of improving the health conditions in which the rural population lived, and before his death he entrusted M. Prohaska with the realisation of this work.

This idea was particularly suitable, as the Yugoslav peasants were more apt to take an interest in institutions of an economic character than in purely intellectual propaganda. The co-operative system of rural hygiene, with the assistance of the American Child Welfare Association, had yielded very satisfactory results. A pamphlet published by the Yugoslav health co-operative societies would be distributed to the members of the Conference.

There was one remark in Professor Parisot's report with which M. Prohaska fully agreed. Professor Parisot urged the necessity of the greatest possible co-ordination in the rural health services and of the close co-operation of the population ; the sympathy of that population in health work must be aroused.

It was with this object that the Yugoslav health co-operative societies regarded it as their duty to lead the rural population to a better understanding of health work, and thereby to altruistic and idealistic views. The health co-operative societies might be called the elect of the Yugoslav co-operative societies.

Professor Parisot had stated in his report that there should be a sufficient number of doctors, and that their professional qualifications should be adequate. The co-operative societies had fulfilled these two conditions even in isolated, mountainous and poor districts, where the task was a difficult one. They had succeeded because they had their own doctors chosen from amongst the best qualified. The members of the co-operative societies and the local committees ensured a further selection. The health co-operative societies had also organised a veterinary section whose work was of great interest to the peasants, as it placed at their disposal, at small cost, the assistance of qualified veterinary surgeons ; this was a further reason for their interest in the health co-operative societies.

The co-operative societies had also organised rural centres, including a dispensary with a few beds and the doctor's dwelling, even in isolated villages with poor communications. By means of these centres, the rural population obtained treatment which was formerly inaccessible to them on account of their great distance from the towns.

The greatest advantage of this organisation was that the Yugoslav peasant was economically interested in the prosperity of the co-operative societies. He paid a contribution and undertook a part of the responsibility equal to ten times that contribution ; if the co-operative society failed in its work, he had to pay a considerable sum. This remark also applied to the health insurance organisation of the co-operative societies ; the peasants had a double interest in its proper working — namely, as co-operators and as insured persons. About twenty health co-operative societies in Yugoslavia had applied a system of health insurance.

The conclusion that might be drawn from the work of the health co-operative societies was that the Yugoslav rural population had at their disposal the necessary medical staff and nurses required to ensure, as effectively as possible, the maintenance of hygiene in country districts.

M. SANTIAGO (Spain) wished to state the views of the Spanish working class. Professor Parisot's report dealt rather too summarily, he thought, with social insurance — which was all the more regrettable, inasmuch as France could now give them the benefit of her experience in this matter as well as in that of friendly societies. The only system which could secure medical assistance for agricultural workers in rural districts was that which operated through the medium of friendly societies. He had been gratified by the stress laid in the German delegate's speech on the value of such societies in Germany and the part they played in rural hygiene. Since its emancipation, Spain was taking steps to introduce health insurance and unemployment and accident insurance. Quite recently, a bill promoted by the Council of Labour, upon which he had collaborated, brought agricultural workers under the law on accidents, and it had been resolved to organise such insurance through the societies. Employers were obliged to join a society in order that workers who had met with accidents could be given competent and scientific treatment. The growth of friendly societies should be encouraged and they should be created in countries where they did not yet exist.

Professor Parisot had also mentioned the attention required by children, pregnant women and workers suffering from tuberculosis, but seemed rather to have overlooked

aged persons exhausted by a lifetime of labour who were sick and bereft of resources and relations. He would like, in this connection, to commend the action of the Prague municipality in founding an institution for the aged sick and indigent above 50 or 60 years of age, where they could end their days in peace. He ventured to hope that the Conference would bear this question in mind.

Dr. PELC (Czechoslovakia) wished merely to supplement Professor Parisot's interesting report by a few concrete examples from Czechoslovak experience. Could social insurance alone be expected to solve the problem before the Conference, particularly that of the free treatment of sick persons in rural districts? Personally, he believed that the system of communal doctors employed in Europe before social insurance became so general was worthy of consideration. Czechoslovakia had about 2,000 communal doctors paid by the State, whose duty it was to attend, free of charge, all residents in the commune who could not afford other treatment. In the present time of crisis, what would have happened if this system had not been in force? Insurance funds were no longer receiving regular contributions from members, so that it was more necessary than ever to have the unpaid services of communal doctors for the destitute. He did not mean to advocate relief in preference to sickness insurance. These factors were the twin columns of one edifice. Professor Parisot was right in emphasising the importance of the psychological factor in the case of peasants; it should never be overlooked.

First aid was a specially serious problem in rural districts in view of the increasing use of agricultural and other machinery. In Czechoslovakia, there were fire brigades in nearly every commune, and it had been arranged jointly with the Red Cross that these brigades should be furnished with the necessary equipment to be able to give first aid. It was certainly right to invoke the collaboration of all to attain the best results, and he could cite a further instance from Czechoslovak experience in this connection. It was still an unfortunate necessity for States to maintain expensive armies with large stocks of equipment which lay idle in peace time. The idea had occurred to them to use some of that material for the welfare of the community by asking the Army to put its motor-cars at the disposal of Red Cross societies for the free transport of the sick.

Dr. LUTRARIO (Italy) wished to stress some controversial points in Professor Parisot's report from a knowledge of Italian conditions. As the Rapporteur had justly remarked, modern medicine should not merely treat the patient, but try, as far as possible, to forestall the onset of the trouble and possibly ascertain by periodical examination what disease a person was likely to contract. As he had already pointed out in the Preparatory Committee, much had been done in this direction in the United States; and a good start was now being made in Europe also particularly by insurance companies, who arranged for their policyholders to have periodical consultations in order to ascertain their physical condition and nip any ailments in the bud. The result was nearly always to arrest the progress of disease. The principle should be to secure collaboration, not between the physician and the patient, but between the physician and the healthy or ostensibly healthy person. There should be a preliminary inspection of the human organism just as, before starting a motor tour, the engine was examined. Professor Parisot had put his finger on the vital point when he mentioned the necessity of collaboration between the doctor and the patient.

Another point which had raised much controversy, especially at Budapest, was the collaboration between midwives and health insurance funds. Midwives, of course, could not be employed universally, but only in those departments where they could be really useful. In Italy, thanks mainly to the *Opera Nazionale pro Maternita e Infanzia*, midwives had contributed to excellent results being attained in the field of medical assistance, but it must be recollected that, in Italy, midwives, after a course of preliminary instruction, had

to take three years' special training before they could practise. They were then able to collaborate intelligently in preventing puerperal fever — without, of course, taking the place of doctors — and that disease had now diminished very considerably, mainly owing to the work done by midwives, particularly in country districts. Midwives also received special courses in the care of children. In the campaign against cancer, it had been found that women preferred to be examined by midwives before consulting the doctors, and their help was equally useful during pregnancy.

As regards the question of specialists, Professor Parisot had justly observed that it was in that direction that medical assistance should now be developed, owing to the evolution of the science of healing. It was in this direction also that Italy was turning her efforts, although from time immemorial there had been in that country the system of *medici condotti*, of whom there were about 10,000. Italy suffered greatly from malaria, and, in the regions concerned, there was a very large number of anti-malarial dispensaries. A special campaign was being carried on against trachoma, and there were 264 dispensaries available, which, in 1930, had treated 62,788 patients. In certain provinces, inspectors were appointed exclusively for the supervision of trachoma. Similarly, there were many dispensaries for those suffering from tuberculosis and venereal diseases, especially in the country districts. In certain provinces, in particular in the province of Rome, the Governor had instituted a weekly visit by specialists in the communes.

Another very important point stressed by Professor Parisot was sanitary equipment. The verification of diagnosis in the laboratories was organised in Italy as follows : the chief town of each province possessed a provincial laboratory, and towns of 100,000 inhabitants and over also had a laboratory, to say nothing of the laboratories annexed to hospitals, nursing homes and university institutions, as well as private laboratories.

For the liaison between rural districts and laboratories, Italy possessed the material of which Professor Parisot had spoken in particular, for the transport of samples of drinking water in small, special cases.

In his report, Professor Parisot spoke of medical assistance from the technical point of view. Dr. Lutrario wished to speak of it from the administrative point of view. What was medical service from this point of view ? It was an essentially public service, and for this reason the State could not ignore it, but must itself be responsible for ensuring its administration. In the administrative domain two questions arose : (1) To what organisation should medical assistance be entrusted ? (2) What were the administrative characteristics of such assistance ?

(1) If it was for the State to lay down the general lines for medical assistance, it could not itself administer that assistance except in special cases. Ordinarily, it entrusted that work to the local organisations (communes) or to the health insurance institutions. In both cases, the rule should be that the State supervises that work.

(2) The administrative characteristics of medical assistance were briefly as follows :

(a) In the first place, medical assistance should be comprehensive — *i.e.*, should cover the whole territory and include the whole population ;

(b) Medical assistance should be compulsory — *i.e.*, regulated by law — and the organisation entrusted with the work must provide such assistance compulsorily.

(c) As regards the nature of the services rendered, it had already been stated that they must comprise medical, surgical, obstetrical, pharmaceutical and specialised assistance.

(d) In rural districts, medical assistance must be rendered at home, the patient calling the doctor to his own house. There were also the monovalent or polyvalent, the general or specialised dispensaries. In serious cases, the patient was sent to hospital.

(e) As Dr. Jitta and Professor Parisot had said, it was not possible to fix the district to be assigned to one doctor, for it depended on local conditions and on the character of the population, dense or scattered, healthy or unhealthy, etc. In Italy *medici condotti* were established in malarial districts during the summer.

(f) It was absolutely obligatory for the doctor to live in the district entrusted to him and not in a large town more or less close at hand.

(g) Who was to bear the costs of medical assistance? In Italy, a distinction was drawn between the poor and well-to-do. The commune provided the treatment to be given to the former, and the sums paid on this account to the 10,000 *medici condotti* by Italian communes amounted on an average to more than 72,000,000 lire annually. Between the poorer class, however, of the population and the well-to-do there was a middle class which, though unable to pay doctors their full fees, at the same time was not sufficiently indigent to be supported by the commune. Bodies resembling mutual insurance societies and supplying their members with medical assistance covered most of the requirements of this class which would otherwise have been deprived of medical assistance when the *condotti pieni* were abolished. Of recent creation, these societies were constantly increasing throughout the country.

These free associations, known as " Fascist mutual health societies " were a kind of addition to the professional mutual insurance associations based on the corporative organisation. They were officially recognised in the Labour Charter, and it was part of their duty to supply medical assistance.

Both forms of association had, therefore, to be regarded as channels for the operation of medical assistance enabling all classes of the population to benefit by medical treatment, which is for the patient the most essential and most humane form of assistance.

Dr. Lutrario added that all these observations were set forth in the pamphlet which the Italian delegation had had distributed to all the members of the Conference and which dealt with the three subjects on the agenda and with bonification. Finally, as Dr. Bonamico could not be present at the Conference, Dr. Lutrario asked if it would not be possible to appoint as Rapporteur in his stead M. Buttini, engineer, of the Italian Ministry of Public Works.

This was decided.

The PRESIDENT, before calling on Dr. Unger to speak and on Professor Parisot to close the general discussion on the first item, reminded the meeting that, when the general discussion was closed, the committees would have to set to work. Their task would be to draw up conclusions which would subsequently be examined at a plenary session of the Conference.

Mr. UNGER (Germany) thanked the members of the Conference who had recognised the capital importance of the part played by health insurance institutions in the maintenance of health in rural districts. The sickness insurance societies had determined to pursue that task with the greatest energy and to devote all their efforts to it. Dr. Unger had listened with special interest to the statements regarding the work accomplished with a view to the development of medical assistance in the Netherlands and in Spain. There was no doubt that the good wishes of all were with the countries in question in their efforts, and that, in every country, the necessary assistance would be given both in regard to that work and to the work undertaken by the International Labour Office in the same sphere, the health insurance institutions placing themselves at the service of rural health. In regard to village pharmacies, M. Tornel had justly pointed out that such pharmacies could not carry on their work unless the State allowed them grants and free premises.

Mr. Unger was of opinion that, in Germany, that had long applied, not only to the country districts, but also to certain towns. He thanked M. Prohaska for having so strikingly shown the importance of the co-operative movement, which had grouped its members in the two fields, economic and medical. Mr. Unger hoped that, in all countries, employers would note the measures to which reference had been made. Dr. Pelc had rightly said that insurance alone was not enough; it was only recently that Czechoslovakia had introduced the principle of co-operation in that domain. All such achievements might be regarded as the result of the International Labour Conference in 1927, which had expressly recognised the great advantages of such co-operation in the matter of assistance in rural districts. There might be divergent points of view, but what everyone expected of the delegates was that they should adopt certain resolutions dictated by their inmost convictions and laying down what must be done in justice and of necessity in order that the rural populations should benefit by modern health methods.

Professor PARISOT (France) thanked the various members of the Conference for having praised his report more than they had criticised it, and said that this praise should by rights be bestowed on those who had prepared the way for his work, particularly the President of the Conference, who had for some months past directed the preparatory work, and the highly efficient secretary of the Conference, Dr. Boudreau. He would now reply briefly to the various speakers.

In reply to Mr. Unger, Professor Parisot said that he had been particularly interested in his colleague's statement with regard to the intervention of the social insurance funds in the matter of medical assistance in rural districts. He had not been called upon to deal with the question of social insurance, and what he had said was simply on his own account. He would have liked to deal more fully with what he had seen in Germany, and, in particular, with the very remarkable results achieved by means of co-ordinated efforts. The experience which he had gained in Germany had impressed him so strongly that, in organising social insurance in France, he had endeavoured to bring about this co-operation in the area entrusted to him, and collaboration now existed between the associated funds, the health organisation under his direction and the medical profession as a whole, it being understood that each factor retained its autonomy, that the influence of the insurance funds was in proportion to the population in their area, that the financial assistance normally given by the health organisation was to continue, and that the expenses were not to be borne solely by the insurance funds. Those conditions were in accordance with the findings of the Congress of sickness insurance funds held at Dresden in October, 1930.

In reply to M. Andronesco and to Dr. Jitta, Professor Parisot said that he had not been able to enumerate in his report all the bodies whose co-operation was necessary and who obviously included priests, teachers and the various Red, Green, White or Yellow Cross Societies which played such an important part in the Netherlands. All those bodies should help each other and co-operate closely with a view to bringing about the achievement of the final aim, which was to extend insurance to the whole population and to the rural population in particular.

In reply to Dr. Tornel, Professor Parisot thanked his colleague for confirming, on behalf of the powerful body of medical practitioners, what he himself believed to be true — namely, that no sound health organisation was possible, at all events in certain countries, without the co-operation of medical practitioners, which should be sought and encouraged. As Professor of Preventive Hygiene he was called upon to train medical students, and he endeavoured to explain to them what were the purposes of hygiene and what co-operation was required from various bodies.

In reply to M. Vermaire, Professor Parisot said that he knew Luxemburg very well, and had had occasion to visit that country at the request of its health organisation.

In reply to M. Prohaska, Professor Parisot said that he was constantly struck by the influence which could be exercised on the agricultural population by teachers trained as they were at Zagreb, evidence of which he had seen with his own eyes, and he had listened with interest to M. Prohaska's observations on the powerful influence of the co-operative societies.

In reply to M. Santiago, Professor Parisot had already explained why he had not referred at greater length to social insurance. He fully agreed with his colleague as to the necessity of extending social insurance and also of protecting the aged. Various methods were employed in different countries, and in France there was a large number of almshouses and other establishments intended for old people.

In reply to Dr. Pelc, he said that his Czechoslovak colleague had emphasised certain points which would be very helpful to the Conference. If use could be made of the various means available, and of motor transport in particular, health organisation would be greatly simplified and would be less difficult if communications, roads, means of transport and telephones were improved. Consequently, an efficient organisation in these matters was necessary if medical assistance was to be properly organised.

In reply to Dr. Lutrario, he said that the latter had furnished interesting particulars in regard to Italy, whose remarkable organisation, particularly in the matter of rural hygiene was well known. With his high authority, M. Lutrario had stressed the administrative aspect to the problem which he himself had touched on too lightly, and these details would be of the greatest value to the First Committee in its work.

The PRESIDENT said that the general discussion had been most interesting and fruitful. He would repeat that this result was due to the way in which the Committee of Experts, presided over by Professor Konrich, and the Rapporteurs appointed by the Preparatory Committee — Professor Parisot and Mr. Unger — had accomplished their task. On behalf of the Bureau, he thanked all the members of the Conference who had contributed to the discussion of the first item on the agenda and had furnished concrete data. He declared closed the discussion on this first item. He reminded the members of the Conference who were to serve on the First Committee that ample documentary material was to be found in the Preparatory Committee's report (document C.H.1045). On page 50 of that report there was a special chapter dealing with "Sickness insurance as a factor in rural hygiene," which was largely based on enquiries carried out by the International Labour Office.

The special report drawn up by Mr. Unger dealt with a question of the greatest interest to the medical profession. The discussion had been of very great value, and they could congratulate themselves on the spirit of mutual understanding which had dominated that discussion. Whatever suspicions still lingered in the minds of a certain portion of the medical profession, the fact was undeniable, as Mr. Unger had pointed out, that the work of medical assistance among a credulous and superstitious population had produced remarkable results. Owing to the fact that health insurance funds employed only qualified doctors, and, as a result of the propaganda carried out by those funds among the rural population, the peasants in many places had ceased to have recourse to charlatans and quacks, a very dangerous practice which existed in country districts.

Professor Parisot's report would constitute an excellent basis for the discussions in the First Committee. It included a description of nearly every effective method of applying

in practice the broad principles of medical assistance in rural districts. Finally, he would once again urge the desirability of the Committees, after as full a discussion as might be necessary, reaching concrete conclusions so as to facilitate the discussions which would follow at a plenary meeting of the Conference.

FOURTH MEETING (JULY 1ST, 10 A.M.).

Verification of Credentials. — Opening of the Discussion on the Second Item on the Agenda (Health Services) : Statement by Dr. Stampar, Rapporteur ; Speeches by Professor Puntoni (International Institute of Agriculture), Dr. Chodzko (Poland), Dr. Ferguson (Great Britain) and Dr. Johan (Hungary).

President : Professor G. PITTALUGA.

Credentials Committee.

Dr. JITTA (Chairman of the Committee on Credentials) reported that the Committee had met and examined the credentials of the delegates. It had been found that all the delegates had been duly authorised by their Governments to attend the Conference. Some Governments had expressed regret that they were unable to send representatives. The Swiss Federal Council had stated that its delegates also represented the Principality of Liechtenstein.

The Committee had found everything in order and supposed that its work was now terminated.

The PRESIDENT thanked Dr. Jitta and the other members of the Committee for having concluded their work so rapidly.

M. SANTIAGO (Spain) wished to make an observation on the list of delegates. The Conference had been convened by the League of Nations and not by the International Labour Office, though the problem before it was closely connected with social and labour problems. He therefore thought it would have been advisable that the working classes should be represented. The report by the Preparatory Committee had recommended that the Conference should be representative of all the interests involved in rural hygiene. Nevertheless, M. Santiago affirmed that he, as the delegate of the Spanish workers, was the only representative of the working classes. He considered this omission regrettable.

The PRESIDENT said this question did not concern the Credentials Committee. The Conference was not qualified to make observations on the delegates selected by the various Governments, but could merely verify the credentials of the delegates.

While noting M. Santiago's remarks, he regretted that they were not pertinent to the question under discussion.

M. SANTIAGO replied that he did not wish to discuss the choice of delegates, but, as a working-class representative, he desired to register a protest.

The PRESIDENT declared the incident closed.

The Most Effective Methods of Organising Health Services in Rural Districts.

M. STAMPAR read his report (document Conf. Hyg. Rur. No. 1) with the following changes :

Page 5 : The last sentence beginning " It should be obtained. . . . " was omitted.

Page 8 : The last paragraph beginning " In Yugoslavia . . . " was omitted.

Page 9 : The first three paragraphs beginning " In Poland . . . " and ending " health centres " were omitted.

Page 11, last line : The words " in most agricultural countries " were altered to " in some agricultural countries. "

Page 12 : The first sentence beginning " Such treatment . . . " was omitted.

Page 12, line 9 : The sentence beginning " The economic interest . . . " was omitted.

Page 14, lines 13, 14 and 15, should read " . . . principle, is intended to serve one district. The secondary health . . . "

The PRESIDENT thanked M. Stampar for his excellent report.

Professor PUNTONI (International Institute of Agriculture Rome) submitted his report on anti-rabic dispensaries in Italy. (Document Conf. Hyg. Rur./9.)

Dr. CHODZKO (Poland) drew attention to the decisive influence exercised by the peasant on cultural and economic policy in any country in which the agricultural population predominated. The basic cause of the present world crisis was the feeble demand evinced by the peasant for industrial products, and also the extremely low standard of life and the primitive agricultural equipment of even well-to-do peasants. The adoption of mechanical methods of cultivation would, apart from the resultant economic advantages, ultimately promote a wider knowledge of hygienic and prophylactic principles.

Meanwhile, it was important to study some of the unfavourable factors affecting the health and well-being of country populations. Take rural tuberculosis. In his report issued three years previously on " Rural Sanitation ", he had shown that, in countries like France, Germany, Poland, Switzerland and the United States, the peasants were more and more exposed to the attacks of this scourge. Kellner's study of mortality statistics proved that the agricultural districts of Europe suffered more than twice as heavily from tuberculosis as industrial countries like Belgium, Germany and the United Kingdom. French statistics for 1928 showed that, between the ages of 20 and 39, the mortality from tuberculosis in towns per 10,000 was 28.2 for men and 23.9 for women, as compared with 34.2 and 29.9 respectively in country districts. The tables on pages 28 and 29 of Dr. Stouman's exceedingly valuable report (document C.H. 1052) proved that, in Sweden and Denmark also, mortality from tuberculosis was higher in the country than in the towns. That was a point to which he wished to draw their special attention.

Further confirmation was furnished by the report of Dr. Tomanek on investigations carried out by the Second Medical Clinic of Lwow University in 1,860 cases of peasants and 1,824 cases of town dwellers suffering from tuberculosis. It was found that the gravest and most advanced forms of the disease were twice as prevalent in the country as in the town, due mainly to under-nutrition, physical exhaustion and bad working conditions.

Ergometric tests showed that peasants were physically weaker than town labourers, and that the lack of labour-saving machinery was largely responsible for the physique of agricultural workers being so seriously undermined.

After describing the other forms of tuberculosis prevalent among the peasant population surveyed, Dr. Chodzko suggested that further investigations on similar lines might form a very valuable basis for the organisation of preventive measures among rural populations. They could not be too grateful, he thought, to the State of Saxony for its initiative in this direction — the founding at Pommeritz of the first Experimental Institute for the Hygiene of Agricultural Labour, with the object of rationalising farming operations on a hygienic basis. Schools of Hygiene, too, might help — *e.g.*, by initiating comparative ergometric studies of rural and urban populations and by investigating the problem of the diet of peasants — what quantities and what qualities of their produce (milk, fats, meat, bread) were kept for personal consumption. He proposed, therefore, that a Fourth Committee be appointed composed of the directors or representatives of schools of hygiene present at the Conference to give initial consideration to these suggestions prior to a decision by the plenary meeting.

Before concluding, he wished to draw attention to two passages in the conclusions of Mr. Stouman's report (document C.H. 1052) :

“ (5) Young women in rural districts are in a particularly unfavourable position. This is probably largely due to excessive physical work, the migration of servants and, in some countries, inadequate maternity care.

“ The health of young women in rural districts is of particular importance, since they, with their higher fertility, become the mothers of the greater part of the nation.

“ (6) Tuberculosis generally causes a higher mortality amongst young women in rural districts than in towns.”

It was an extraordinary situation, and he directed their attention to its graphic representation on the two maps prepared by the Health Section and hanging on the wall of the Conference room. They would note that the birth rate all over Europe was steadily decreasing ; women in the towns did not want, and country women were physically unable, to bear children. It was peremptory therefore to make every effort to restore the health of the countryside if the supply of human material for the towns was not to be totally exhausted. M. Gunnar Jahn, of the Norwegian Central Statistics Office, quoted on page 30 of Mr. Stouman's report, indicated another peril to be combated when he referred to the fact that “ servant girls from rural districts constitute one of the essential elements in the propagation of tuberculosis ” — a fact fully confirmed by the Swiss investigators, M. Gigon and M. Künzler.

Dr. Chodzko, in conclusion, reminded his hearers of the ideal type of country doctor depicted by Balzac in his *Médecin de Campagne*, who held that “ *l'avenir, c'est l'homme social, nous ne voyons plus rien au delà* ”. The Conference, he felt, was an embodiment of the public mind of Europe, which would, he hoped, speedily transform the face of their continent to the supreme benefit of all concerned.

The PRESIDENT thought the Conference would be glad to adopt Dr. Chodzko's suggestion to set up another Committee to examine certain fundamental questions regarding the epidemiology of rural populations. A proposal would be submitted by the Bureau at the afternoon meeting and he would be glad if subsequent speakers would give their opinion on Dr. Chodzko's suggestion.

Dr. FERGUSON (Great Britain), speaking as the responsible health officer of a typical English county, desired to comment briefly on Items 1 and 2 of the Conference agenda.

The problem of providing effective medical assistance for rural communities was essentially an economic one. It implied a desire for such service and a willingness to pay for it on the part of those concerned. Such a desire could be stimulated by judicious and informed propaganda. Properly qualified general practitioners were the second essential for the effective prevention and treatment of disease, because out of treatment arose the desire for prevention. The provision of such practitioners and of the other auxiliary services, such as nursing, midwifery, hospitals, etc., might best be discussed in the Committees.

A third essential was that all public and voluntary services benefiting the community should work in co-operation. These services included, in England, women's institutes, voluntary hospitals, voluntary nursing associations, ambulance associations, national health insurance, veterinary services, etc.

On the question as to how the principles above enumerated could best be put into execution, he believed the Conference should confine itself to recommendations defining the ideal to be aimed at. Dr. Stampar's report had wisely emphasised the advisability of not interfering with national administrative systems adapted to the special cultural, economic and social conditions of a people. Furthermore, the problem to be solved varied in different countries, so that it would be a mistake for the Conference to lay down hard and fast rules. Their object should rather be to define general principles and leave each country to settle the details of its own administration in the light of the guidance afforded by the Conference proceedings and documentation.

In England, administration was decentralised as far as possible, thereby enabling local interest and co-operation and local financial resources to be secured. General health policy was framed by the Ministry of Health, which co-ordinated the action of the various local authorities, stimulated those more backward to attain a certain minimum level, and supplied any advice and information necessary. The actual administration rested with the local authorities which were county councils, borough councils and urban and rural district councils. County councils were mainly responsible for school medical, maternity and child welfare, tuberculosis, venereal and veterinary services, while district councils usually dealt with such questions as housing, sewerage and water supplies. In addition, county councils were responsible for poor relief, hospital and domiciliary medical services for the poor and private homes for young children and the aged and infirm.

The co-ordination of the county council's medical services was effected by the county medical officer, with the help of the necessary medical, technical and clerical staff. It had recently been enacted that no medical officers of health could engage in private practice.

He agreed with the Preparatory Committee's proposal that, even where decentralisation existed, the State should still be responsible for general health policy and have the right to supervise its execution and to insist on deficiencies in local health services being remedied.

Neither the Preparatory Committee's report nor Dr. Stampar's statement explained who was to establish and finance primary and secondary health centres, and what was their exact relation to local government authorities. In England, such centres were created and maintained by the local authority, which directed their policy; they all aimed at having voluntary local committees to take an interest in their activities and supplement either in service or in money the official activities maintained. While providing facilities for advice and consultation, such centres left treatment (with certain exceptions) to the general practitioners. The exact types of centres in Dr. Stampar's report would not fit into English Government administration.

He wished to stress the importance of such voluntary and consultative committees, official and un-official, and to testify to the value of their work. English counties, for

example, possessed official committees of the governing bodies and the medical and surgical staffs of the voluntary hospitals, whose advice had to be obtained before the local authority arranged for any additional hospital accommodation. There also frequently existed unofficial liaison committees representing the medical profession which county medical officers found it extremely valuable to consult.

Dr. JOHAN (Hungary) thought the question now being discussed was the one out of the three on the programme of the Conference for which it would be most difficult to find a unanimous solution. Countries like Hungary, which had hitherto been concerned chiefly with the programme of the Conference for which it would be most difficult to find a unanimous solution. Countries like Hungary, which had hitherto been concerned chiefly with problems of urban hygiene, anticipated that the proceedings of the present Conference would constitute a very valuable guide in organising rural health services. Conditions in towns differed greatly from those in villages, and the problem should therefore be considered as distinct.

He would like to submit some observations regarding items 1 and 2 of the agenda. He agreed with Dr. Ferguson that the question of organising public health work in rural areas has a very important economic side too, and, when such work had to be organised in Hungary, the question of economy would certainly be examined also. As regards staff, it was very important, particularly in the case of primary health centres, to attach to it the work of general practitioners. In Hungary, primary health centres were established in the rural communes, and the village doctor was put in charge. In such case, the village doctor must have had special training in preventive and public health medicine, a question, he thought, which required to be studied. As regards auxiliary staff in rural districts — health visitors, nurses, midwives — he thought that social workers should be added to this list, particularly in impoverished rural districts and social problems should also be included. In Hungary, the control of the social institutions is entrusted by law to the health officer. The problem of combining the activities of one or more of such auxiliary workers in a rural district was rather complicated, but should be studied. Midwives, for example, were not so fully trained that they could take the place of nurses. In Hungary, they had a system by which midwives were given supplementary training to enable them to take the necessary action pending the arrival of the qualified nurse. It was easier to combine the services of bedside and public health nurses by giving the latter, as a basis, training in bedside nursing. This would qualify them to instruct members of the family in the care of the sick. Hungary had not yet found it possible to organise systematically public social welfare activities in rural districts, but steps were now being taken in this direction, and for this reason co-operation with voluntary agencies was being organised.

He thought Dr. Chodzko's idea of creating a Fourth Committee to co-ordinate the work of schools or institutes of health in connection with the rationalisation of rural public health work an excellent one, the more so as, where such schools (institutes) existed, as in Hungary and Yugoslavia, etc., they were entrusted with the supervision of rural health work. Hungary, for instance, might possibly be able to supply interesting data on the question of the food of agricultural workers.

FIFTH MEETING (JULY 1ST, 3.30 P.M.)

Continuation of the Discussion on Item 2 (Health Services). — Speeches by M. Sarraz-Bournet and M. Vimeux (France), Dr. Lutrario (Italy); Dr. Kacprzak (Poland), Dr. de Buen (Spain), Dr. Vasile (Roumania), Dr. Canal-Comas (Spain), Dr. Miemietz (Germany). — Proposals to set up a Fourth Committee and to convene a Meeting of the Directors of European Schools of Hygiene. — Resumption of the Discussion on Item 2. — Speech by M. Prohaska (Czechoslovakia).

President : Professor G. PITTALUGA.

Discussion of the Second Item on the Agenda.

M. SARRAZ-BOURNET (France) stated, on behalf of the French delegation, that, on the whole, he could subscribe to the conclusions of Dr. Stampar's report.

Primary and secondary health centres such as Dr. Stampar had described existed in France under other names. The details supplied by the Conference of Experts and the indications given in the report would make it possible to improve the work of such centres in accordance with the main lines of the plan put forward.

As regards rural sanitary equipment, France also had a fairly advanced organisation, the details of which would be given to the Conference during the discussion of item 3 on the agenda.

There was, however, in Dr. Stampar's report one point on which France must make certain reservations.

If the Conference was to be successful, the recommendations proposed should be unanimously accepted, and it would be advisable to make allowance for local ideas and the methods of collaboration which had been gradually established in the various countries between the public and private institutions dealing with problems of health organisation in rural districts. Whereas in certain countries they were building from the foundations upwards, in others it was necessary to take into account institutions already existing, which were more or less complete and more or less satisfactory, but which could be improved.

The organisation of rural hygiene in France was not ideal. Legislation was still imperfect, and much had yet to be done to bring it into line with the progress of science; nevertheless, for medical assistance and health work, France could count on the help of doctors of exceptional skill practising in rural districts. These doctors made their living by private practice, but nevertheless co-operated actively with the public institutions. French law was very liberal in this respect and only rarely allowed doctors to be officials also. The law on social insurance stipulated freedom in the choice of the doctor, and there were very few exceptions to that rule: departmental, dispensary and laboratory doctors, and doctors of the maritime sanitary service. A practising physician in France was never an official. The only exception was colonial doctors, who practised outside France itself under special conditions and among very primitive races with which no European population could be compared.

The French delegation must also make reservations regarding that portion of Dr. Stampar's report dealing with the part played by health centres in the treatment of

the sick. The delegation considered that such centres could only be called upon to treat the sick or injured in exceptional cases, if the number of practising doctors were insufficient; or in an emergency.

Without prejudice to the proposals of the Committee concerned, France would like to ask for the inversion, as it were, of Dr. Stampar's formula, so that treatment by the centre should be the exception rather than the rule.

Such an amendment would, moreover, make it possible to take stricter account of the varying conditions prevailing in different countries.

Apart from that reservation, France felt much satisfaction at the valuable opportunity for exchange of information at the Conference on Rural Hygiene, and considered that it would now be feasible to present, in the fight against disease and social evils, a united front in which the public authorities, the medical profession, social insurance institutions, agricultural organisations, voluntary societies and the population itself would all join together.

The PRESIDENT took note of the reservations made by the French delegation and of the fact that these in no way prejudiced the decisions of the Committee.

M. VIMEUX (France) felt that he should explain to the Conference, on behalf of the agricultural social insurance organisations, the declaration appearing on page 34 of the Preparatory Committee's report. The representatives of the social insurance friendly societies had gone to the Committee with some apprehension and desired to define their position as a matter of caution. The representatives of the mutual aid societies were fully satisfied, and Dr. Stampar had interpreted the opinion of their representatives perfectly. Although it was true that the friendly societies were autonomous organisations, they could not dispose of their funds without regard to the opinion of those who had supplied them. They were none the less determined to give their co-operation and assistance with a view to securing the best possible results.

The experts report, page 22, and that of the International Labour Office, page 59, accurately expressed the opinion of the representatives of those societies; but on all points M. Vimeux considered that Dr. Stampar's report gave complete satisfaction to the societies.

They were particularly grateful to Dr. Stampar for having noted the assistance which the agricultural co-operative associations could give in the matter of propaganda among the rural population and to Mr. Unger for defining the part played by the social insurance institutions.

Dr. LUTRARIO (Italy) thought that the spirit of conciliation and moderation which actuated Dr. Stampar and other speakers had greatly simplified the difficulties inherent in the manifold and complex problems connected with item 2 of the agenda.

At the beginning of his report, Dr. Stampar had rightly pointed out " that most countries have public health organisations of long standing with definite traditions and a definite system of their own ". Such organisations had proved their worth and in common fairness could not be ignored.

Dr. Stampar's report gave a clear, if summary, picture of two systems of health organisation in European rural districts.

He had described the British system, known as the " County Health Unit Plan ", which consisted of making one health officer (medical officer) solely responsible for all health work in the county. The same system had obtained in Italy ever since the Basic Law for the Safeguarding of Hygiene and Public Health of December 22nd, 1888. The health officer, as he was known in Italy, was the mainspring of the health organisation. He constituted in his own person the first grade in the health hierarchy, and was the

dynamic inspiration of every small rural health office. It was his duty to supervise hygienic and sanitary conditions, to inform and assist the communal *Podestà* on everything connected with the hygiene and health of the population. He also drew up periodical reports on the sanitary conditions in his district. Though paid by the municipality, he was appointed by the prefect, and thus invested with the dignity and authority of a Government official. He had charge of the staff of district health services and had at his disposal an isolation post and disinfecting appliances.

The more populated and the larger the commune, the greater was the importance of the health officer. The small health office was expanded according to requirements. The staff — doctors, veterinary surgeons, in some places an engineer, and frequently the inspectors known as *vigili sanitari* — were more numerous.

In larger rural districts, the health offices had departments for the preventive treatment of infectious diseases, for school hygiene, for housing and soil hygiene and for the hygiene of foodstuffs. The casual isolation post became a real hospital for infectious diseases. Disinfection was allotted a special department to itself; there were dispensaries for special and general purposes, which acted also as centres of diagnosis, a hospital for ordinary diseases, and, in certain districts, sanitary stations. Every province had a provincial laboratory with micrographic and chemical sections working in co-operation with other laboratories in large communes, hospitals, voluntary institutions, etc.

The special features of the Italian system were :

- (1) Health officers were not confined to a few centres, but could be found everywhere, even in the smallest villages ;
- (2) The extent and importance of the equipment at their disposal were proportional to the actual requirements of the districts ;
- (3) The special legal status, owing to his functions, of the health officer who, though attached to the district, had the authority of a Government official.

In this connection, he must correct a misunderstanding. It should not be imagined that in small rural communes the *medico condotto* must necessarily be a health officer. On the contrary, the two duties were quite distinct, though they might occasionally be discharged, with the prefect's special permission, by the same person. This permission, however, lapsed, *opere juris* as soon as the two offices could be separated.

Once the position of the Italian health officer, with his auxiliaries in the form of relief personnel, health bureaux, and health and preventive institutions, were properly defined, a clear idea could be formed of the country's health organisation. Health offices were co-ordinated and worked in liaison with the provincial health organisation, which in its turn co-operated with the central authorities. The whole was interconnected and co-ordinated under one supreme centre, with a progressive subordination which was not, however, such as to deprive the minor authorities of their proper functions or of their independence. The system was divided into four distinct grades :

(a) The directing authorities : the Minister of the Interior with the prefects and the *Podestàs* subordinate to him ;

(b) The executive authorities : the General Administration of the Health Services, the provincial doctor and the health officers ;

(c) The advisory authorities : the Supreme Health Council and the Provincial Health Council ;

(d) The research institutions : the central Government laboratories, the provincial laboratories and the communal laboratories in certain towns.

It was a kind of army drawn up in battle order, with one single front, but with each unit preserving its independence within the general scheme.

Priority had been given by the Government to restoring rural health, and the first step in the campaign was the Mussolini Law on comprehensive bonification. The purpose of the law, which was being fully applied throughout the country, was not merely to improve the land, but to colonise the reclaimed tracts, to ameliorate the health and the well-being of agricultural workers by means of model villages, sanitary farmhouses, water supply, drainage, schools, etc. This would all be discussed in the Third Committee, and members could obtain information also from the publication which had just been circulated: "Sanitary and Health Services in Italian Rural Districts and 'Integral Bonification'" (document Conf. Hyg. rur. 13, published by the Italian delegation).

In conclusion, he would like to say a few words on one department to which the Government devoted particular attention — *propaganda*.

It must be admitted that the modern peasant no longer resembled his predecessor. He had acquired more self-respect and personality, and was fully aware of the part he played in the national economy. He read newspapers and took an interest in politics. His knowledge of sanitary requirements, however, was usually rather limited. Generally, he paid very little attention to the quality of his drinking water or food supplies, to the presence of flies in his house or to the dangers of malarial districts.

The Government was combating this carelessness and trying to arouse the peasant to a sense of the danger of neglect in those matters. To start with, intensive propaganda was carried out in primary schools, the idea being that the pupils would preach compliance with certain rules at home. The tidiest children were given prizes consisting of small cases containing pieces of soap, a toothbrush, underclothing, etc.

In Tuscany, he had personally observed the extraordinary results obtained from this form of propaganda by that great public health specialist, the late Professor Sclavo. This propaganda followed the younger generation as they grew up. There was first the *Opera Nazionale Balilla* (National Balilla Movement), then the *Opera Nazionale Dopolavoro* (Workers' Sports Clubs), and a whole system of libraries, lecture campaigns, etc., among which mention should be made of the "Chariot of Thespis," which travelled from village to village giving performances by good actors of the classics and trying to develop a taste for the beautiful and the artistic among the rural population. The benefits afforded by the educational cinema and rural broadcasting were also increasing steadily. Another very interesting form of propaganda initiated by the Head of the Government himself was the *wheat motor-train*, which, with its staff of popular lecturers, visited village after village trying to inculcate a love for the wheat from which bread was made — wheat, which M. Mussolini called the *gloria dei campi, fragranza della terra, festa della vita... Il più santo premio alla fatica umana*.

Under all these beneficent influences the peasants were gaining better understanding of hygiene and frequently demanded sanitary improvements of their own accord — a happy omen for the regeneration of the countryside.

Dr. KACPRZAK (Poland) pointed out the importance of education for rural hygiene. Although in large communities the municipality could itself always provide adequate sanitation, in the rural districts it was necessary to appeal to the population. Moreover, urban districts were richer and had much more political influence than rural communes, and the level of education was higher. The peasant was conservative, and distrusted new ideas. Nevertheless, without his goodwill no results could be hoped for. Only on the spot and within the limits of his own environment could the peasant be convinced of the benefits of hygiene; even so, hygiene must be adapted to the conditions of rural life.

Dr. Kacprzak recalled his impressions of a tour in northern countries; he referred to the Danish peasant, whose comparative poverty did not prevent very meticulous

hygienic precautions. Dr. Kacprzak had heard in Denmark that the best propaganda in that country had been due to the dairies. For butter to be exported to the best markets the buyer had to have a guarantee of the perfect purity of the produce supplied to him. The peasant realised that it was to his advantage to keep his animals clean and to protect his milk from any contamination ; if it was good and wholesome, a better price could be obtained for the dairy produce. The proverbial cleanliness of Holland could be partly ascribed to the production and sale of foodstuffs in that country and the necessity, for instance, of inspecting meat, etc. The Polish delegate pointed out that in all countries where progress had recently been made — such as Yugoslavia — the same method was employed — namely, presenting the health side of measures of hygiene in relation to their financial aspect. The peasant must be convinced that hygiene paid.

Governments, on the one hand, and peasants, on the other, were more willing to make sacrifices for the veterinary organisation than for the assistance of human patients ; in most agricultural countries the peasant built his stable before his house.

Rural health propaganda found its best auxiliary in the practising doctor, who had the confidence of the family and whose advice was readily accepted. This did not always apply to official health officers, who were sometimes unpopular on account of decisions taken for the public benefit which ran counter to certain individual interests. It was none the less necessary for the country practitioner to have sufficient training in rural health work. Moreover, a most effective part could be played by educational institutions. The teaching of hygiene should be compulsory. The teacher should be responsible, not only for the intellectual development of his pupils, but also for the improvement of their ideas of hygiene and even their physical development. It was during the period between childhood and adolescence that it was easiest to instil habits of the greatest value for the future. In Poland, special courses in hygiene had been organised for primary teachers.

The influence of priests in regard to measures of hygiene had been mentioned. Dr. Kacprzak did not deny that influence, but no conclusive result had as yet been obtained.

In Poland, active propaganda was going on especially among doctors, the clergy and teachers, as well as through the numerous active agricultural and dairy co-operative societies. The women's section of the agricultural associations had for the last three years been organising competitions in the hygiene of rural housing. Special lectures were given on the spot to peasant's wives. After the course, the audience was asked to enter for the competition and a simple handbook was distributed explaining what must be done to make the rural home healthy. The competition lasted for four summer months, during which the woman inspector, sometimes accompanied by the district health nurse and the district doctor, visited all the houses of the competitors at least three times. At the close of the test period, the most careful housewives — those who had shown the greatest improvement in the management of their homes — obtained prizes, which generally consisted of some household utensil. The number of entrants in this competition rose from 352 in 1929 to 670 in 1930 and over 1,000 in 1931, which showed the value of such propaganda.

Dr. DE BUEN (Spain) referred to the great difficulty of making definite rules in regard to rural hygiene ; methods must vary according to the country. One of the most essential points was to organise assistance in rural districts where there was none. In Spain, rural medical assistance was optional but very widespread. On an average, there was one doctor to a thousand inhabitants, and even, in certain districts with a sparse population, to less than a thousand inhabitants. It followed that these doctors must be helped if their co-operation in matters of hygiene was desired.

Rural assistance in Spain began with the creation of provincial health institutions, which had been maintained from the outset by a compulsory contribution from all the small towns. For some time a " Committee of Mayors " had been concerned principally

with their activities from the economic standpoint. That constituted the first start towards co-operation. Nevertheless, at the outset, such health services consisted only of laboratories for disinfection, and were concerned with the transport of patients to specialists by motor-car, etc. It was soon perceived that that was not the only end to be pursued, and epidemiologists were appointed. The first of these had to go from village to village every time a special problem arose. Since then, health and social instruction had been given to the provincial health authorities, and there were now a large number of services of this kind which constituted veritable rural health centres for tuberculosis, syphilis, etc. Each provincial health centre constituted a centre for the training of doctors. Rural doctors followed more or less advanced courses of instruction in the principles of hygiene. They were now willing even to follow a short special course in hygiene before receiving the title of "medico-titular", which was more or less equivalent to the Italian *medico condotto*. Such doctors went into the villages; they received payment for assistance to the poor, which was given free in all rural districts in Spain. They also obtained some remuneration for minor health work. Such health work at present consisted of the compulsory notification of infectious diseases in the villages. The rural doctors were also asked to co-operate in minor sanitary work — for instance, with regard to malaria. A large number of rural doctors were in possession of microscopes bought by the communes or by the anti-malaria services; they carried out minor tests, vaccinations, etc. In that connection, Dr. de Buen mentioned that the mortality from smallpox, which had made great ravages in Spain some years ago, had now fallen to zero.

In Spain noteworthy attempts were being made to educate the rural population by example. In connection with irrigation works, railway construction, etc., specialists went to the spot — not only in villages, but where there were no villages — and the rural population could see the work done by them for itself. Such methods had given good results in the education of the rural population.

A start had also been made with the creation of secondary centres, supported by municipal, provincial and State subsidies.

As regarded propaganda, much was being done through the cinema, pamphlets, lectures, etc. These were excellent means in the more thickly inhabited areas, but most expensive in thinly populated rural districts. There, concrete examples were better. The following was the procedure in the anti-malaria campaign: A malarial centre was selected in a rural district; a small health service station was established, often of the simplest order; the peasants, more accustomed to observe natural phenomena than to read, did not fail to realise the results of the work of the little local centre thus established. The population could thus be educated rapidly, not only in the locality where the centre was set up, but over a fairly wide area. This system promoted the subsequent introduction of more important measures. A study of this question in districts infected by an important but easily preventable disease would present great interest. Even in the remotest districts, the inhabitants became accustomed to the doctor's visits, and the way was thus prepared for more extensive health measures.

The anti-malaria campaign in Spain had resulted in the conversion of a great number of these primary anti-malaria centres into secondary centres.

Dr. VASILE (Roumania) thought that remarkable proof of the interest taken in the health problem of the present day was provided by the Preparatory Committee's report and the breadth of the discussions which had taken place. He much appreciated the Rapporteurs' work, and thanked the Health Organisation of the League for summoning the Conference, for which the Secretariat had prepared so carefully.

Though the spirit was willing, internal conditions in Roumania had unfortunately only allowed the practice of the more advanced ideas for some fifty years past; every

effort, however, was being made to catch up with other nations. The present economic crisis had forced Roumania to modify her policy, hence she had been obliged to abandon free medical aid, hitherto traditional. Roumania was essentially an agricultural country, and the problem would, it was hoped, be solved by means of compulsory insurance for agricultural workers. The rural hospitals, like the national health organisation, were State administered, and the communal doctors, paid by the communes, were State appointed and supervised. These hospitals acted as dispensaries. Each health district was about equivalent in area to an English county. The district medical officer was assisted by a varying number of subordinate health officials and midwives. The average population of a district was fifteen to thirty thousand. Unfortunately, unfavourable conditions, such as distance, insufficient pay, lack of means of transport, etc., hindered the work of doctors, who were forced to engage in private practice.

In the Committee, Dr. Vasile would give further details of the districts health organisations, especially as regarded recruitment of staff and the advantages and drawbacks of the Roumanian system. Until 1910, the district medical officer had been obliged during his epidemiological enquiries himself to seek out the sick persons in each village; such a system did not give very good results. The establishment of general dispensaries, either at the doctor's place of residence or in some other place at which he attended on a certain day, marked a real step forward in rural hygiene and in the development of health centres in the direction indicated by the Rapporteurs. Demonstration centres already existed in three country districts and served to train health officers and students.

He was glad to express appreciation of Dr. Stampar's work in Yugoslavia, which he had been able to admire at first hand during the interchange of rural hygiene specialists. He thanked the Spanish Government for promoting the present Conference and the Chairman for his able guidance.

Doctor CANAL-COMAS (Spain) considered the second item on the agenda the most important from the point of view of his delegation, which represented practically the whole body of Spanish doctors working in rural areas. The organisation of rural health centres was of fundamental importance in the improvement of health conditions. Generally speaking, the Committee of Experts, the Preparatory Committee and the Conference shared this view, which was expounded in Professor Parisot's and Dr. Stampar's reports. The latter contended that the co-operation of the population in country districts must be won in order to achieve decentralisation of the health service and to entrust this to the local authorities without, however, depriving the State of its powers of direction and control. This was, for most countries, too idealistic, especially in cases where local conditions such as general education, the state of communications and other elements of country life were not very highly developed. It would thus be impossible to base health organisation upon this idea alone. The primary health authority in Spain had, up till now, been the Mayor of the commune presiding over what was called the "Local Health Board" (*Junta*). This system had yielded varying results as regards the improvement of public health. Spanish doctors considered that the establishment of permanent centres in country districts was too complicated an undertaking to yield satisfactory results. The Spanish health officers had proposed the establishment of permanent centres under the direction of the municipal health inspector in all districts too thinly populated to ensure the livelihood of a resident doctor without State aid. They also proposed the establishment of local primary health centres run on very simple lines. These centres, which were already working in several places, also undertook — quite apart from treatment — diagnostic research for purposes of medical assistance in general. The primary centre was the elementary but fundamental nucleus of rural health organisation. The secondary centre, on the other hand, should be as highly developed as possible in both its sanitary and its medical branches if it was to

render real service to the work of co-ordinating and directing the organisation of rural hygiene.

Dr. MIEMIETZ (Germany), speaking as a country doctor, thanked the Health Section and the Committee for consulting private practitioners, and notably country doctors, when preparing the first item on the agenda. This procedure had avoided the mistake previously made by more than one country in leaving the framing of draft laws to politicians, jurists and theorists without consulting experts with practical training, which had led to inapplicable or harmful laws. If the work of organising rural hygiene were to succeed, practitioners must co-operate with the public authorities, and health and social insurance institutions. Professor Parisot's report and Mr. Unger's speech on the previous day had stressed the fact that such co-operation was indispensable.

The first and second items on the agenda were both of interest to practitioners. In the first place, it was dangerous to give health measures and preventive medicine greater importance than the actual medical treatment of the rural population ; the former should not be exaggerated at the expense of the latter. A second essential point, which had given rise to profound differences of opinion when the recommendations and decisions were being discussed and framed, must also be considered. Was it right and necessary to put health measures and preventive medicine in one class and treatment in another ? On the contrary, was it not abnormal that the drawing of this distinction had led to the existence of two quite separate categories of doctors ? It seemed impossible to come to a decision *a priori*. An empirical point of view could perhaps be attained after examination of the situation in Europe. In most European States treatment was given by private practitioners, whilst the public health services were responsible for health measures and social welfare. On these lines, many European countries had achieved an entirely satisfactory method of promoting the health and medical treatment of the rural population. Health insurance societies, certainly those for agricultural workers, had never questioned the fact that actual treatment was the private practitioner's province. Consequently, the private practitioner was the best doctor from the patient's point of view. There was a bond of confidence between them which was the best means of ensuring a cure. The practitioner must have the best possible training, must belong to a class distinguished by its high moral character, and must consider his profession, not as a trade, but as a service in the interests of public health. The great majority of European practitioners fulfilled those conditions. The health officer had at least as many qualities as the practitioner, but he was responsible to the authorities, who might frequently hamper him in his purely medical work and were sometimes even obliged to do so, since the good of the individual did not always square with the interests of the community as a whole.

As regarded Dr. Stampar's report, he was almost entirely in agreement with Dr. Ferguson's statements. The Committee's work upon the second item on the agenda had been especially difficult, and the scheme of organisation deserved general admiration. Dr. Stampar's work in his own country, carried out under the most difficult conditions, could not be too highly praised. That work had, however, been performed in exceptional circumstances and could not be extended to other countries.

The foregoing remarks explained Dr. Miemietz attitude regarding health centres. He fully supported the statements made in the Committee's printed report (pages 18 to 24 of the English text) and Dr. Stampar's general statements. That organisation played the part which is elsewhere allotted to secondary health centres.

On the other hand, it was not possible to give effect to the proposal that all countries should undertake the organisation of primary centres ; Germany certainly could not do so. There the task, when not undertaken by the secondary centre, was carried out by each individual doctor within his own place of practice and by the auxiliary medical staff

in co-operation with the secondary centre, the health insurance funds, and private social welfare societies. This co-operation between all the factors concerned had made it possible to provide satisfactory health measures and medical treatment for the rural population of Germany.

Proposal to set up a Fourth Committee of the Conference, and Proposal to convene a Meeting of the Directors of European Schools of Hygiene : Draft Resolution submitted by the Bureau.

The PRESIDENT said he thought the discussion had now reached its climax. The representatives of powerful associations of medical practitioners had expressed their anxieties — quite apart from any material interests — regarding the relationship between medical assistance and the organisation of health centres in rural districts. That relationship was so important that the Conference had constantly had in mind the necessity for agreement on this subject, even though this desire had not always been expressed in so many words. Dr. Chodzko had made a suggestion at the previous meeting which might perhaps meet the Conference's wishes, and on the President's proposal the Bureau presented the following draft resolution (document Conf.Hyg.rur./18) :

“ The Conference decides to set up a Fourth Committee on ‘international rural hygiene studies’, which, after examining the various proposals made by the delegations and in the report of the Preparatory Committee, will submit to the Conference for approval the questions to be studied under the auspices of the League of Nations.

“ The Conference also asks if the League of Nations Health Organisation would convene a meeting of the directors of European schools of hygiene during the Conference, to consider to what extent these schools might undertake certain of the international studies to be recommended by the Conference, and to make suggestions to the Fourth Committee on this subject. ”

M. PROHASKA (Yugoslavia) stated, with reference to the proposal, that a meeting of the directors of European schools of hygiene should be convened, that he had had wide experience of agricultural questions and might therefore be able to make some useful suggestions. He asked whether other persons besides the directors of schools of hygiene would be allowed to attend the proposed meeting.

The PRESIDENT explained that the proposed Fourth Committee would include any members of the Conference who wished to join in its discussions. The Bureau had also thought it desirable to convene a meeting of the directors of schools of hygiene, to consider technical points and to ensure that the two meetings would keep in touch with one another. The Fourth Committee would submit to the directors of the schools of hygiene suggestions on the work to be carried out and the directors, in their turn, would give any explanations needed by the Fourth Committee. The proposal was intended to facilitate the Conference's work.

Resumption of the general discussion.

M. PROHASKA (Yugoslavia) stressed the necessity, already emphasised by Professor Parisot, for co-operation and co-ordination. Perhaps the members of the Conference had noticed that Dr. Stampar had said very little of co-ordination in Yugoslavia between

the work of the health authorities and the health co-operative societies. This, however, existed. From the beginning of the health co-operative movement, a special law had provided State subsidies for it. This law made provision both for the liberty without which a co-operative society could not exist and at the same time for the co-ordination of the work done. The Health Institute at Belgrade had been especially active, creating co-operative schools of hygiene, for which the co-operative societies themselves chose the pupils. This choice obviously led to the enlisting of excellent recruits. An effort had been made in Yugoslavia to work always in co-ordination with the local authorities. The principles thus adopted, which M. Prohaska summarised, were dealt with in detail in a pamphlet which had already been distributed to the members of the Conference in English, and the French text of which would be ready shortly. In conclusion, he agreed with his Hungarian colleague that a village should be considered as a separate entity and should not be treated as a small town.

Work of the Conference.

The PRESIDENT adjourned the general discussion on the second item on the agenda. As regarded the third item, the reports on the question of sanitation in rural districts were so technical that it would be better to refer them direct to the Third Committee. Thus no general discussion on item 3 of the agenda would take place in plenary conference.

SIXTH MEETING (JULY 2ND, 9.30 A.M.).

Draft Resolution (Fourth Committee and Meeting of the Directors of Schools of Hygiene) : Speeches by M. Gautier (France), M. Pelc (Czechoslovakia), M. Jitta (Netherlands), Dr. Lutrario (Italy).— Continuation of the Discussion on Item 2 (Health Services and Centres) : Speeches by Dr. Konrich (Germany), M. Andronesco (Roumania), Dr. Ismail (Turkey), M. Pallis (Greece), Dr. Berry (Irish Free State), Dr. Garcia Tornel (Spain), Dr. Spaas (Belgium), Dr. Kolar (Czechoslovakia) ; Reply by Professor Stampar (Yugoslavia).

President : Professor G. PITTALUGA.

Draft Resolution (document Conf.Hyg.Rur./18).¹

M. GAUTIER (France) said the draft resolution provided for two different committees — namely, a fourth committee of the Conference and a meeting of directors of schools of hygiene during the Conference.

¹ The draft resolution was as follows :

“ The Conference decides to set up a Fourth Committee on international rural hygiene studies, which, after examining the various proposals made by the delegations and in the report of Preparatory Committee, will submit to the Conference for approval the questions to be studied under the auspices of the League of Nations.

“ The Conference also asks if the League of Nations Health Organisation would convene a meeting of the directors of European schools of hygiene during the Conference, to consider to what extent these schools might undertake certain of the international studies to be recommended by the Conference, and to make suggestions to the Fourth Committee on this subject”.

With regard to the latter meeting, it was evident that numerous eminent representatives of the schools of hygiene were present at the Conference, and it would be of great advantage if they met in a private meeting outside the Conference. There was no objection to such a meeting. The League could at any time call such representatives together, and it would be advisable to take advantage of their presence in Geneva.

With regard to the Fourth Committee which it was proposed to set up, he thought this committee might select the most important ideas expressed during the discussion and, after examination, draw up a programme of future work for submission to the Conference. Such a committee would, for that purpose, draft a series of resolutions. If the Fourth Committee proposed in the draft resolution was of that character, he agreed to the suggestion.

With regard to the composition, the President has stated that any member of the Conference could take part. M. Gautier did not quite agree with that view. He thought such a committee would have to work rapidly, since it would have to report to the Conference, whose meetings could not be prolonged indefinitely. He therefore thought that the committee should consist of only nine or twelve members.

He took the opportunity of replying to M. Santiago's remarks of the previous day regarding the composition of the various delegations to the Conference. He was not in a position to speak in respect of other countries, but, with regard to France, the delegates represented all branches of the agricultural interest without distinction. The delegation included doctors, health officers, administrators and representatives of agricultural societies. He regarded the last-named as of great importance, especially in respect of propaganda for health work.

Returning to the question of the proposed Fourth Committee, he suggested that the President and Bureau of the Conference should draw up a list of some nine or twelve members who should form a resolution committee for rapidly considering the most important questions which arose. He thought the Conference should not be too ambitious. It would, he hoped, meet again, and it should therefore now deal with a small number of essential questions. In this case, he thought the Conference would render valuable service to public health, agriculture and mankind.

M. PELC (Czechoslovakia) agreed to some extent with M. Gautier's remarks, although his attitude was somewhat different. Public health was not only a question of finance and goodwill, but was also largely a question of knowledge. What was badly needed was research in questions of rural hygiene. He thought Dr. Chodzko's suggestion was a good one, as it aimed at encouraging such research work. It was not often that so many experts met together, and such an opportunity should not be lost. He would be glad if the proposed committee could consider a programme of research work.

He had no remarks to make regarding procedure, and thought that could be left to the President and the Bureau, who would no doubt be able to reconcile M. Gautier's view with that of Dr. Chodzko.

Dr. JITTA (Netherlands) agreed with M. Gautier regarding a resolution committee. With regard to the proposed meeting of the directors of schools of hygiene, he had no objection. All countries were not, however, in the fortunate position of possessing such schools, though they were interested in such questions. He therefore suggested that the meeting should include other competent persons from countries which did not possess such institutions.

Dr. LUTRARIO (Italy) understood that the Fourth Committee would be a kind of drafting committee, which would extract from the discussion all subjects of international interest.

With regard to the meeting of the directors of schools of hygiene, he agreed with Dr. Jitta, particularly as some countries, such as Italy, did not possess schools falling exactly within the description of the draft resolution. In Italy, however, the movement was very developed, as there were twenty schools of hygiene and six higher institutions. If he was correct in his interpretation of the proposal, he would be obliged to make reservations on behalf of the Italian delegation.

The PRESIDENT pointed out that the directors of schools of hygiene formed a technical organ which already existed and had already met. The proposal was merely to convene a meeting of these directors, who would place their suggestions before the Conference.

With regard to Dr. Lutrario's remarks respecting European schools of hygiene, he explained that this meant schools of hygiene in Europe.

Dr. RAJCHMAN, Medical Director, suggested the following amendments to the draft resolution in order to meet the views of the various speakers.

With regard to M. Gautier's remarks he suggested substituting the words " a Fourth (Resolution) Committee " for the words " a Fourth Committee on international rural hygiene studies ".

In order to meet Dr. Lutrario's views, he suggested substituting the words " undertake certain studies among those to be recommended by the Conference " for the words " undertake certain of the international studies to be recommended by the Conference ".

An organisation of directors of schools of hygiene already existed and had met at Madrid in May. It was natural they should meet again since they were assembled at the present Conference. They might inform the Conference of what subjects they proposed to investigate.

Dr. LUTRARIO (Italy) said the Italian delegation would have no difficulty in accepting the first part of the resolution. If he had thoroughly grasped the explanations given, the Fourth Committee would really only be a kind of Drafting Committee, which would extract from the proceedings the most important questions and frame a programme of future work.

Regarding the second part of the resolution, he shared Professor Jitta's misgivings. In the first place, he did not exactly know what " European " schools of hygiene were meant. If they accepted the usual interpretation of the expression, the meeting would necessarily be confined to a limited number of individuals. Many countries — even large countries — would be excluded. As the object was to establish a programme of studies dealing with the topics before the Conference and interesting all European countries, it would be better to broaden the basis of suggestions and co-operation for such a programme.

Dr. RAJCHMAN, Medical Director, remarked that two Italian representatives were connected with schools of hygiene. If it was desired that, in addition to the school at Rome, another school should be represented, this result could no doubt be obtained by addressing a letter to the President of the Health Committee.

The PRESIDENT, in summing up the proposed amendments, thought all objections were now removed. The revised text would be distributed to the Conference. The Bureau reserved the right to make a further proposal regarding the constitution of the Fourth Committee.

The amended text was adopted.

Second Question on the Agenda (Rural Health Centres) (Continuation of the General Discussion).

Dr. KONRICH (Germany) said it had been clear from the outset that the first and second questions on the agenda were very closely connected, and this view had been confirmed by the discussions in the Conference. There were, nevertheless, great differences between medical assistance and rural health centres. It was no doubt much easier to obtain uniform medical treatment for the rural population than to provide for uniformity in preventive measures. This was due to differences, not only between different countries, but even in local conditions in the same country.

The experts' report and that by Dr. Stampar laid down clear rules for one solution of the question, and showed that that solution was practicable. In Germany, however, as had been shown by M. Miemietz and M. Unger, the basis of medical treatment was that the patient should choose his own physician in accordance with the confidence he placed in him. This view had, for a time, been to some extent negated by the advent of social insurance, but had since again become predominant.

Curative treatment was a matter that concerned the doctor and his patient. Preventive treatment should endeavour to take its place between these two parties. He did not want to dwell on the distinction between curative and preventive treatment. On the contrary, there must be co-operation between the two. In Germany, a definite distinction actually existed, because the medical practitioner was a free agent, while the preventive doctor was an official. Some form of co-operation must be found. In Germany, this took the form of what was known as an *Arbeitsgemeinschaft*.

The preventive staff should be trained for the task they had to fulfil. Unfortunately, they had not yet reached the stage of training which was desired. This was natural in view of the great development in preventive medicine which took place after the war, when it was found impossible to supply a sufficient number of trained men.

As Dr. Konrich had already stated, preventive doctors in Germany were State or communal officials. They received training in special courses at the institute of social hygiene. They were forbidden to give curative treatment in order that they might not compete with the ordinary practitioners.

He regarded the auxiliary personnel as being of great importance — in particular, the nurses. In Germany, these were of various kinds, such as nurses attached to friendly societies, communal and district nurses, etc. One of their main objects must be to give instruction in the necessity for health measures. For this purpose they should be as well trained as possible. With regard to the question as to whether nurses should have general or specialised training, he inclined to the opinion that general nurses were the most suitable. If only specialised nurses were used it might happen that the same small district would require one nurse for children's diseases, one for pulmonary diseases and one for venereal diseases. Not only would that be expensive, but the advice given might be contradictory. In rural districts, this would tend to confuse and undermine the confidence of the population. He therefore concluded that, for preventive treatment in country districts, it was better to employ nurses with a general training.

The auxiliary staff should also include health inspectors. These should be used, not only for inspection, but also for educating the population, especially the children, in questions of hygiene. In addition, the health inspector could also supervise foodstuffs. In Germany, food control was not in the hands of the health officials, but was dealt with by pharmacists. The health inspector could be used to connect up these two services.

With regard to the premises to be used for health work, he pointed out that there were no health centres in Germany, but that there were other equivalent arrangements. The general health work was in the hands of the district hospitals, which gave hospital

treatment and training. He thought it important that small districts should establish premises for health services in the same way as they built churches and schools.

He was not in favour of adopting a too rigid form for the health centres. At any rate, such rigidity would not be acceptable to Germany. He was in favour of simplifying the system and thought that could be done by means of improved transport. Instead of many small centres, it would be better to centralise the work in one larger centre.

He agreed with the guiding principle, expressed in the reports by the experts and by Dr. Stampar. He appreciated, in particular, Dr. Stampar's remark that there were various ways of reaching the same object. He hoped Dr. Stampar would agree that the method used should not be the same everywhere, but that the object should be to obtain the same good results.

M. ANDRONESCO (Roumania) wished to mention a few problems which he thought might be referred to the Fourth Committee. They were as follows :

- (1) Artificial light as a social pathological factor ;
- (2) Labour and health ;
- (3) The bases of society as a social pathological factor ;
- (4) Shame as a social pathological factor ;
- (5) Sterilisation of criminals, idiots, tubercular cases and degenerates ;
- (6) Intoxication as a pathological factor ;
- (7) The value of applied hygiene ;
- (8) Food reform ;
- (9) Insufficiency of respiration as the greatest social pathological factor ;
- (10) Physical culture ;
- (11) The most urgent and the easiest means of attaining adequate hygiene.

Dr. A. ISMAIL (Turkey) read his report (document Conf.Hyg.rur./24) on the position of public health work in Turkey.

He added that Turkey, like other countries, awaited with great interest the results of the discussions in the Conference in order to use them for improving health work in rural districts.

On behalf of his Government, he thanked the Spanish Government and the Council of the League for their initiative in convening for the first time a Conference on Rural Hygiene.

The PRESIDENT intimated that the report they had just heard was being translated and would be distributed on the following day.

M. PALLIS (Greece) wished for the moment merely to comment on the French representative's reservation regarding Dr. Stampar's report — a reservation which clearly illustrated the contrasting conditions prevailing in the various countries. Where, as in Greece, there was a shortage of private doctors in country districts, it was essential that the public health officers should, as Dr. Stampar proposed, be permitted to give medical treatment. In Greece, 87 per cent of the medical profession was concentrated in towns, leaving only 13 per cent, or an average of one doctor for every 7,000 rural inhabitants. The disproportion was even greater in northern Greece, where the settlement of more than half a million refugees on the land had compelled the Government to establish rural dispensaries with paid doctors and chemists to ensure the settlers the benefits of a medical service. The principles advocated in Dr. Stampar's report were those which had just

been adopted by the Greek Government in organising its new health and social services, but these were still of too recent a date to furnish useful material for discussion by the Conference.

He associated himself with Dr. Ferguson's remarks on the rather vague reference made in the report to the financial side of rural hygiene schemes. Were these to be maintained by voluntary contributions or from the proceeds of taxation? His own suggestion was that the problem might be solved if communes were given the proceeds of the land tax or the tax on agricultural produce. In Greece — and he thought it was true of other countries — peasants were constantly claiming relief from such taxation on the ground of losses suffered through hail, drought, floods, etc. The Greek Government had recently suspended collection of the agricultural produce tax for two years. He believed that, if the peasant realised that such revenue would be expended on local requirements, such as health services, by their own communal authorities, they would be less anxious to claim exemption, and communal health services would enjoy permanent and regular support. That was the solution he intended to propose to his own Government for solving the difficult problem of decentralisation.

In regard to the other questions on the agenda, his delegation was there to receive rather than to give information. For the last twenty years the Greek health services had had to concentrate their efforts on combating epidemics and other natural catastrophes, to the neglect of the more normal activities of health administrations. They hoped now to embark on a new era of health re-organisation, which would certainly bear good results.

Dr. BERRY (Irish Free State) supported the President's suggestion that the First and Second Committees should hold joint meetings, since it was almost impossible to differentiate in rural areas between curative and preventive medicine.

In Irish rural districts, curative services were in the hands of the dispensary doctor, a part-time public official whose salary was borne on the local rates, but partially repaid by the Central Government. The office was pensionable and the holder could practise privately. His duties were to give free medical assistance and medicine to the poor in his district and, where necessary, secure hospital treatment for them. Such activity, he thought, had a wider scope than that of health insurance funds, since it covered the destitute, the peasant the farmer, the small shopkeeper and their families. The Irish authorities would be very reluctant to change a system which had proved to be in the best interests of the sick and needy in rural areas. For preventive work, it was found that county health units were the most satisfactory. The dispensary doctor acted as medical officer of health for his district, co-operating with the county medical officer of health. The latter was a whole-time specially qualified doctor responsible for the public health of the county, for maternity and child-welfare schemes, for school medical inspection, tuberculosis and venereal disease work, etc. It had been found that the active co-operation of the local practitioner in rural areas was indispensable. As regards the decentralisation of medical and public health work in rural areas, he was convinced that there should be a central authority to supervise and co-ordinate policy, otherwise chaos and confusion would result.

Dr. Garcia TORNEL (Spain) thought there was a dangerous inconsistency between Dr. Stampar's statement that "primary rural health centres are intended, not only for consultation, but also for the treatment of patients" and the conception of such institutions expressed in Professor Parisot's report as primarily centres of diagnosis and prevention. In special cases, a health centre might supervise or administer the medical treatment; but, if that practice became general, friction might develop between doctors employed in such centres and the local practitioners.

Dr. SPAAS (Belgium) explained that it was a mistake to think of Belgium as a pre-dominantly industrial country ; there were provinces in which 60 per cent of the population inhabited small villages of less than 1,000 people. The law formerly left the organisation of health services to the local authorities, who depended for technical advice on committees composed of representatives of the medical profession. Latterly, the Government had found it necessary to set up a special health inspection department staffed by qualified doctors, and there was an arrangement by which communal authorities could obtain the services of doctors attached to this department free of charge. In general, all the activities of health services were free and at the entire disposal of doctors.

As regards infant mortality, the Government directed its energies to co-ordinating the work of private child welfare agencies, such as *l'Œuvre nationale de l'enfance*, and maternity clinics. Pre-natal care and money grants to women in child-birth were provided by the law of the country. Subsequent supervision took the form of school medical inspection and school and open-air holiday camps were provided for delicate children.

The campaign against tuberculosis throughout Belgium was conducted by the *Association belge contre la tuberculose*, the *Ligue nationale belge contre la tuberculose* and *l'Œuvre de la préservation de l'enfance*, all of which were now incorporated in *l'Œuvre nationale belge contre la tuberculose*. This had now been officially recognised as a public utility body, and the Government had granted a subsidy of 100 million francs for the purchase of a complete anti-tuberculosis equipment. Efforts were also made to remove children from an undesirable environment, and to arrange for public lectures on social health topics. Anti-venereal work was another activity encouraged by the Government, which supplied medical practitioners with remedies for free distribution. Normal and domestic economy schools had also been created to train instructresses in health and social welfare work and enable them to give country girls the instruction necessary to fit them for more efficient discharge of their daily tasks.

Dr. KOLAR (Czechoslovakia) thought that the various reports submitted to the Conference would form a solid foundation for international collaboration in solving rural hygiene problems. They furnished ample evidence of the progressive impoverishment, both material and physical, of the rural population, and of the possibility of remedying these evils by adopting the proposals made. It was certainly true that many of the latter involved considerable expenditure, and much propaganda work would be necessary to convince the agricultural population of their necessity. The economic productivity of some of the proposals was obvious even in a time of depression like the present. He referred to water supply improvements, land bonification, the treatment of solid and liquid sewage, etc. The economic advantages of other proposals — *e.g.*, treatment of household garbage — were not so directly obvious and would require further investigation. Steps should also be taken, he thought, to convince the populations concerned that the value of rural sanitation lay as much in the ultimate advantages of lower sickness and death rates as in the actual sanitary improvements introduced. He could not sufficiently stress the importance of propaganda aimed at stimulating an intelligent interest in rural hygiene problems and directed by professional agriculturists to ensure its penetrating to the circles most concerned. Such propaganda work should not concern itself with model installations or equipment which were beyond the means of the average peasant, but confine itself to practical local requirements.

He would venture to cite the instance of a private organisation for rural health which had been working for three years in Czechoslovakia and drew its members from all classes of rural society. One of its activities was the opening of crèches for the children of agricultural labourers and smallholders during their parents' working hours. In addition, the society conducted annually a special propaganda campaign in the Press with a view

to popularising prophylactic measures. Illustrated posters were sent out and villagers were invited to attend lectures organised locally with the active collaboration of doctors, veterinary surgeons, schoolmasters and agricultural training-school teachers, etc. Hints were given to communes on the disposal of sewage and the improvement of health conditions by means of town planning and drainage schemes, construction of water-supply systems, inspection of wells, appointment of school doctors, establishment of public medical consultations, etc. Training courses for lecturers were also organised and printed lectures supplied for the use of doctors, veterinary surgeons and agricultural inspectors. The society could already claim to have achieved considerable success, though in general there was still much scope for pioneer work and for greater co-ordination of methods.

In conclusion, he wished, on behalf of the Czechoslovak Ministry of Agriculture, to thank the Spanish Government and the League of Nations, as well as the various Rapporteurs, for the action taken in convening the Conference.

Dr. STAMPAR (Yugoslavia) wished to reply briefly to the various questions raised concerning his report.

He had certainly not intended to imply that any one system could be applied indifferently to all countries.

On the delicate question of the relations between the local practitioner and the health centre, he would be very loth to oppose the legitimate interests of the medical profession. When a country, however, was inadequately supplied with rural doctors, health services could not possibly be dispensed with. Moreover, health service implied arranging for the introduction of a medical practitioner into a district where he would live and work — in other words, the creation of a primary or secondary health centre. Did they imagine, again, that, in a district where malaria or venereal disease was endemic, a single general practitioner could possibly deal with the situation ?

As regards the point raised by Professor Konrich on the differentiation between curative and preventive medicine, he thought that, in districts such as he had just described, a doctor must combine both activities.

His German colleagues had mentioned the desirability of permitting patients to choose their own doctors, but there were rural districts in some countries where no doctor could be found, or where the population was quite indifferent to the need for medical attention. They could not afford, he believed, to wait until education had done its work in such districts, and rural health services should be introduced even at the risk of antagonising the medical profession. Similarly, health insurance funds could supply a deficiency in health services in rural districts. The question was whether, in such cases, members should be entitled to choose their own doctors or should be bound to accept the services of the doctor appointed by the fund.

On the important question of the resources available for organising rural health services, he referred them to the recommendation in the report that the population should be sufficiently interested to provide the necessary funds itself. His own experience went to show that even the poorest district was prepared to contribute in kind when it realised the value of the benefits conferred.

Dealing with Dr. Ferguson's remarks concerning the rôle of local consultative committees, he reiterated the view expressed in the report that such bodies had no official standing or power of decision, but should act as a link between the population and the health centre. As regards the relation of primary health centres to local authorities, he conceived that the former should be executive organs of the latter.

The PRESIDENT declared closed the discussion on item 2 of the agenda.

SEVENTH MEETING (JULY 2ND, 3.30 P.M.).

Constitution of the Fourth Committee. — Opening of the Discussion on Item 3 on the Agenda (Sanitation). — Statements by the Rapporteurs, M. Bürger (Sewage and Refuse), M. Krul (Water Supplies), Mr. Ross Hooper (Housing), M. Buttini (Bonifications).

President : Professor G. PITTALUGA.

Appointment of the Drafting Committee.

The PRESIDENT stated that, in accordance with the resolution adopted at the previous meeting, the Drafting Committee had been appointed as follows :

Chairman : Dr. CHODZKO.

Members : Dr. A. SHEARER (*Chairman of the First Committee*),
Dr. Bela JOHAN (*Chairman of the Second Committee*),
M. VIGNEROT (*Chairman of the Third Committee*),
Dr. SEIFFERT,
Dr. SORENSEN,
Professor Innocencio JIMENEZ,
M. VIMEUX,
M. C. BUTTINI,
M. KRUL,
M. PIRC,
M. UNGER,
Dr. Sterling BERRY.

The President hoped that the appointments to the Committee, which it had been agreed to limit to twelve members, would meet with the Conference's approval.

Discussion of the Third Item on the Agenda.

In view of the extremely technical character of the problems referred to the Third Committee, the Plenary Conference would confine itself to hearing summaries of the four reports submitted by the Rapporteurs of that Committee.

M. BÜRGER (Germany) summed up the main conclusions of his report on the disposal of sewage (document Conf.Hyg.rur./25).

M. KRUL (Netherlands), in summing up his report on water supplies in rural districts, said that his task had been to a great extent lightened in that he had been able to compile it from the full data contained in the experts' reports, the information gained from their discussions, and from the Health Section's documents. He then gave a resumé of the report (document Conf.Hyg.rur./7.)

M. Petrik had spoken in his report of the progress made in centralising the Netherlands water system. He had described the material side only without dwelling on the lengthy negotiations with municipal councils which were often necessary before the

scheme could be carried out. Its promoters, however, were inspired by William the Silent's words : " I go forward, though hope seems vain ; I persevere, though I may not succeed ".

Mr. Ross HOOPER (Great Britain) presented his report on rural housing (Conf. Hyg.rur./3). Progress towards a better rural housing system would of necessity be slow ; in some districts twenty-five years had passed before the separation of human beings and animals in farm dwellings had been achieved. Thanks, however, to State aid and encouragement and to the co-operation of the many organisations concerned, good results would undoubtedly be achieved. The Sub-Committee of Experts had purposely confined itself to submitting a general scheme only, on the lines of which each country could draw up a programme suitable to its local conditions, customs and financial situation.

Since M. Bonamico was unfortunately not able to be present M. BUTTINI (Italy) thanked the Conference for allowing him to submit the report on " Bonifications " (document Conf.Hyg.rur./6). He gave a brief summary of M. Bonamico's report.

The PRESIDENT thanked the different Rapporteurs on behalf of the Conference. As already decided, no general discussion on their reports would take place in plenary session. As they were highly technical, they would be submitted direct to the Third Committee for discussion.

Work of the First and Second Committees.

The PRESIDENT stated that, if their Chairman so wished, the First and Second Committees could hold joint meetings in view of the connection between the subjects with which they were called upon to deal.

EIGHTH MEETING (JULY 6TH, 4 P.M.).

Submission and Adoption of the Reports of the First, Second and Third Committees.

President : Professor G. PITTALUGA.

Submission of Reports by the Three Committees.

The PRESIDENT stated that the three Committees had concluded their work and drawn up reports containing the conclusions arrived at.

He would call on the Chairman of the three Committees to report on their work.

Dr. SHEARER (Great Britain), Chairman of the Committee on Medical Assistance, submitted his report.

No observations were made.

The report was adopted.

Dr. JOHAN (Hungary), Chairman of the Committee on Rural Health Centres, submitted his report.

No observations were made.

The report was adopted.

M. VIGNEROT (France), Chairman of the Committee on Sanitation in Rural Districts, in submitting his report, quoted a passage from the memorandum of the Health Organisation regarding the necessary measures of sanitation in rural areas. He thought the object proposed had been attained by the resolutions as finally accepted by his Committee.

No observations were made.

The report was adopted.

Professor MADSEN, President of the Health Committee of the League of Nations expressed his satisfaction at the co-operation that had been established between the sanitary engineers and the League's Health Organisation. He hoped this co-operation would continue in the future.

(The meeting adjourned in order that the Fourth Committee might meet.)

NINTH MEETING (JULY 6TH, 6 P.M.).

Submission and Adoption of the Report of the Fourth Committee.

President : Professor G. PITTALUGA.

Dr. LUTRARIO (Italy) thanked Professor Bernard for the friendly reference to the Italian delegates made at the beginning of his report to the Fourth Committee.

Professor Léon BERNARD (France) thanked Dr. Lutrario, and hoped that his words would find expression in deeds, and that he would shortly be able to supply the Italian co-operation without which the work undertaken could not be completed.

Report of the Fourth Committee.

Dr. CHODZKO (Poland) (Chairman of the Fourth Committee) submitted the report of the work of that Committee (document Conf.Hyg.rur./34). The Fourth Committee asked the Conference also to adopt the proposals contained in Professor Léon Bernard's report, which it had just approved.

He laid particular stress on resolution (g), reading as follows :

" (g) The Conference wishes to assert the importance in the sphere of rural hygiene of close co-operation between public relief officials, sanitary engineers, architects, agricultural experts, hygienists and general practitioners, the representatives of health insurance institutions, agricultural trade unions and private agencies.

" The Conference on Rural Hygiene has furnished a striking example of the fertility of such collaboration, which, begun under the auspices of the League of Nations, should be continued and developed. "

The Conference would certainly be unanimous in congratulating the Spanish Government on its initiative and the Council of the League of Nations on having responded to that initiative. It would, however, be a poor reward for both parties if the present Conference were to be the last. He was expressing a general sentiment in hoping that a similar conference would be convened in a few years' time to consider the practical results of their present deliberations.

The PRESIDENT repeated Dr. Chodzko's statement made to the Fourth Committee — that the question of co-operation in the enquiries which Professor Léon Bernard's report suggested should be undertaken remained open. The Health Organisation would welcome the names of further schools, institutes and establishments anxious to share in the enquiry.

The report of the Fourth Committee was adopted, together with Professor Léon Bernard's report on the meeting of directors of European schools of health.

The PRESIDENT thought it was a matter for congratulation that the proceedings of the Conference were terminating by the adoption, not only of conclusions on the questions which had been studied beforehand by the Preparatory Committee, the Committees of Experts and the Rapporteurs, and exhaustively discussed in the Conference Committees, but, in addition, by the adoption of a programme of practical enquiries initiated by the Conference, which would be highly valuable in future and had already been entrusted to technical organisations.

The President said that the Conference would doubtless discuss the concluding recommendation of the Fourth Committee's report at its next meeting. Some time, of course, would have to elapse before the practical work to be undertaken in the various countries yielded really valuable results. It would only be after such an interval that the Conference could re-assemble and examine the results achieved.

In conclusion, he was gratified to note the useful collaboration initiated with the International Labour Office and the International Institute of Agriculture at Rome.

TENTH MEETING (JULY 7TH, 11.45 A.M.).

Closing Meeting.

President : Professor G. PITTALUGA.

There being no formal agenda, the Président said he would call on those members who had expressed a desire to speak.

Dr. BERRY (Irish Free State), in congratulating the Spanish Government, the President, the Health Organisation and all concerned on the success of the Conference, reminded delegates that it was the Irish member of the Council who had reported on the original Spanish proposal to convene the Conference. He felt sure that the Council would approve the results achieved, and that the work done during the past week would herald the opening of a healthier era for rural populations.

Professor MIYAJIMA (Japan) said he had benefited greatly by passive participation in the Conference's proceedings. Though concerned, and rightly so, with European

problems, the recommendations made could not fail to be of advantage to Eastern countries also. Japan would certainly try to adapt them to her own situation and would be very glad if the League later decided to call an international conference which would continue the work so successfully begun.

M. PALLIS (Greece), in adding his congratulations on the success of the Conference, was convinced that its final recommendations would be immensely valuable, particularly to countries less advanced in the sphere of public hygiene. He hoped steps would be taken to put the recommendations into effect by those present holding administrative positions or capable of influencing departmental policy, as well as to convince the respective national delegates to the Assembly of the significance of the results achieved. He concluded with a tribute to the generous support given to many national health services by the Rockefeller Foundation.

Professor PUNTONI, on behalf of the International Institute of Agriculture, Rome, expressed his gratification at the success of the Conference under the able chairmanship of Professor Pittaluga. The Institute at Rome had a long record of pioneer work in this sphere and would be glad to continue its co-operation in raising the standard of rural hygiene.

Professor JITTA (Netherlands) wished to express his gratification at the results achieved and, in particular, to stress the unanimity which had characterised the Conference and added to the weight of its recommendations.

Dr. LUTRARIO (Italy) expressed his delegation's gratification at the unanimous conclusions adopted by the Conference — the result, he thought, of the excellent preliminary spade work done by the Preparatory Committee and the Health Organisation, as well as of the conciliatory spirit shown by all the delegates. The ultimate effect would be to restore the countryside to its rightful position as the source of national energy and healthy initiative.

M. UNGER (Germany) was grateful for the opportunity afforded to representatives of rural health insurance institutions to participate as delegates in such an important Conference. He trusted that the intimate co-operation so auspiciously established would continue to increase and lead to the greater uniformity and effectiveness of rural health services.

Professor KONRICH (Germany) thought the Conference marked a turning-point in the development of public health work, which had hitherto concentrated its main efforts on urban populations. There could be no radical improvement in health and general fitness if the interests of the rural section of the community were neglected. They were now, he felt, on the right path.

Dr. SPAAS (Belgium) mentioned that his delegation's inability to participate in the deliberations of the directors of schools of health by no means implied a lack of interest in the subject. The Belgian authorities had frequently helped in working out model programmes of public health studies and had always put their practical experience at the disposal of the Health Section.

M. TIXIER (International Labour Office) said it had always been the object of the Labour Office to promote the welfare of both urban and rural workers. Having co-operated in all the preliminary proceedings, they were extremely glad to note the final success achieved

by the Conference. In view of the large number of interests — medical, engineering, social insurance, departmental, etc. — represented, it was a really remarkable result to have produced a series of unanimous recommendations. He thanked the Conference for its recognition of the important part which health insurance institutions could play in promoting rural hygiene.

M. FIERLINGER (Czechoslovakia) said his country had so far concentrated its efforts mainly on urban health schemes, but would now be glad to make practical use of the Conference's recommendations regarding the organisation of rural hygiene. He associated himself with the tributes paid to all responsible for the success of the Conference.

Dr. CHODZKO (Poland) was particularly glad to see the idea of rural health centres internationally approved and the right of the country folk to enjoy the same facilities as urban populations officially recognised in what might be called the "Peasants' Charter". Equally gratifying was the unprecedented unanimity which had prevailed and which augured well for the future when the recommendations were given general effect.

Dr. SARRAZ-BOURNET (France) associated himself with the sentiments of previous speakers and expressed the hope that the findings they had adopted would contribute to ensuring the social peace which the world so urgently needed.

Dr. Sadi DE BUEN (Spain) acknowledged the compliments paid to his country for suggesting the convening of the Conference, and said the recent political change in Spain had intensified the efforts made to improve rural health conditions by both Governmental and local authorities. The proceedings of the Conference would be extremely valuable to those authorities, and he hoped that, in the course of time, they would be able to point to tangible results.

Dr. PIRC (Yugoslavia) noted that the conclusions adopted proved that the Yugoslav authorities were proceeding on the right lines in the schemes which they had been pursuing for the past ten years, and in which they had had the invaluable co-operation of the Health Section and the Medical Director. It was a notable testimony also to the importance of the Conference that, at such a time of economic depression, it had assembled so many prominent experts. He hoped that the work of standardising methods of rural health organisation would be continued.

Mr. HOOPER (Great Britain) thought the great accomplishment of the Conference was the charter of health services which it guaranteed to rural workers.

Professor MADSEN (Health Committee) congratulated all concerned on the striking success of the Conference. Rural hygiene had been one of the earliest preoccupations of the Health Committee as evidenced by the practical encouragement it had given to national effort in countries like Bulgaria, Greece, Yugoslavia, etc. The work done in those countries and the unanimity which had been such a feature of the present Conference should encourage its members to persevere and deal ultimately with yet wider international problems.

The PRESIDENT spoke as follows :

Ladies and Gentlemen, — You will, I hope, allow me to remind you that, when I had the honour to open the proceedings of this Conference ten days ago, I ventured to recall those wise and profound words of Lessing : " Men should not be judged by their success, but by the effort that they make in order to succeed ". We have made our effort.

That might content us. Nevertheless, it is only right that, having reached the end of our task, we should stop to consider the results achieved and to delight in that ample satisfaction which is always the fruit of effective and useful effort.

All of you who have shared in this work will carry away with you the certainty that the effort has been effective. We started with a general discussion, full of interest, on the three great questions included in the agenda. New questions arose and we unanimously agreed to refer them for closer study to the committees into which the Conference split up. We thus adopted the true modern method of collective work which calls for both competence and specialisation. The directors of the schools of hygiene and public health of various European countries, who met during our Conference, placed themselves at the disposal of the Fourth Committee, and, in co-operation with that Committee and in accordance with your instructions, drew up a scheme of work. All of this work was submitted for your consideration and approval in the plenary meetings held yesterday and this morning.

These really important meetings have led to a series of practical conclusions, on which we have all agreed and which all of you, as heads and members of the different national delegations, will take back to the administrations and organisations of your own countries as principles which should provide the basis for reforms in hygiene and public health in agricultural and rural districts.

Medical assistance, its technical improvement, the possible utilisation of health insurance, the organisation of health services in rural districts, sanitation in regard to housing, water supplies, sewage, manure, the soil and the improvement of working methods — all these questions have been thoroughly considered, and on them all we have reached clear and practical conclusions.

It is obvious that our task does not finish there. We must all become the apostles of the work which we have planned together and of which we can each foresee the effect in our own countries.

May I, as President, and on behalf of you all — for I am proud of the way in which you have always shown your confidence in me — express the warmest thanks to the Rapporteurs, Professor Parisot, M. Stampar, M. Unger, Mr. Hooper, M. Bürger and M. Bonamico, and to the members of the Committees of Experts who laid the foundations of this work in the memorandum that was distributed by the Secretariat. Finally, I would like to thank those who have collaborated with us from the very outset, the technical members of the Health Section of the League of Nations, and particularly Dr. Boudreau, for the devotion they have shown and for the heavy work they have successfully completed, and also the Medical Director, Dr. Rajchman, who has given our Conference the benefit of his enthusiastic support.

I am sure that this first European Conference on Rural Hygiene will mark an epoch in the history of hygiene in agricultural and rural districts. For the first time on so large a scale and with so much authority, practising physicians, health officers, administrators, agriculturists, engineers and organisers of agricultural associations have met together for the thorough study of those questions which are most important for the improvement of conditions of life in rural districts from the standpoint of hygiene and health. It will not be the last time. There is still a long road to be travelled, but this Geneva Conference, convened by the League of Nations, marks the starting-point on that road, clearly indicates its stages, and assures us of an international co-operation, both technical and moral, which redoubles our strength and our faith.

CHAPTER III. — CONSTITUTION, MINUTES AND REPORT OF THE FIRST COMMITTEE (MEDICAL ASSISTANCE).

List of Members of the First Committee. — Minutes of the First Meeting (July 2nd, 3.30 p.m.)
and of the Second Meeting (July 3rd, 3.30 p.m.). — Report.

FIRST MEETING (JULY 2ND, 3.30 P.M.)

Chairman :

Dr. A. SHEARER *Great Britain.*

Vice-Chairman :

Dr. A. ISMAIL *Turkey.*

Present :

Mr. GULDENTOPS	<i>Belgium,</i>
Mr. SPAAS	<i>Belgium,</i>
Mr. J. LANGER	<i>Czechoslovakia,</i>
Dr. H. PELC	<i>Czechoslovakia,</i>
Mr. MERTZ	<i>Denmark,</i>
Mr. Jules GAUTIER	<i>France,</i>
Mr. S. DE LESTAPIS	<i>France,</i>
Prof. J. PARISOT	<i>France,</i>
Mr. SARRAZ-BOURNET	<i>France,</i>
Prof. F. KONRICH	<i>Germany,</i>
Dr. W. MIEMIETZ	<i>Germany,</i>
Dr. PRAUSNITZ	<i>Germany,</i>
Mr. K. UNGER	<i>Germany,</i>
Dr. J. FERGUSON	<i>Great Britain,</i>
Dr. A. LUTRARIO	<i>Italy,</i>
Mr. A. ROBERTI	<i>Italy,</i>
Dr. D. RIO	<i>Italy,</i>
Mr. J. BEIJERMAN	<i>The Netherlands,</i>
Mr. Ferraz DE ANDRADE	<i>Portugal,</i>
Mr. ENESCO	<i>Roumania,</i>

Dr. A. CANAL-COMAS	<i>Spain,</i>
Mr. I. JIMENEZ	<i>Spain,</i>
Mr. Maycas DE MEER	<i>Spain,</i>
Dr. Sadi DE BUEN	<i>Spain,</i>
Mr. E. SANTIAGO	<i>Spain,</i>
Mr. L. G. TORNEL	<i>Spain,</i>
Dr. L. PIRC	<i>Yugoslavia,</i>
Mr. K. SCHNEIDER	<i>Yugoslavia,</i>
Mr. PROHASKA	<i>Yugoslavia.</i>

Observers :

Dr. NAMANO	<i>Japan,</i>
Dr. TSURUMI	<i>Japan,</i>
Mr. Espinosa FERRANDAZ	<i>Spain.</i>

Secretaries :

Dr. BOUDREAU
Dr. HUANG

The CHAIRMAN, after welcoming the members of the Committee, reminded them that their task was to study the principles and methods of ensuring medical assistance in rural areas. Each member had a special practical knowledge of the country with which he was particularly concerned, and the Committee's discussion would allow of an exchange of information. He personally would be glad to give an account of the methods employed in the Highlands of Scotland, with which he was particularly well acquainted.

The convening of the Conference augured well for the study — urgently needed in Europe — of the problem of medical assistance in rural districts.

He had accepted the chairmanship of the Committee feeling that he could rely on his colleagues' co-operation. They would, of course, speak whenever they desired to do so, but he would ask them to help his work by making as short speeches as possible.

The discussion which had already taken place in plenary session would facilitate the Committee's work, which would be based on the report of the Committee of Experts. The Committee was fortunate in counting both Professor Parisot and Mr. Unger among its members.

Dr. BOUDREAU (Secretariat), informed the Commission that Dr. Decourt, of the International Professional Association of Medical Practitioners, wished to make a statement.

The CHAIRMAN proposed to open the discussion with the consideration of Professor Parisot's report.

Professor PARISOT (France) pointed out that his report reproduced the conclusions of the Committee of Experts and some part of the Budapest report's conclusions. It would thus be simpler to study the printed document itself.

M. PROHASKA (Yugoslavia) reminded the Chairman that he had promised to give the Committee some particulars on the organisation of rural hygiene in Scotland.

M. SARRAZ-BOURNET (France) asked that the Committee's task might be clearly defined. He advocated a study of the experts' report item by item.

Dr. LUTRARIO (Italy) suggested a drafting amendment to the passage in italics in the first paragraph of the report.

The MEDICAL DIRECTOR pointed out that the Committee was not required to consider drafting amendments, the Fourth Committee having been expressly appointed for this purpose.

M. SARRAZ-BOURNET (France) had understood that it was for the Committee to frame draft resolutions to be submitted to the plenary Conference.

The MEDICAL DIRECTOR recalled that the President of the Conference had proposed to refer the various reports to the different Committees. These could enter at once upon a detailed discussion, the general discussion having taken place in plenary conference. In his view, study of the experts' report was a good system upon which to work. He feared that, if the Committee were to undertake drafting, it would not achieve satisfactory results. Such a task was better left to a small drafting committee.

The discussion on paragraphe I of the report of the experts was continued.

M. Sadi DE BUEN (Spain), Professor PARISOT (France) and Dr. BOUDREAU (Secretariat) spoke on paragraph 1 of the report.

M. PIRC (Yugoslavia) made some general remarks on the best methods to be followed in rural hygiene and prevention.

M. LUTRARIO (Italy) thought that the figure of 2,000 persons per duly qualified medical practitioner given in the report seemed too small.

M. Sadi DE BUEN (Spain), M. KACPRZAK (Poland), Dr. MIEMIETZ (Germany) and M. GULDENTOPS (Belgium), on the contrary, considered the figure justified.

Dr. LUTRARIO (Italy) accepted the figure after explaining that his objection referred to doctors giving compulsory assistance only. The number of these was fairly large in Italy, and constituted a heavy item in the State budget.

No objections were raised to paragraph 2.

M. SARRAZ-BOURNET (France) suggested the addition to paragraph 3 of a statement by Professor Parisot regarding the part to be played by pharmacists and co-operation between doctors and veterinary surgeons in cases of diseases affecting both men and animals.

With reference to paragraph 4, Dr. HUMBERT (representing the Red Cross societies), speaking as delegate of the international voluntary organisations, drew attention to the importance of the organisation of the auxiliary staff, a question even more difficult to solve than that of finding funds for voluntary societies. He pointed out the advantages of agreements between the Governments and Red Cross societies on the lines of that concluded by the Greek Government. Such agreements might be useful where rural hygiene was concerned — for instance, Governments estimating the number of centres for which the required staff might ask the Red Cross societies to supply such staff.

Dr. BOUDREAU (Secretariat) pointed out to Dr. Humbert that the part to be played by voluntary organisations was dealt with later in the report. He therefore asked him to postpone his proposals.

SECOND MEETING (JULY 3RD, 3.30 P.M.).

Chairman : Dr. SHEARER.

The Committee proceeded with the study of the experts' report paragraph by paragraph.

M. SARRAZ-BOURNET (France) proposed the insertion of a new sentence in paragraph 5, drawing attention to the connection between the organisation of the health centre and that of the health services, which were the subject of item 2 on the Conference's agenda.

Dr. BOUDREAU (Secretariat) recalled that the President of the Conference had proposed a joint meeting of the First and Second Committees in order to reach agreement on points within the competence of both. M. Sarraz-Bournet's proposal might be referred to this joint meeting.

The CHAIRMAN emphasised the necessity for close co-operation between the centre and the patient's physician.

Paragraph 5 was adopted.

With regard to paragraph 6, Dr. Sadi DE BUEN (Spain) pointed out that a large number of privately founded country hospitals existed in Spain, working under very bad conditions. The Commission might perhaps express the opinion that it would be better to do away with these unsatisfactory institutions and to concentrate on the development of more important and better equipped establishments.

Dr. BOUDREAU (Secretariat) said that it would be difficult for the Commission categorically to condemn all small hospitals, some of these being State-established. The words "hospitalisation in appropriate, suitably equipped institutions" in themselves implied that very small establishments presented disadvantages.

M. SARRAZ-BOURNET (France) agreed.

Dr. FERGUSON (Great Britain) drew attention to the conclusion reached by the Royal Commission responsible for estimating the number of hospital beds necessary per 1,000 of the population in England — namely that 1.6 beds per 1,000 persons were required in voluntary hospitals and three beds per 1,000 persons were required in public assistance hospitals.

Paragraph 6 was adopted.

Dr. GULDENTOPS (Belgium) drew attention to the danger of leaving analyses to rural pharmacists. This might encourage quack medicine. The rural population was always inclined to go to a pharmacist rather than to a doctor. Pharmacists, however, were becoming more and more content to sell patent products, thus reducing their preparatory work to a minimum.

Dr. BOUDREAU (Secretariat) recalled that Professor Parisot's proposal regarding the duties of pharmacists was to be referred to the Drafting Committee.

Professor PARISOT (France) considered it essential that analyses should be carried out in properly supervised laboratories, and that the qualifications of persons doing such work should be verified. It seemed to him that rural pharmacists did not fulfil all necessary conditions in that respect. They had inadequate time at their disposal and the constant sale of the different products they supplied made it impossible for them to undertake work requiring exclusive attention. It was preferable to entrust analyses to a biological medical expert with his own laboratory, provided that this laboratory was properly supervised, or, better still, to the primary or secondary health centre.

The CHAIRMAN drew attention to the advantages of close co-operation between the patient's physician and the medical specialist.

Paragraph 8 was adopted.

M. PROHASKA (Yugoslavia), though fully satisfied with the wording of paragraph 9, asked for an addition to it regarding the collaboration of health co-operative societies. In certain countries, these had helped to bring about the organisation of medical assistance in rural districts under the best possible conditions. In Yugoslavia, it was the co-operative societies alone which had been able to establish doctors in some of the more mountainous and isolated districts.

Dr. BOUDREAU (Secretariat) could bear personal witness to the valuable work of the Yugoslav health co-operative societies, which were a most successful enterprise. Nevertheless, he had some hesitation in recommending the addition suggested by M. Prohaska. The Committee was not very fully informed on the work of these organisations, and it might therefore be better to leave the text as it stood and to insert a special paragraph regarding co-operative societies in the explanatory text which followed it.

M. PROHASKA (Yugoslavia) considered that co-operative societies came within the category of private organisations. Since a paragraph was devoted to each of the other groups of institutions, a paragraph on co-operative societies might equally well be included.

Professor PARISOT (France) proposed that " mutual health co-operative societies " should be mentioned in the report.

This proposal was adopted.

Professor KONRICH (Germany) drew the Commission's attention to the passage referring to places where medical assistance was not yet provided and to the possibility of having recourse to persons who did not possess full medical qualifications. That provision might be very prejudicial to rural populations, and it was essential that treatment of the sick should only be undertaken by fully qualified persons.

The CHAIRMAN agreed. He noted Professor Konrich's remarks, which would be communicated to the Drafting Committee.

Mr. UNGER (Germany) also agreed. The German law on health insurance required that treatment should be given only by qualified doctors. The International Conference of Health Insurance Funds in 1927 had adopted a resolution to the same effect.

The CHAIRMAN, since the Committee had finished its work, proposed the appointment of a Drafting Committee, which would take into account the suggestions made during the discussion. He suggested that the Committee might consist of himself, the Vice-Chairman, and Professor Konrich, Professor Parisot and Dr. Unger.

Dr. BOUDREAU (Secretariat) thought that, as all the proposed changes were slight, the Committee should leave the matter in the hands of its Drafting Committee. The text drawn up would be distributed to the members, who would have every opportunity to comment upon it in plenary session.

Professor KONRICH (Germany) thanked the Chairman on behalf of the Committee, which felt that useful work had been done.

The CHAIRMAN had drawn up a statement on medical assistance in the Scottish Highlands. The roneographed text would be distributed to the members of the Committee.

REPORT OF THE FIRST COMMITTEE.

The First Committee adopted the following report :

1. In the largest sense, effective medical assistance may be considered as indicating a medical service organised in such a way as to place at the disposal of the population all the facilities of modern medicine in order to promote health and to detect and treat illnesses from their incipency.

2. In order to furnish effective medical assistance to the rural population, the Conference is unanimous in the belief that 2,000 is the maximum number of persons who can be given proper medical attention by a duly qualified medical practitioner, on the understanding that, in proportion to the growth of the health services and the needs of the people, this number may be reduced to one thousand.

3. It is desirable that the number and distribution of pharmacists, and doctors who dispense their own drugs, in rural districts should be such as to ensure that all medical prescriptions may be furnished rapidly to the rural population.

4. Such medical assistance also requires a technically qualified auxiliary personnel comprising one or more nurses, or, provisionally, in the absence of qualified nurses, other persons possessing the minimum necessary technical training. However, it is essential that this auxiliary personnel abstain from all medical treatment, such treatment being only permissible under the direction of a qualified medical man.

5. It is recommended that, in the smallest rural settlement, the patient should be able to find a person capable of rendering first aid and of carrying out the doctor's orders.

6. The rural population and rural doctors should be in a position to utilise the services of centres of diagnosis and, if necessary, of specialised treatment. Such centres should be suitably equipped and provided with a qualified staff, anti-tuberculosis and anti-venereal dispensaries, etc.

These services should maintain liaison with the patient's physician, who should be informed of the results of the examinations, or, if necessary, kept in touch with the treatment and its results.

7. Rural medical assistance also implies facilities for hospitalisation in appropriate, suitably equipped institutions.

It is recommended that there should be such a hospital for a population of from twenty to thirty thousand people, a rational organisation requiring about two beds per thousand of the population.

However, each such institution should have not less than some fifty beds.

Permanent means of communication (telegraph, telephone, etc.) and constantly available means of transport should be at the disposal of patients and doctors to permit of rapid hospitalisation in urgent cases.

8. Rural medical assistance should utilise the services of laboratories.

Simple examinations and analyses may be carried out in the hospital laboratories.

More complicated examinations and analyses (bacteriological, pathological, serological, etc.) should be carried out in large, specially equipped laboratories.

9. Rural medical assistance should also be able to utilise medical specialists.

The specialists should keep in touch with the patient's doctor, informing him of the results of the examination and of the treatment and its results.

10. *Means of Realisation* A. The realisation of effective medical assistance in rural districts demands the collaboration of the public authorities — health and welfare (assistance) — of the medical profession, of health insurance institutions, of mutual benefit associations (sanitary co-operatives, etc.), of private agencies, etc.

B. The public authorities should ensure that the entire population benefits from an effective medical assistance. By means of a rational organisation of the health services, adequately staffed with specialists, they should attempt to develop the preventive tendencies of rural medical assistance.

In the interest of effective medical assistance, it would also be desirable for the public authorities to seek to organise a rational and co-ordinated health programme on a territorial basis, taking account of local conditions.

The public authorities should stimulate, assist and co-ordinate the efforts of agencies and groups which attempt to realise effective medical assistance. They should seek to fill the gaps and avoid the duplication which may occur in the organisation of this assistance.

C. The Conference considers that, when health insurance applies to the entire body of agricultural labourers, it permits the realisation of effective medical assistance in rural districts under the best conditions.

D. Nevertheless, where health insurance has not yet been established, rationally organised, free medical assistance may intervene usefully in completing a system which partially satisfies the needs of rural populations.

CHAPTER IV. — CONSTITUTION, MINUTES AND REPORT OF THE SECOND COMMITTEE (HEALTH SERVICES).

List of Members of the Second Committee. — Minutes of the First Meeting (July 3rd, 10 a.m.)
and of the Second Meeting (July 4th, 10 a.m.). — Report.

LIST OF MEMBERS OF THE SECOND COMMITTEE.

Chairman :

Dr. B. JOHAN, *Hungary.*

Vice-Chairman :

Mr. A. PALLIS, *Greece.*

Members :

Mr. J. SPAAS,	<i>Belgium,</i>
Dr. H. PELC,	<i>Czechoslovakia,</i>
Mr. M. ZELENKA,	<i>Czechoslovakia.</i>
Mr. A. METZ,	<i>Denmark,</i>
Mr. SORENSEN,	<i>Denmark,</i>
Mr. Jules GAUTIER,	<i>France,</i>
Mr. S. DE LESTAPIS,	<i>France,</i>
Prof. J. PARISOT,	<i>France,</i>
Mr. M. SARRAZ-BOURNET,	<i>France,</i>
Mr. P. VIMEUX,	<i>France,</i>
Dr. MIEMIETZ,	<i>Germany,</i>
Dr. G. SEIFERT,	<i>Germany,</i>
Mr. K. UNGER,	<i>Germany,</i>
Dr. J. FERGUSON,	<i>Great Britain,</i>
Dr. N. WHITE,	<i>Greece,</i>
Dr. S. BERRY,	<i>Ireland,</i>
Mr. G. GIORGI,	<i>Italy,</i>
Mr. O. GORINI,	<i>Italy,</i>
Mr. A. LABRANCA,	<i>Italy,</i>
Dr. A. LUTRARIO,	<i>Italy,</i>
Mr. E. C. VAN LEERSUM,	<i>Netherlands,</i>
Dr. J. H. TUNTNER,	<i>Netherlands,</i>
Mr. Ferraz DE ANDRADE,	<i>Portugal,</i>

Dr. S. TUBIASZ,	<i>Poland,</i>
Mr. C. ANDRONESCO,	<i>Roumania,</i>
Mr. V. PASCAL,	<i>Roumania,</i>
Dr. A. CANAL-COMAS,	<i>Spain,</i>
Mr. I. JIMENEZ,	<i>Spain,</i>
Mr. R. Maycas DE MEER,	<i>Spain,</i>
Dr. Sadi DE BUEN,	<i>Spain,</i>
Mr. L. G. TORNEL,	<i>Spain,</i>
Mr. WRANNE,	<i>Sweden,</i>
Mr. M. PETRIK,	<i>Yugoslavia,</i>
Mr. PROHASKA,	<i>Yugoslavia,</i>
Dr. M. RANKOV,	<i>Yugoslavia,</i>
Mr. K. SCHNEIDER,	<i>Yugoslavia.</i>

Observers :

Mr. C. N. LOU,	<i>China,</i>
Mr. ROY,	<i>India,</i>
Dr. HAMANO,	<i>Japan,</i>
Dr. TSURUMI,	<i>Japan,</i>
Mr. CAMARHA VALES,	<i>Mexico,</i>
Mr. ESPINOSA FERRANDIS.	<i>Spain.</i>

Secretary :

Dr. CIUCA.

FIRST MEETING (JULY 3RD, 10 A.M.).

Chairman : Dr. Bela JOHAN (Hungary).

Discussion of the Report of the Preparatory Committee¹ : Chapter III.

The CHAIRMAN, after briefly explaining the origin of the Preparatory Committee's report, pointed out that the Committee would have to discuss pages 18 to 33, dealing with the most effective methods of organising health services in rural districts, bearing in mind the recommendation (see page 8) that purely veterinary questions should be omitted and only those aspects of the milk supply discussed which concerned rural districts alone. It should also be observed that their primary concern was with the principles embodied in the italicised recommendations ; matters of phraseology would be dealt

¹ See Annex 1.

with by a special Drafting Committee. Before considering Chapter 3 in detail, he would ask Dr. Gorini, who had to leave Geneva that day, to make a statement on the problem of the milk supply in rural districts.

Dr. GORINI (Italy) wished to stress the importance of hygienic methods in milk production and mentioned that the new Italian law of May 29th, 1929, known as the "Milk Charter", marked a definite advance in this direction. Sanitary treatment of milk by filtration, pasteurisation, sterilisation, etc., concerned urban centres primarily, and was of secondary importance as compared with the production of really healthy milk. Milk, infected or impure on production, was well known to be capable of transmitting numerous infectious diseases, so that the introduction of hygienic methods of milk production would help enormously in combating tuberculosis and other social diseases. Another aspect of hygienic milk production was the educational effect on the persons employing them of the methods adopted to ensure the absolute cleanliness of the milk. The whole question was one which merited more than a mere casual reference. He would be glad to submit a detailed draft for a special chapter on the subject.

The CHAIRMAN said they would now take the consecutive paragraphs of Chapter III.

Paragraph 1.

Dr. TUBIASZ (Poland) proposed the insertion of a reference to a third form of rural health organisation in which both the State and the local authorities co-operated, and described the practical operation of such a system in Poland, which, after some initial difficulties, was now working satisfactorily.

Dr. BOUDREAU (Secretariat) explained that the Preparatory Committee, though fully aware of the existence of other forms, had decided to mention only the two principal systems. Reference could be made in the explanatory notes to the method adopted in Poland.

Dr. PROHASKA (Yugoslavia) suggested referring in paragraph 1 to private health co-operative societies.

The CHAIRMAN thought paragraph 1 was intended to cover official organisations only, but the suggestion made might be considered in connection with the later paragraph on the work of private agencies.

Dr. LUTRARIO (Italy), on a point of drafting, suggested that the words "General Considerations" should form the heading of the whole section and not of paragraph 1 only.

Agreed.

Dr. FERGUSON (Great Britain) presumed there was no intention in paragraph 1 to hamper any action taken by local authorities to improve the general level of health services.

Dr. BOUDREAU (Secretariat), agreed that the Drafting Committee should be asked to make it quite clear that local initiative should be encouraged.

Paragraph 1 was adopted.

Paragraph 2.

Dr. LUTRARIO (Italy) noticed that various expressions were used throughout the report for "health officer", and suggested that the Drafting Committee should adopt a uniform title for that official.

Agreed.

— In reply to a query by Dr. Metz (Denmark), Dr. BOUDREAU (Secretariat) confirmed that it had been agreed that public health officers should be fully qualified clinicians.

Paragraph 3.

Dr. LUTRARIO (Italy) suggested the insertion in line 1, paragraph 2, of the words "generally speaking", after "correspond", in view of the fact that there might be special geographical conditions militating against strict adherence to the administrative boundaries.

Agreed.

Dr. BERRY (Irish Free State) emphasised the desirability of rural health districts being sufficiently large to enable health officers to trace the exact source of disease; the figure of 50,000 was a very fair estimate.

Dr. FERGUSON (Great Britain) asked whether the report defined the duties of a medical officer of health. In England, these varied considerably according to the type of local government district. School inspection, maternity and child welfare, tuberculosis and other such services, for example, came under the county council, whereas matters of environmental hygiene, such as sewerage, water supplies and housing, were under the district council. A law had recently been passed providing, in effect, that medical officers of health should, in the future, be whole-time officers; if necessary, two or more districts might combine for this purpose. He took it that the Conference was elaborating a theoretically ideal programme, which it was clearly understood might not be applicable *in toto* to every country.

Dr. BOUDREAU (Secretariat) confirmed that there was a paragraph further on in the report outlining the general duties of medical officers of health.

The CHAIRMAN added that the object of the Conference was to lay down a minimum programme of rural health measures applicable to the maximum number of countries.

Paragraph 4.

Adopted.

Paragraph 5.

Dr. LUTRARIO (Italy) noticed that no mention was made in paragraph 1 of the clerk's qualifications, although paragraph 2 defined those of the health nurses and the sanitary inspector. He suggested the insertion of some such word as "administrative" before "clerk".

The VICE-CHAIRMAN thought that, in most countries, clerks were assumed to have certain professional qualifications.

The point was referred to the Drafting Committee.

Paragraph 6.

Adopted.

Paragraph 7.

Dr. LUTRARIO (Italy) questioned the appropriateness in paragraph 2, line 3, of the expression "in the absence of doctors". In Italy, the doctor was compelled by law to notify infectious diseases. The case also of heads of public institutions, such as prisons, did not seem to be covered.

The CHAIRMAN thought it was primarily the doctor who had diagnosed the case who should make the report.

Dr. PRAUSNITZ (Germany) suggested that auxiliary health personnel should also be required to make notifications.

Dr. PELC (Czechoslovakia) thought the problem should be submitted to a joint session of the First and Second Committees.

The CHAIRMAN agreed, but emphasised the necessity of the Second Committee taking a preliminary decision on all such points.

Dr. SPAAS (Belgium), supporting Dr. Lutrario's suggestion, mentioned that, under Belgian law, it was the doctor's duty to notify infectious cases, but that, where he failed to do so, the head of the family took the necessary action. On the further question of the declaration of the cause of death, Belgian law had overcome the objection to the violation of professional secrecy by the adoption of a special form which he could, if necessary, submit for the Committee's information.

In reply to the Spanish delegate's proposal that a seventh point should be added to sub-paragraph C, dealing with the supervision of minor rural industries, like brick-making and the manipulation of vegetable fibres, which were dangerous to the health, the CHAIRMAN thought this came under C (4).

Dr. METZ (Denmark) suggested the addition under C (3) of a reference to the work done on behalf of the aged and infirm.

Dr. SARRAZ-BOURNET (France) confirmed that health officials in various countries had the right to supervise institutions for the aged and infirm, and agreed that the suggested addition was necessary.

Dr. BOUDREAU (Secretariat) thought the suggestion made by Dr. Metz regarding the aged and infirm, as well as that of Dr. Hamel regarding crippled children, might be dealt with in the explanatory notes, particularly as they were social rather than health problems.

Dr. TUBIASZ (Poland) endorsed Dr. Pelc's proposal to insert a reference to supervision of all curative institutions and medical personnel.

Dr. BERRY (Irish Free State) strongly deprecated the idea of a health officer officially supervising the curative work of local practitioners.

The CHAIRMAN fully agreed. A health officer might, however, be given power to supervise the professional qualifications of doctors setting up in practice in his district. He supported Dr. Pelc's suggestion to submit the question of the hygienic supervision of public institutions and their staffs to a joint meeting of the First and Second Committees.

Dr. BOUDREAU (Secretariat) reminded members that most countries already had a system of registration or licensing for medical practitioners.

Dr. FERGUSON (Great Britain) was strongly averse to any semblance of interference with the internal administration of voluntary hospitals; State-supported institutions were a different matter. Had the Preparatory Committee any views on the provision of hospital accommodation ?

The CHAIRMAN replied that this problem would be dealt with by the First Committee (cf. report, page 13 (6)), and confirmed Professor Parisot's remark that the recommendation proposed would refer solely to supervision by the health officer of the hygienic condition of hospitals, etc.

Dr. FERGUSON (Great Britain) thought reference should also be made to private nursing homes. These were usually subject to supervision by the health officer as regards suitability of accommodation, equipment and staff, but not as regards the treatment administered.

The CHAIRMAN agreed that such a reference might be inserted in the explanatory notes. He concluded that the recommendation regarding administrative supervision of the hygienic conditions of public medical institutions and personnel *was adopted*.

Dr. BOUDREAU's *suggestion that the point regarding supervision of doctors' professional qualifications might be covered by some such wording as, "Where other supervision does not exist, the public health officer should exercise such powers", was adopted*.

Dr. PELC (Czechoslovakia) drew attention to the disproportion between sub-paragraphs A, B and C of paragraph 7; C should be given relatively more prominence.

Dr. BOUDREAU (Secretariat) concurred and suggested that the Drafting Committee be asked to reverse the order of A and C.

Agreed.

Paragraph 8.

The VICE-CHAIRMAN stressed the desirability of organising the consultative committees on the basis of the village commune with a membership composed of the mayor, councillors, priest or pastor, schoolmaster and one or two women.

Dr. BOUDREAU (Secretariat) confirmed that that was the sense of the English text of the paragraph.

Dr. TUBIASZ (Poland) wished to have the conjunction " or " in line 4 changed to " and ".

Dr. LUTRARIO (Italy) was sceptical of the value of such committees, and suggested substituting the words " advise on the co-ordination of " for " co-ordinate " in line 1 of paragraph 2.

The CHAIRMAN thought it would really be the duty of the public health officer to co-ordinate health activities.

Dr. FERGUSON (Great Britain) deprecated the tendency of the Conference, in its desire to set up an ideal scheme, to overload the health officer at first with duties which would come to him naturally as the health work grew. He felt that it might delay progress if the health officer were made to appear too powerful. He felt that, in a formal document, it would be more prudent to devolve the responsibility primarily on the committee or the council, though in practice the health officer's advice would be usually adopted.

The CHAIRMAN said Dr. Lutrario's suggestion would be referred to the Drafting Committee.

Paragraph 9.

Adopted.

Paragraph 10.

Adopted, the Drafting Committee to consider the substitution of " administration " (Lutrario) or " communities " (Sarraz-Bournet) for " authorities ".

Paragraph 11.

Dr. MIEMIETZ (Germany) would like to see a reference made at the end of paragraph 1 to the medical profession.

Dr. BOUDREAU (Secretariat) sympathised with the view, but, as the recommendation had entailed very laborious negotiations between health insurance fund representatives and the experts, doubted whether any amendment could now be made.

M. VIMEUX (France) demurred to any change being introduced in the present wording. Indirectly, the medical profession would always be able to collaborate — at any rate, in France. If the profession wished a direct reference to be inserted, it might be done in the following paragraph.

Dr. DECOURT, speaking on behalf of thirty-two medical associations, would like to see a reference to the profession inserted in paragraph 11.

Dr. LUTRARIO (Italy) thought the paragraph should also mention collaboration with " other similar institutions "; he was referring to such bodies as national Red Cross societies, the Balilla movement, etc.

Dr. BOUDREAU (Secretariat) stressed the essential difference between the organisations mentioned by Dr. Lutrario and public institutions like health insurance funds. The former might be referred to in a special paragraph.

M. VIMEUX (France) pointed out that the idea of the recommendation was to prevent overlapping as between authorities which had financial responsibility for health work, which was certainly not the case with the medical profession. The latter might, of course, be represented on technical committees.

M. UNGER (Germany) also demurred to any change being made in paragraph 11, the main significance of which lay in its being the first authoritative recognition of the necessity of public health authorities collaborating with health insurance institutions. He would like to see alcoholism added to the list of diseases in line 4 of the second paragraph.

Dr. HUMBERT (League of Red Cross Societies) agreed with the recommendation contained in paragraph 11, but suggested it might be made clearer that the collaboration referred mainly to the sphere of finance. As there were various private organisations engaged in combating different social diseases, it was most important to avoid working at cross purposes.

Dr. LUTRARIO (Italy) did not agree that the Red Cross was a private organisation — at any rate, in Italy. In view of its invaluable services in combating various social scourges, it should certainly be mentioned in the following paragraph.

M. PROHASKA (Yugoslavia), reverting to the proposal he had made regarding paragraph 4, now thought that paragraph 11 would be the more appropriate place to insert a reference to "health co-operative societies", particularly as social insurance was one of the activities of such bodies.

The CHAIRMAN, summarising the discussion, said the Committee had to decide on Dr. Miemietz proposal to insert a reference in paragraph 1 to the medical profession and on Dr. Prohaska's suggestion that health co-operative societies should be mentioned.

Professor PARISOT (France) proposed that paragraph 11 stand as at present worded; a reference to the medical profession might be made in paragraph 12 and to health co-operatives societies in paragraph 13.

The CHAIRMAN assumed the Committee would agree to the proposal, and also to that of M. Unger for adding alcoholism to the diseases mentioned in paragraph 2, line 4. Due recognition of the importance of the medical profession could be given by devoting a special paragraph to the work and duties of doctors.

Agreed.

SECOND MEETING (JULY 4TH, 10 A.M.).

Chairman : Dr. Bela JOHAN.

Discussion of the Report of the Preparatory Committee¹ : Chapter III (Continued).

Paragraph 12.

The CHAIRMAN proposed the insertion of the words " the medical profession " after " authorities " in line 1.

Professor PARISOT (France) thought the French text of the first sentence needed improvement, and that there should be a direct reference in sub paragraph 2 to the work of Red Cross societies.

Dr. HUMBERT (League of Red Cross Societies) referring to the previous day's discussion on paragraph 11, thought it important to avoid giving the impression that the activities detailed in that paragraph concerned public health authorities and health insurance institutions only. The existence of the latter had not affected the work of private agencies combating tuberculosis, venereal and other social diseases. He would, therefore, propose inserting a new sub-paragraph between (2) and (3) to read :

" That a regular liaison body should be established to decide, when introducing any permanent scheme or fresh programme of rural hygiene, what voluntary contribution might be made in their particular domain by national Red Cross societies or by associations with special experience in combating social scourges. "

On the general question of the appropriateness of special reference being made to the Red Cross, he would like to emphasise the fact that such societies were on a rather different footing from other private agencies, inasmuch as they were constituted in virtue of international conventions and were specifically referred to in Article 25 of the Covenant.

He was prepared to leave his proposal in the hands of the Drafting Committee.

The CHAIRMAN felt they were all convinced of the importance of Red Cross work and equally of the necessity for adhering to the recommendation in paragraph 2 (3).

Professor PARISOT (France) suggested the insertion in paragraph 2, line 1, after " collaboration ", of the words " in the activities mentioned in the preceding paragraph ".

Professor KONRICH (Germany), stressing the necessity for wholehearted co-operation between all the factors responsible for rural hygiene, deprecated special prominence being accorded to any one private agency over another.

¹ See Annex 1.

It was agreed to adopt paragraph 12 with the three amendments as proposed, and, on Dr. BOUDREAU's suggestion, to quote in the explanatory notes (which would be retained in the final report) the allusion made in Article 25 of the Covenant to Red Cross organisations.

Paragraph 13.

M. SORENSEN (Denmark), as representing Danish agricultural associations, would like to see a special reference in this paragraph to the value of collaboration with local technical advisers in agriculture and domestic economy and with the officials of Ministries of Agriculture and Economy and the officials of Ministries of Agriculture supervising slaughterhouses, agricultural produce, etc. Such officials had unique opportunities for direct contact with the agricultural population.

The CHAIRMAN said the Drafting Committee would bear M. Sorensen's suggestions in mind.

Paragraph 13 was adopted.

Paragraph 14.

M. SORENSEN (Denmark) thought the work done by local technical and domestic economy schools should not be overlooked when referring to "folk high schools".

It was agreed to mention this in the explanatory notes.

Paragraph 14 was adopted.

RURAL HEALTH CENTRES.

Dr. LUTRARIO (Italy) thought the Committee was now faced with the most difficult part of its task — viz, the question whether rural health centres were the most effective method of organising health services in rural districts. He would not contest their value, but there was another system already operating in some countries — the county health unit plan — which gave equally satisfactory results. He would be glad in this connection to see a reference also to the Italian *medico condotto*, whose duties corresponded to those of the medical officer of health. The matter might be dealt with by inserting an introductory paragraph before paragraph 1, describing the two alternative forms of organisation, more particularly as this would make the document more consistent with Dr. Stampar's report (document Rural Hyg. Conf. I, page 7).

The CHAIRMAN agreed that the Drafting Committee might be asked to refer to the existence of an alternative system. Perhaps Dr. Lutrario would submit his exact proposals in writing.

Dr. TUBIASZ (Poland) thought the two systems were similar since rural health centres would, as in Poland, come under the county officer of health.

Dr. BOUDREAU (Secretariat) mentioned that the drafting of this section of the Report had given a certain amount of trouble, but the text before them had been adopted as that most likely to prove of value both to older administrations anxious to improve their

systems and to countries which were contemplating the creation of such an organisation. The drafting amendment suggested by Dr. Lutrario would, he thought, be an improvement, but he would deprecate any changes of substance.

Dr. PELC (Czechoslovakia) agreed with Dr. Tubiasz that the two systems were, in essence, identical ; it was merely a matter of nomenclature.

Dr. FERGUSON (Great Britain) felt that the Committee's report should contain a special paragraph describing the county health unit system. A study of document C.H.1045 showed that the underlying principles of both systems were really the same, inasmuch as they both aimed at securing that the medical officer of health should co-ordinate all services. In England, however, the scheme of primary and secondary health centres proposed by the Preparatory Committee would cut across the basis of local government administration, and therefore would be unworkable in the form proposed. In England responsibility for public health was shared between the rural district councils and the county councils, the rural district councils being responsible for environmental hygiene and the county councils for the great personal services.

Dr. MIEMIETZ (Germany) agreed that the recommendations of the report could be accepted, provided an introductory paragraph specifically mentioned that there were other systems operating equally satisfactorily.

Professor KONRICH (Germany) thought the most logical solution would be to start Section B with the " Definition " given in paragraph 4, insert next an introductory paragraph as suggested, and then proceed with paragraphs 1 to 3.

The CHAIRMAN thought the suggestion might be adopted, and asked if paragraph 4 was acceptable.

Adopted.

Paragraphs 1, 2, 3, 5, 6.

Adopted.

Paragraph 7.

Professor PARISOT (France) pointed out that, though the principle embodied in the first paragraph was not in accordance with French practice, he could not refrain from paying a sincere tribute to the results obtained by Dr. Stampar through applying this policy in Yugoslavia.

Dr. MIEMIETZ (Germany) wished to have the word " tuberculosis " omitted from line 2 of the explanatory notes to this paragraph.

Adopted.

Paragraph 8.

Dr. BOUDREAU (Secretariat) had been asked by the representatives of health insurance institutions to point out that it was not implied in 8 (a) that the public health officer had any control over health insurance societies.

Adopted.

Paragraphs 9 and 10.

Dr. BOUDREAU (Secretariat), replying to Dr. Spaas, suggested that the first " and " in line 4 of paragraph 9 might be substituted by " and/or ".

In reply to Dr. Tubiasz, he explained that the repetition in this paragraph of the activities already enumerated in paragraph 6 was intentional ; it was desirable to avoid any possible misunderstanding. Rural centres acted as filters for the secondary centres, which simply carried the same work a stage farther.

Paragraphs 11 and 12.

Adopted.

Paragraph 13.

Dr. PELC (Czechoslovakia) drew attention to a report, copies of which he could supply to those interested, on the work done in Czechoslovakia in standardising equipment for health centres. If the Committee agreed, he would suggest that the League Health Organisation should undertake a study of the problem of standardising such supplies ; a considerable saving would result in the equipment of health centres.

Professor KONRICH (Germany) thought mention should also be made of disinfection apparatus, both stationary and mobile.

Dr. Sadi DE BUEN (Spain), on the general question of organisation, wondered whether it would not be preferable to start with secondary health centres and afterwards develop the primary. He pointed to the difficulty of simultaneously training the larger number of personnel required by primary centres, and feared the quality of the work would be unfavourably affected.

The CHAIRMAN, dealing with the various suggestions made, thought Dr. Pelc's proposal might be referred for detailed study to the Health Section. He took it Dr. Konrich's suggestion applied equally to primary health centres. On the point raised by the Spanish delegate, he thought the logical procedure was to build up from the primary health centre to the secondary ; but, as Professor Parisot suggested, mention might be made in the introductory remarks of the desirability of secondary health centres being available to support the primary.

Paragraph 13 was adopted.

Paragraph 14.

Dr. HUMBERT (International Red Cross Societies) proposed the addition of " private health agencies " after the word " institutions " in line 6, so as to enable advantage to be taken of the great potentialities those agencies afforded.

Adopted.

The CHAIRMAN said the Committee's work was now finished ; it only remained to appoint a Drafting Committee to frame the conclusions which had been arrived at. He suggested the following members should act : Dr. Ferguson, Professor Parisot, Dr. Stampar, M. Unger and, *ex officio*, the Chairman and Vice-Chairman. Before

terminating the proceedings, he thought the Committee would wish to acknowledge the valuable work done by Dr. Chodzko and the League Health Organisation in so framing the draft report that it had only required two days' discussion by the Committee.

REPORT OF THE SECOND COMMITTEE.

The Second Committee adopted the following report :

A. GENERAL CONSIDERATIONS.

1. There are two principal forms of rural health organisation — the form in which the State administers the local services, and the form in which the State has only supervisory functions, the local authorities being responsible for the local health administration.

Both may give good results, and the form best suited to the rural districts of a given country depends on the manner in which the general administration of that country is organised.

When it is necessary to organise the rural health service, there is need for a State organisation which will assume control over local health work. As the country develops, its local administrative organisation becoming sufficiently strong to carry out public health work, and the education of its people in hygiene being sufficient to cause them to support the local health service, there may be a gradual decentralisation in health matters until the responsibility can be assumed safely by the local authorities.

Even when such a decentralisation has taken place, the State should preserve its right to frame the health policy which it is the duty of the local authorities to carry out, as well as its right to supervise the work and remedy the deficiencies of the local health service.

2. The public health officer fully responsible for the promotion of the health work in a rural district should give his whole time to his official duties ; the practice of medicine, in particular, is incompatible with the work of such an official. He should be a doctor trained in hygiene and preventive medicine according to the recommendations of the Conferences of Directors of Schools of Hygiene at Paris and Dresden (document C.H.888). His compensation should be sufficient to assure him a comfortable living. He should enjoy security of tenure in office, subject to the proper discharge of his duties, and have the right to a reasonable pension when age or the completion of a fixed number of years of service make it necessary for him to retire.

3. The optimum size of a rural district for which one full-time health officer may be responsible will vary with the density of the population, the means of communication, the prevailing diseases, and other local conditions. Subject to these variables, a population of from twenty thousand to one hundred thousand, or an average of fifty thousand, may be fixed, it being understood that one or more full-time assistant health officers will be needed for populations in excess of fifty thousand.

The rural health district should preferably correspond with the administrative district in view of the difficulties which would otherwise result. As, in European countries, such administrative districts almost always have populations in excess of fifty thousand, they may be suitably staffed by the appointment of one full-time health officer with the proper number of assistants.

4. The Conference considers that the health authorities of the rural districts described above should be responsible for the protection and promotion of the public health in all its aspects. The district health officer, as executive officer of the health organisation, should be entrusted with the realisation of the entire programme in order to ensure the economy and efficiency resulting from unity of direction.

5. The minimum staff for such a rural health district should consist, in addition to the health officer, of one or more public health nurses, a sanitary inspector, and a clerk.

The nurse should have a diploma in generalised public health nursing from a recognised school of health nursing or its equivalent. The Conference considers that the programme of such nursing schools should be studied by the competent commission of the League's Health Organisation.

The sanitary inspector should have received suitable training at a school or institute of hygiene. Under the direction of the health officer, he should be able to inspect foods, investigate and abate nuisances and carry out the work of rural sanitation planned by the sanitary engineer.

6. Although in many European countries the rural district as defined above cannot alone afford to employ a sanitary engineer, the services of such an engineer should be available in all rural districts. Such engineers may be employed by the central health organisation, the State or the province. Their work should be that described by the Conference at Budapest.

It is important that the programme and methods of training these engineers in all countries should be perfectly adapted to the work they are required to do. The Conference believes that the study of this subject should be undertaken by the Health Organisation of the League of Nations.

7. *The Programme of the Health Services in such a Rural District.*

(a) *Branches of Work.* — The programme of the rural health services should include measures for dealing with all the health problems which a survey of the district has revealed to be of real importance; in particular it should relate to :

- (1) Infectious disease control ;
- (2) The campaign against the so-called social diseases ;
- (3) Maternal and infant welfare and school hygiene ;
- (4) Sanitation ;
- (5) Hygiene of milk and foods ;
- (6) Education in hygiene ;
- (7) Sanitary supervision of medical institutions ;
- (8) Where there is no legislation providing for the supervision of medical practice, the public health officer might be entrusted with the registration of medical personnel.

Provision should also be made for first aid and for the transportation of the sick in urgent cases.

Laboratory facilities should be available in accordance with the recommendations of the Budapest Conference.

(b) *Notifiable Diseases and Vital Statistics.* — The effective work of rural health services depends on the completeness of their information on the prevalence of infectious diseases and on the accuracy with which causes of death are certified.

All doctors practising in rural health districts should be required by law to notify the health authorities immediately of every case of an infectious disease which they have examined. In special cases (absence of doctors), heads of families, teachers and local officials should be required to notify suspected cases to the health authorities.

The attending physician should be required by law to fill in a standard certificate of the cause of death and to transmit that certificate to the local health authorities without delay.

The health officer should utilise every means to keep in touch with the prevalence of infectious diseases in his district — routine epidemiological investigations of cases and contacts, charts and graphs, a diagnostic (consultation) service. The returns of causes of deaths should be studied regularly to the end that the general health programme may be suitably adapted to local needs.

(c) *Statistics on Social and Economic Conditions.* — In addition to vital statistics, which permit the health authorities to appraise the results obtained and to adapt their programme to local needs, statistics relating to social and economic conditions (composition of the population, housing, hospitals and other medical institutions, etc.) collected by various agencies — in particular, by health insurance institutions — should be utilised by such authorities.

8. In order to ensure the interest and enlist the support of the public, the Conference considers it advisable to set up advisory councils or consultative committees, composed of leaders in the community or of representatives of agencies¹ which carry on health work.

In the latter case, this Committee should co-ordinate the work of the agencies concerned, and there is every reason to emphasise this recommendation.

9. In view of the wide variations in health programmes in the different countries and the considerable differences in local conditions, it is not possible at present to recommend a model budget for a rural health district, or to state what should be the *per capita* expenditure for health purposes. It is also impossible to decide on the percentages of the budgets of States, provinces, districts and communes which should be allocated to the health services.

The Conference considers it advisable to secure further information on the cost of rural health services and, to this end, recommends that studies on a uniform plan should be carried out in rural districts under the auspices of the Health Organisation of the League of Nations.

The purpose of these studies should be to determine which effective form of rural health organisation is most economical and, in particular, the cost of the method described by the Budapest Conference in comparison with other methods in use.

10. Official funds for health work in rural districts are derived in varying proportions from the State, the province, the county, the district and the commune. While the State may have to provide the largest proportion when the rural health services are being organised, or in the case of poor districts, it is essential that the proportion contributed locally should gradually increase.

11. In order to avoid deficiencies and prevent duplications in the promotion of the health of the rural population, it is desirable that collaboration should be established between the public health services and social insurance institutions.

¹ This recommendation does not apply to health insurance institutions, which are treated in paragraph 11.

This collaboration might relate particularly to the following work :

- Joint study of plans for the provision of sanitary equipment in rural districts ;
- Establishment of vital statistics ;
- Campaign against tuberculosis, venereal diseases, cancer, mental diseases, alcoholism, etc. ;
- Maternal and infant welfare ;
- Child welfare ;
- Education in hygiene of the rural population.

The collaboration might be realised by means of " committees of co-operation ", composed of representatives of the public health service and insurance institutions.

12. Collaboration between the health authorities, the medical profession and private health agencies (particularly the Red Cross) is indispensable in the interests of economy and efficiency. The work of private agencies is of great value in view of the interest they arouse in hygiene, and their contribution to the available health resources and equipment.

Useful collaboration between the health authorities and private health agencies within the fields of activity mentioned above presuppose :

(1) The existence of an effective rural health service and a health programme adapted to local needs.

(2) *That the work of private health agencies should be set out in the programme adopted by the responsible local health authorities.* In this way, the health officer will play an important rôle in the technical direction of the work of these and other similar agencies, as he is responsible for all public health work in his district.

(3) That, in each rural district, it would be preferable to have a single private health agency or at least a co-ordination of such agencies, thus avoiding dispersion of effort.

13. Co-operation between the public health authorities, the various agricultural technical advisers and the agricultural associations of all kinds is also highly desirable. Inspired by the desire to raise the standard of life in rural districts, these associations offer a valuable means of securing the co-operation of the rural population. The results of their work are reflected in health as well as in economic and social conditions, and they are concerned with housing and sanitation as well as with other hygienic measures.

14. The Conference desires to draw attention to the higher health standard in rural districts which is obtained by the improvement of general education by such means as the folk high schools in Denmark. Raising the general level of education by such means results in a greatly increased appreciation of hygiene and provides a fertile soil in which to implant ideas of health and sanitation.

B. RURAL HEALTH CENTRES.

1. *Definition.* — The rural health centre may be defined as an institution for the promotion of the health and welfare of the people in a given area, which seeks to achieve its purpose by grouping under one roof or co-ordinating in some other manner, under the direction of the health officer, all the health work of that area, together with such welfare and relief organisations as may be related to the general public health work.

In rural districts where such public health work has been organised for some time, it may be difficult to group all health activities under one roof or in the same organisation. Nevertheless, an attempt should be made to co-ordinate the work of existing agencies in the most effective way.

On the other hand, where a modern public health organisation is to be created in new territory, the health centre, as defined above, is the best method of attaining the desired result.

2. It is necessary at the outset to specify that rural health centres, considered as agencies particularly adapted to the promotion of public health in rural districts, constitute an integral part of the general health organisation. They are, in consequence, closely related to and dependent on all the elements which form that organisation — in particular, the State or provincial institutes of hygiene, which, in several countries, constitute the most fully developed centre on which all others may depend for technical guidance.

3. It is to be understood that the considerations which follow relate to average centres, and that, in addition to these, there may be a large number of different types, the development of any particular centre being necessarily conditioned by local exigencies.

4. There are two methods of classifying rural health centres. They may be designated as small or primary centres and as larger or secondary centres, according to their varying organisation and development ; or they may be divided into village or communal, corresponding to primary, and district (*arrondissement*), corresponding to secondary centres, according to the administrative subdivisions in which they work.

The Conference expressed its preference for the first of these classifications — that is, their subdivision into primary and secondary health centres.

There should also be branch health centres of the most simple type to enable the work of such primary centres to be carried into the smaller villages.

I. The Primary Health Centre.

5. In the general public health armament of a given country, the primary health centre, with its branch centres, represents the terminal stage ; it is the smallest agency adapted to serve the public health needs of the smallest rural area.

The working programme of this centre should be established on the basis of a preliminary survey concerning :

1. The topographical conditions of the district — density of the population, distribution (dispersion) of homes, means of communication. This information will facilitate the selection of the sites, and the determination of the number of health centres and branch health centres required.

2. The health and epidemiological conditions among the people. This information will be equally useful in establishing the centre's programme of work.

6. *The Minimum Programme of a Rural Health Centre.* — In addition to the campaign against those diseases which the survey has shown it to be of the first importance to prevent, the minimum programme of work will consist of :

(a) Maternal welfare ;

(b) Infant welfare, including pre-school and school hygiene ;

(c) Popular health education ; a practical example may be furnished by the provision of shower-baths ;

(d) Sanitation; in general, the centre should deal with all the sanitary conditions affecting the people ;

(e) Finally, provision of first aid in urgent cases.

7. In areas where the absence or insufficient number of physicians prevents the adequate provision of medical treatment, and in the case of patients unable to receive proper treatment elsewhere, the health centre should undertake this work.

On the other hand, in areas where medical care and treatment are adequately provided, the centre should limit itself to such treatment as may be necessitated by the requirements of social prophylaxis.

The adoption of this policy by the health centre will assist in securing the co-operation of the practising physician, who will be all the more disposed to co-operate as the centre, in view of its equipment, is in a position to provide him with valuable assistance in his daily practice.

8. *Personnel* : (a) *The Director*. — The primary health centre, like all other health organisations, is under the general direction of the public health officer and of the health administration of the State.

Its actual administration may be entrusted either to an expert medical officer of health (trained in a school of hygiene) or to a general practitioner with a satisfactory knowledge of medicine and the necessary supplementary training (refer to the reports and conclusions of the Conferences of Directors of Schools of Hygiene). This training should, in particular, relate to social hygiene and preventive medicine on the one hand, and, on the other, to the knowledge required to meet the specific needs of the centre he directs.

(b) *The Public Health Nurse (Health Visitor)*. — No organisation concerned with social hygiene can afford to dispense with the services of the public health nurse.

Generalised (polyvalent) rather than specialised public health nursing should be the rule in rural districts.

Depending upon the various activities of the centre, and the amount of work to be done, one nurse may serve one or more centres.

By means of an intelligent adaptation of her work to the minimum programme of the centre, and taking into consideration such varying factors as the number of families and of patients requiring her attention, the density of the population, the distribution (dispersion) of homes and the means of communication, a nurse may undertake to serve a population of between six and eight thousand.

The nurses employed in the primary and secondary centres should be in possession of diplomas as general public health nurses (from a recognised or State school) and should have received, during their professional education, theoretical and practical training which would fit them for their rural work.

When it becomes necessary to organise or extend the rural health service, in the absence of sufficient graduate nurses, possessing diplomas in general public health nursing to fill all the vacancies, is it wise to resort, as an emergency measure and only temporarily, to the services of a personnel which has received only elementary and partial training ?

Without doubt ; but this method should be applied only on condition that it is altogether provisional, and on the understanding that the personnel so employed shall leave the service at the end of a fixed period (at the latest as soon as such personnel can be replaced by graduate public health nurses), unless they undertake to complete the training leading to the award of the diploma mentioned above.

(c). *The Midwife.* — Should the services of midwives be utilised in the work of the centre, and, if so, under what conditions and in what way ?

The fact that the midwife is in a position to render important services to the centre in the care of pregnant women (pre-natal care), as well as in the supervision of the infant during the first days of life, is beyond question.

In these respects, the midwife will become a useful assistant to the nurse entrusted with this work, solely on the condition, however, that she possess the proper qualifications, not only as a result of her training (diploma in midwifery), but also on account of the special instruction she has received in the work entrusted to her.

Under these conditions, the midwife may be attached to the personnel of the centre, to carry out these well-defined tasks, under the direction of the medical director of the centre. The possibility of utilising her services in this capacity will be facilitated in the case of midwives already in the employ of villages (communes).

(d) *The Sanitary Inspector.* — The sanitary inspector will be entrusted with the supervision and execution of minor sanitary improvements (under the technical supervision and direction of the sanitary engineer attached to the secondary centre), as well as of the measures having to do with general health work, such as disinfection, etc.

II. *The Secondary Health Centre.*

9. The secondary health centre is a more fully developed organisation than the primary centre on account of its greater completeness of equipment, its larger personnel and the wider scope of its work.

The secondary centre directs and co-ordinates the work of primary centres and, at the same time, ensures liaison between them and all other health and welfare agencies — in a word, all agencies connected with the promotion of public health.

10. *Programme.* — In addition to its work as a primary centre (in its immediate neighbourhood) and to the prevention of those diseases which have been shown to be important problems by the preliminary survey already mentioned, the secondary centre should deal with the following :

- (1) The campaign against tuberculosis ;
- (2) The campaign against venereal diseases ;
- (3) Maternal welfare work ;
- (4) Infant welfare work (including the child of pre-school age) with special emphasis on the welfare of the child of school age (school polyclinics) ;
- (5) Health education — first, for the general population ; second, by means of special courses and field work for (a) doctors, (b) nurses, (c) midwives, (d) sanitary engineers and inspectors ;
- (6) Sanitation ;
- (7) Laboratory analyses, of a simple and routine character.

The Conference was of the opinion that, in addition to this work, the centre might undertake the provision of first aid in urgent cases and ensure the prompt transport of sick and accident cases by supervising the proper organisation of this service.

11. *Personnel* : (a) *Medical Director*. — The medical director of the secondary centre should be a full-time physician trained in public health ; this work should preferably be entrusted to the medical officer of health in charge of the district.

(b) *Nurses*. — The rules set out above concerning public health nurses also apply here, it being understood, however, that, in view of the greater development of the secondary centre, the nursing staff attached to it should be in proportion to the work.

(c) *Midwives*. — The considerations set out above concerning the employment of midwives apply also to the secondary centre.

(d) *The Sanitary Engineer*. — Sanitary engineering work forms an integral part of the work of the secondary centre.

This service should be directed by a sanitary engineer with special training for rural work who will be attached to the staff of the centre or seconded for that purpose from the central institute, according to local conditions.

The sanitary engineering work in the district served by the secondary centre will, in general, deal with all matters concerning major and minor sanitation, such as provision of pure water, sewage and refuse disposal, housing, etc.

(e) *The Sanitary Inspector*. — As many as may be necessary, in view of local conditions (see the considerations above respecting these inspectors).

(f) *Laboratory Technicians*. — In the administration of the public health services, it should be emphasised that, as a general rule, the laboratory investigations (which not only necessitate the most careful technique, but also a fully experienced staff and the most complete equipment) should be undertaken at the institute of hygiene, and that only analyses of the most elementary and routine character should be made at the secondary centre.

Consequently, it will not be necessary in most cases to secure for the centre the services of an expert laboratory technician, as it should be possible to utilise the existing staff for the elementary work which may have to be done.

The State institute or central hygienic laboratory will utilise the secondary centre as a depot and centre of distribution for its sample containers.

This is the personnel essential for the administration of such a centre ; but, in case of greater development of one or more of its sections, it may become necessary to secure the services of other technicians (for X-rays, etc.).

Naturally, a suitable subordinate personnel will be required for its internal administration.

12. *Committees which might assist the Primary and Secondary Health Centres*. — The Conference was of opinion that the work of these centres might receive greater support through the establishment of committees ; first, the official health committee provided for by the sanitary legislation of the State ; secondly, a non-official committee, including in its membership representatives of the local administration, the medical profession, social insurance institutions, the teaching profession, the clergy, private welfare agencies, and, in general, of all who might contribute to the development and the prosperity of the centre on account of their moral, political or financial influence.

13. *Equipment*. — The secondary centre should be fully equipped in accordance with the requirements of public health and modern medicine. In particular, there should

be : a standard Röntgen-ray outfit (a mobile outfit as well, if necessary) ; shower-baths ; motors for the transport of the staff.

• The Conference considered that failure to provide the staff with the means of transport to enable them to do their work rapidly and to reach all parts of their district would reduce greatly the scope of their technical work.

14. *Relationship of the Centre to Other Health Agencies.* — Certain of the agencies with which the health centre should be in (relationship secondary health centres, specialised dispensaries, institutes of hygiene) also form integral parts of the general health organisation of the country. In such cases, the proper relationship already exists. With others (establishments for treatment and prevention, hospitals, sanatoria, preventoria, social insurance institutions, private health agencies), relationships should be established which will permit the centre to obtain their help either directly or through the secondary centres.

CHAPTER V. — CONSTITUTION, MINUTES AND REPORT OF THE THIRD COMMITTEE (SANITATION).

List of Members of the Third Committee. — Minutes : First Meeting (July 2nd, 5.30 p.m.) : Procedure : Opening of the Discussion on Water Supplies. — Second Meeting (July 3rd, 10 a.m.) : Close of the Discussion on Water Supplies, Opening of the Discussion on Housing. — Third Meeting (July 3rd, 3.30 p.m.) : Continuation of the Discussion on Housing ; Discussion on Bonifications, Opening of the Discussion on the Disposal of Sewage. — Fourth Meeting (July 4th, 10 a.m.) : Close of the Discussion on Sewage and Refuse. — Report.

LIST OF MEMBERS OF THE THIRD COMMITTEE.

Chairman :

M. M. VIGNEROT *France.*

Vice-Chairman :

M. M. PETRIK *Yugoslavia.*

Members :

Mr. K. LERCH	<i>Austria,</i>
Mr. J. VAN DER VAEREN	<i>Belgium,</i>
Mr. R. KOLAR	<i>Czechoslovakia,</i>
Mr. ZELENKA	<i>Czechoslovakia,</i>
Mr. S. SORENSEN	<i>Denmark,</i>
Mr. AUGÉ-LARIBE	<i>France,</i>
Mr. M. BONIS-CHARANCLE	<i>France,</i>
Mr. DABAT	<i>France,</i>
Mr. Jules GAUTIER	<i>France,</i>
Mr. P. VIMEUX	<i>France,</i>
Dr. B. BÜRGER	<i>Germany,</i>
Dr. W. MIEMIETZ	<i>Germany,</i>
Dr. G. SEIFFERT	<i>Germany,</i>
Mr. H. R. HOOPER	<i>Great Britain,</i>
Mr. A. PALLIS	<i>Greece,</i>
Mr. D. WRIGHT	<i>Greece,</i>
Dr. B. JOHAN	<i>Hungary,</i>
Mr. N. SIEGESCU	<i>Hungary,</i>
Mr. C. BUTTINI	<i>Italy,</i>

Prof. V. PUNTONI	<i>Italy,</i>
Mr. G. ZAMBELLI	<i>Italy,</i>
Dr. J. N. M. JITTA	<i>Netherlands,</i>
Mr. W. F. J. M. KRUL	<i>Netherlands,</i>
Dr. J. H. TUNTNER	<i>Netherlands,</i>
Mr. Ferraz DE ANDRADE	<i>Portugal,</i>
Mr. M. ENESCO	<i>Roumania,</i>
Mr. G. ARROYO	<i>Spain,</i>
Mr. J. Coll CREIXELL	<i>Spain,</i>
Mr. H. SANTIAGO	<i>Spain,</i>
Mr. J. LAZARO-URRA	<i>Spain,</i>
Mr. N. H. WRANNE	<i>Sweden,</i>
Mr. R. RUBATTEL	<i>Switzerland,</i>
Dr. M. RANKOV	<i>Yugoslavia.</i>

Observers :

Mr. LOU	<i>China,</i>
Professor PRAUSNITZ	<i>Germany,</i>
Dr. HAMANO	<i>Japan,</i>
Dr. TSURUMI	<i>Japan,</i>
Mr. TOWNSEND	<i>United States of America.</i>

Secretary :

Dr. FORESTIER.

FIRST MEETING (JULY 2ND, 1931, 5.30 P.M.).

Chairman : M. VIGNEROT (France).

Changes in the list of members of the Committee (document Conf. Hyg. Rur. 15 (1)).

The name of Mr. Juan LAZARO-URRA, Professor at the School of Sanitary Engineering, Madrid, was added to the list of members of the Committee and Dr. PELC's name was removed.

Procedure of the Third Committee.

The CHAIRMAN recalled that the principal documents before the Third Committee were the reports of Dr. Bürger, Mr. Krul, Mr. Ross Hooper and Mr. Bonamico. The substance of those reports had been given at the plenary Conference and there was no need to go over the same ground. There was also the experts' report, contained in the Brown Book, which consisted of two main parts — the principles derived from the matter

contained in the technical chapters and the technical chapters themselves. All the passages in italics constituted the conclusions proper adopted by the experts, whereas the passages in roman type were comments drawn up by the Health Section, which took into account the preliminary reports of the experts and the discussions to which those reports had given rise.

The Chairman considered that it would be well to begin by examining the technical chapters, taking last the opening chapter, which was given up to general principles and could, if necessary, be amended in accordance with the discussions on the technical chapters.

Examination of the Preparatory Committee's Report : Chapter IV.

As Dr. Bürger's report had not yet been distributed in the French and English texts, the President proposed to begin with Section B, " Water Supply " (page 39 of the Document C.H./1045).

B. WATER SUPPLY.

Introduction.

The conclusion which served as an introduction to the chapter on water supply was read.

M. KRUL (Netherlands) considered that it would be well to add something about the collaboration of co-operative societies and agricultural associations.

The CHAIRMAN said that that collaboration was concerned with the various aspects of rural sanitation and would be more suitably placed among the general principles which would be considered at the close of the discussion.

Mr. Ross HOOPER (Great Britain) remarked that, in the second sentence of the commentary, it was stated that an abundant water supply " has also an important indirect influence, due to the cleanliness it promotes in houses, stables, dairies, etc. ". He proposed that the word " indirect " should be deleted.

M. KRUL (Netherlands) said that that term was used in contradistinction to the word " direct ", used in the sentence before.

Dr. BÜRGER (Germany) considered, in regard to the last words of the first conclusion, that the supply of pure water in rural districts was of great value, not only for the promotion of agriculture, but, in general, for civilisation. He proposed to substitute the word " civilisation " for " agriculture ".

The CHAIRMAN explained that " the promotion of agriculture " had been intentionally mentioned in order to draw the special attention of farmers, from the professional point of view, to questions of this kind.

As the result of an observation by Mr. TOWNSEND (United States of America), the first words of the comments : " an abundant supply of water " were changed to " an abundant supply of pure water ".

M. VAN DER VAEREN (Belgium) thought that the Committee was required to give its opinion only on the passages in italics — that is, on the conclusions proper and not on the comments.

M. PALLIS (Greece) feared that the discussions of the Committee would be unduly prolonged if it had to discuss the comments in detail.

Dr. JITTA (Netherlands) endorsed this point of view. The Conference would give its opinion on the conclusions finally reached by the Third Committee and not on the report of the Preparatory Committee — that is, the comments.

M. VIMEUX (France) also supported this proposal.

M. BONIS-CHARANCLE thought that it would be well to draw attention to the fact that the consumer would be all the more desirous of using an abundant water supply if he had less trouble in obtaining it. Individual branch pipes should therefore be encouraged.

M. VIMEUX (France) pointed out that this suggestion should properly come under Section I, "Public Water-Supply Systems".

The first conclusion was adopted.

1. *Public Water-Supply Systems.*

(a) *For a Number of Villages.*

On the proposal of M. KOLAR (Czechoslovakia) the word "villages" was replaced by "settlements" (in French "agglomérations").

The CHAIRMAN pointed out a misprint in the second line of the conclusions in the French text.

Dr. JITTA (Netherlands) considered that it would be better to make a transition between the first and second conclusions. For that purpose the following passage from Mr. Krul's report might be reproduced :

"The choice of the most effective and economical method depends on varying factors, such as the hydro-geological and topographical conditions, the climate, the administrative organisation of the country, economic conditions, the density and character of the population."

The CHAIRMAN wondered whether that passage had not better be placed in the comments.

M. DABAT (France) pointed out that the words : "when there was no special circumstance against it" summed up very clearly what Dr. Jitta meant to say.

Dr. BÜRGER (Germany) proposed to replace the words : "a large supply is always to be preferred to a smaller one" by "a large supply always has certain advantages over a smaller one".

He would also be in favour of deleting the following phrase : " This system is to be recommended, particularly in the more populated areas " ; otherwise, it would sometimes be necessary to bring the water supply over too great a distance in the more populated areas.

M. JUAN LAZARO-URRA (Spain) observed that it was not sufficient to recommend an improved water supply ; a recommendation should also be made that there should be a water supply of some kind, for certain rural districts in Spain, for instance, were entirely devoid of such a supply, in which case the settlements should be considered first. They should at least have the water required for drinking and domestic purposes, for watering the animals and washing clothes.

M. AUGÉ-LARIBE (France) pointed out that it would be sufficient to add to the first paragraph of the conclusions of Section 5 regarding the Central Organisation : " Such an organisation would also constitute a service of hydro-geological information with a view to ascertaining the water available, etc. "

M. RUBATTEL (Switzerland) believed that the third Committee ought to simplify the conclusions rather than complicate them. It seemed to him preferable to adopt texts to which everyone might subscribe without trying to introduce considerations affecting any given country in particular. In his opinion, it would be better to retain only the first sentence of the first paragraph under discussion.

M. DABAT (France) pointed out that by so doing the second paragraph would disappear, though it contained an idea not implicit in the first three lines of the first paragraph.

The CHAIRMAN added that it was the duty of the Conference to give practical advice to the various health administrations. Without being drawn into long commentaries, it was necessary at least to provide sufficiently full explanations.

M. RUBATTEL (Switzerland) replied that what was required was the adaptation to varying national conditions of the principle implied in the three first lines. Each country had specialists capable of adapting that principle to its own special conditions.

The CHAIRMAN pointed out that the Committee had before it three proposals :

(1) M. Bonis-Charancle proposed to call attention to the advantage of a water supply in the home.

(2) Dr. Jitta wished to supplement the conclusion under discussion by a passage which would serve as a connecting-link.

(3) M. Rubattel asked that the conclusions in general should be reduced, which raised a question of principle regarding the manner in which the Committee intended to pursue its work.

M. KRUL (Netherlands) thought it important to distinguish clearly between the general principles and the comments. If the principle laid down in the first sentence, concerning the advantages of a centralised water-supply system, were considered sufficient, the principle expressed in the following sentence — namely, that an extensive system was better than a small system — would be discarded. There were, however, villages without any water-supply system in which it might at first seem desirable to begin by installing a small system, whereas it was better to take a broader view (except, of course, in certain local circumstances) and group villages together in a regional system rather than instal a small system in each village.

M. AUGÉ-LARIBE (France) proposed that the two paragraphs of the conclusion under discussion should be maintained intact.

M. RUBATTEL (Switzerland) would, in any case, oppose the sentence : " a large supply is always to be preferred to a smaller one ". In Switzerland, there were whole cantons in which the villages were supplied, not by grouping communes, but by an organisation directly dependent on the Government. The tradition was firmly rooted in Switzerland that each commune should have its own water supply under Government supervision in individual cases.

Mr. ROSS HOOPER (Great Britain) thought that the two paragraphs of the conclusion in question embodied sound principles. Rough indications were of little practical use. It could obviously not be expected that all the suggestions contained in this conclusion would be directly applicable to every commune ; but, in any case, detailed explanations had more advantages than disadvantages. Each country would select those proposals which suited its special conditions.

M. VAN DER VAEREN (Belgium) proposed that the first and second sentences of the first paragraph should be combined to read :

" The system of central water supply distributed to a number of communities is to be preferred to a small one, where practicable, under local conditions. "

M. RUBATTEL (Switzerland) was prepared to agree to a motion on these lines. He proposed that a drafting committee should be asked to consider any new texts which might be suggested.

The first paragraph was adopted, with the text proposed by M. Van der Vaeren.

Second Paragraph.

Prof. PUNTONI (International Institute of Agriculture) drew attention to the sentence : " It follows that the source which can be developed most economically may be selected, as purification will remove the possibility of danger, " etc. In his view, the method of treatment was not a matter of indifference. The filtration method was costly and the use of chlorine had other disadvantages ; in particular, it gave the water an unpleasant taste which remained.

The text should be modified so as to show that purification must be considered as a remedy when a better quality of water was not available, but that the kind of treatment employed was not a matter of indifference. In some cases, it would be better to spend more money on the installation and thus economise later on purification.

The CHAIRMAN pointed out that the Committee was at present considering public water supply—*i. e.*, very large systems for which springs were not always found. It was in these cases that, for want of better methods, the water must be purified. It was stated in the conclusion that purification would be easier according as the system was more extensive. With regard to the supply for individual villages (paragraph (b)), it was stated further on that purification processes requiring technical supervision which would be impracticable in rural districts should be avoided.

Professor PRAUSNITZ (Germany) made the following remarks, based both on his personal experience of the Breslau water-supply service and on the great difficulties which

had been encountered in Western Germany in villages dependent on centralised supply systems. These difficulties had arisen particularly from the use of chlorine, which gave a most unpleasant taste. The disadvantage was smaller in towns than in country districts, where there was a risk of peasants losing faith in a system devised according to hygienic principles and returning to their well water. Would it not be better, from the economic point of view, to spend more on obtaining water which was good at its source than to use surface or other water which required purifying and necessitated a system demanding very careful supervision ? Moreover, in spite of all the supervision exercised in the villages in question in Western Germany, serious epidemics had broken out.

The CHAIRMAN pointed out that the draft conclusions referred to purification only where it was necessary and were not concerned with the case of individual villages. There was no doubt that efforts must be made to find naturally pure water before taking the risk of a process of purification ; it was only stated that, if treatment was necessary, it would be more satisfactorily carried out in the case of a large supply.

M. RUBATTEL (Switzerland) had not the slightest desire to criticise co-operative societies, but feared that, by retaining the expression " co-operation of a number of villages ", the Committee might appear to be recommending a system of co-operative societies.

The Committee decided to replace the word " co-operation " by " grouping ".

The CHAIRMAN asked Prof. Puntoni whether he insisted on a change of drafting or whether it was sufficient for the various explanations to be recorded in the Minutes.

Prof. PUNTONI (International Institute of Agriculture) explained his intention. The conclusion seemed to say that, if there were two sources — a pure source requiring certain installation expenses and a less pure source requiring less expense of that kind but necessitating purification processes — the second should be preferred ; that should, however, not always be the case.

M. AUGÉ-LARIBE (France) thought it would be sufficient to replace the word " source " by " system " in the sentence, " It follows that the source which can be developed most economically may be selected ". Thus, if the purification system was shown to be the more costly, it would not be the more economical.

The CHAIRMAN thought that the sentence might be omitted so as to obviate any anxiety on the point.

M. GORNI (International Labour Office) considered, however, that it would be useful to maintain the suggestion that, when there was an association of communes, there might be greater probabilities of finding water.

M. VAN DER VAEREN (Belgium) proposed that, in the last sentence, the words " any modern method of purification " should be replaced by " any effective method ".

At the CHAIRMAN's suggestion, the Committee decided to omit the word " modern ".

The second paragraph was adopted with the various amendments.

Constitution of a Drafting Committee.

On the proposal of Dr. BOUDREAU, the Committee decided to ask the Chairman to appoint a small drafting committee.

SECOND MEETING (JULY 3RD, 1931, 10 A.M.).

Chairman : M. VIGNEROT (France).

Examination of the Preparatory Committee's Report : Chapter IV (continued).

B. WATER SUPPLY (continued).

1. Public Water-Supply Systems (continued).

The CHAIRMAN stated that, in view of a suggestion made by the Secretariat, the procedure for examining the report would be changed. The Committee's task was to discuss the experts' report, but it must leave the drafting of any proposed amendments to the Drafting Committee.

M. ZAMBELLI (Italy) suggested inserting in the chapter on public water-supply systems an account of what had been done in Italy. He referred, in particular, to the construction of aqueducts mentioned on pages 32 and 64 of the document Conf. Hyg. Rur. 13.

The CHAIRMAN stated that this information would be brought to the notice of the Secretariat, who would no doubt endeavour to include it in the report.

M. KOLAR (Czechoslovakia) pointed out that paragraph (b), which was entitled "For Individual Villages", might also refer to a group of villages, and he thought the heading should be changed.

He also suggested changing the order of the various sections under the heading "Water Supply" as follows : (1) Public Water-Supply Systems ; (2) Individual Water Supplies ; (3) Purity of the Water ; (4) Supervision of Water Supplies ; (5) The Central Organisation.

The CHAIRMAN pointed out that the Committee had only to discuss questions of principle. It was unnecessary to raise questions regarding the re-arrangement of the report unless they involved some important principle. He therefore proposed to leave this question to be settled by the drafting committee.

Dr. JITTA (Netherlands) suggested that the end of the first paragraph of paragraph (b) should be worded :

" In order to secure, as far as possible, water free from any dangerous contamination. "

The CHAIRMAN did not agree with this amendment, as he considered that, if the water was not subject to purification, it should be free from the possibility of contamination.

Dr. JITTA (Netherlands) thought it would never be possible to ensure a water free from any possibility of contamination. It might be possible to omit the words " the possibility of ".

The CHAIRMAN suggested retaining the original wording and adding " whenever used without purification ".

M. KOLAR (Czechoslovakia) suggested inserting in the second paragraph of paragraph (b), " especially from the point of view of technical supervision ", in order to show that there might be other reasons for avoiding the necessity of systems of purification.

The CHAIRMAN said that remark would be noted for the drafting committee.

M. BONIS-CHARANCLE (France) suggested inserting the following text :

" The consumer will have all the more desire to use water in abundance if he has little difficulty in procuring it. The ideal solution is to instal a water supply in the house or the farm or, more generally, within reach of the consumer. "

M. KRUL (Netherlands) asked whether this applied to pipe water or to individual supplies.

The CHAIRMAN said it referred to both. The idea was to have the water supply as near as possible.

He said the Drafting Committee would take this proposal into consideration.

Section 1 (Public Water-Supply Systems) was adopted, subject to the modifications suggested by the Committee.

2. Purity of the Water.

M. JITTA (Netherlands) suggested altering " disinfection " to " sterilisation ".

Dr. BÜRGER (Germany) did not agree. The object was not to sterilise but to disinfect the water. If chlorine was used, for instance, it killed harmful bacteria, but did not sterilise the water.

The CHAIRMAN said these remarks would be noted. Possibly such an expression as " chemical purification " might satisfy both parties.

M. VAN DER VAEREN (Belgium) suggested altering the words " lines of defence " to " measures ".

M. PUNTONI (International Institute of Agriculture) suggested that disinfection was one form of purification and might therefore be included under point 2.

M. AUGÉ-LARIBÉ (France) suggested that paragraph 3 should read.

“ When the water is drawn by rocky formations in which fissures exist (limestone), it *must* be adequately purified. ”

With regard to point 1, “ Protection of the Source ”, some words should be added in brackets referring to the area, conduits, etc., in order to explain the meaning.

Prof. PUNTONI (International Institute of Agriculture) referred to point 4, “ Supervision ”, and suggested it would be impossible to establish international principles for the supervision of water. Different criteria were adopted for testing water for bacteria in different countries, and theoretical principles should not be rigorously applied to all. He thought some remark to this effect might be inserted in the comments on this section of the report.

The CHAIRMAN asked Prof. Puntoni to prepare a text in writing.

M. KRUL (Netherlands) approved of this idea, but thought the word “ supervision ” should not refer only to bacteria, but should be used in its widest sense, as in section 3 of the report.

Section 2 (Purity of the Water) was adopted, subject to the above comments.

3. *Supervision of Water Supplies.*

M. AUGÉ-LARIBÉ (France) wished to include a remark condemning open conduits for water supplies.

The CHAIRMAN pointed out that this idea was covered by paragraph 2 of Section 2, “ Purity of the Water ”, where reference was made to the protection of the source and supervision of the supply.

M. AUGÉ-LARIBÉ (France) nevertheless thought that a sentence should be inserted deprecating the use of open conduits.

M. BUTTINI (Italy) thought that, as it was impossible to exclude sources which were not absolutely pure, it was unnecessary to refer to open conduits.

The CHAIRMAN further pointed out that closed conduits could not be laid through rocks. He suggested that M. Augé-Laribe's remark might go into the comments on the report.

M. RUBATTEL (Switzerland) suggested omitting the word “ public ” in the first sentence, as this would enlarge the scope of the supervision.

The CHAIRMAN said the supervision actually referred to public water supplies. With regard to private supplies, supervision was in the hands of the police. He was therefore not in favour of omitting the word “ public ”.

M. BUTTINI (Italy) suggested that the comments on Section 3 should include a statement of the great progress made in Italy, where 210,000,000 lire had been spent on rural water supplies in the last seven years.

Dr. BOUDREAU (Secretary) stated that the Secretariat had been responsible for the comments on the report. It had been obliged to restrict itself to material available in the Secretariat and information contained in speeches in the committees. It had had to be very careful not to insert any information for which it could not vouch. He would be glad to receive the information with regard to Italy and to insert it in the report.

Section 3 (Supervision of Water Supplies) was adopted, subject to the above remarks.

4. Individual Water Supplies.

M. AUGÉ-LARIBE (France) approved the idea contained in the second sentence to the effect that wells, etc., should be constructed by qualified technicians. He thought, however, the qualifications should be defined. The contractors might, for instance, be required to have certain diplomas showing that they had followed certain professional courses.

The CHAIRMAN thought this idea might be inserted in the comments.

M. RUBATTEL (Switzerland) agreed with M. Augé-Laribe and thought the construction of wells, etc., should be under State supervision, as a question of public interest arose even in the case of private water supplies.

The CHAIRMAN stated that the essential principle was that the contractor should have followed a special course of instruction and should have obtained a certificate. He thought that the method of application should be left to the individual countries.

M. RUBATTEL (Switzerland) thought State control was more important than certificates.

M. AUGÉ-LARIBE (France) thought this was going too far. If such strict conditions were laid down for contractors, then no more wells would be sunk. He had no objection to State control, but time must be allowed for the training of contractors in the hygiene of water.

Dr. JITTA (Netherlands) was in favour of leaving the word "qualified" unchanged and allowing each country to settle the method of application.

M. GAUTIER (France) and M. VAN DER VAEREN (Belgium) agreed with Dr. Jitta.

M. RUBATTEL (Switzerland) did not insist on the insertion of his remarks regarding State supervision.

M. AUGÉ-LARIBE (France) suggested changing the words "adequately enforced" in the second paragraph to "strictly enforced".

The CHAIRMAN agreed.

Section 4 (Individual Water Supplies) was adopted, subject to the above remarks.

5. Central Organisation.

M. GAUTIER (France) thought the word "province" at the end of paragraph 2 should be replaced by some other term with a wider meaning — for instance, "district" or "other competent administrative unit".

The CHAIRMAN suggested leaving this to the Drafting Committee.

M. KRUL (Netherlands) suggested inserting a conclusion regarding State financial assistance. This was referred to in the "General Considerations" on page 35 (see document C.H./1045), and also under "Housing" on page 43 (document C.H./1045). He suggested adding some remarks on the lines of the first sentence of Chapter 6 of his report (document Conf. Hyg. Rur. 7).

In reply to the Chairman's remark that this idea was already included in the report, he stated that, if it were specially mentioned in the chapter on the water supply, it would serve to stress the point. Moreover, the chapter on housing already contained such a remark.

Dr. JITTA (Netherlands) supported M. Krul's proposal. He thought the good results obtained in respect of water supply in Holland were due to the financial help received from the Government.

Mr. HOOPER (Great Britain) said that many countries had found credit helpful in respect of the water supply. He would prefer not to mention one country only, but to refer to the assistance obtained in many countries.

The CHAIRMAN asked M. Krul to draft an additional paragraph to be inserted in the chapter on water supply.

M. DABAT (France) thought that, if a further paragraph on financial assistance were inserted, it might express the desirability of increasing the subsidy for intercommunal water supplies rather than for individual supplies.

Mr. HOOPER (Great Britain) thought this would penalise one party to the advantage of another. It would be unjust, as intercommunal supplies were not always possible.

The CHAIRMAN thought complete freedom in this respect should be left to the various countries.

M. DABAT (France) withdrew his proposal.

Section 5 (Central Organisation) was adopted, subject to the above remarks.

Composition of Drafting Committee.

After discussion, it was agreed that the Drafting Committee should consist of the Chairman, the Vice-Chairman and the four Rapporteurs.

Examination of the Preparatory Committee's Report : Chapter IV (continued).

C. HOUSING IN RURAL DISTRICTS.

M. GAUTIER (France) objected to the word "adequate" in the third paragraph.

M. RUBATTEL (Switzerland) suggested omitting the reference to "the depressed condition of agriculture" in the first paragraph, as the principles laid down were intended to apply even after that depression had been overcome.

He said that the reference to "the lack of cheap credit" was not true for all countries, and suggested making a change in the wording in order to bring out this idea.

Mr. HOOPER (Great Britain) recalled that, when the experts drafted Section 2, item (g), they had intended to convey the idea that the site was unsuitable and not that there was insufficient exposure to the sun.

M. PETRIK (Yugoslavia) pointed out that the site was dealt with in item (d), and that the experts, in referring to insufficient exposure to the sun, had had in view the neighbourhood of high trees.

The CHAIRMAN proposed that it should be left to the Drafting Committee to settle this question.

M. GORNI (International Labour Office) noted that item (c) referred to protection from the stables. He thought this should be extended to include manure heaps, which should be at a certain distance from the house.

M. GAUTIER (France) suggested that the opening sentence of Section 2 should begin : "The principal defects of rural housing *to be avoided* . . ."

The CHAIRMAN agreed.

Dr. JITTA (Netherlands) referred to item (b), which provided for toilet and sanitary facilities. The comments referred to water-closets. This should include privies. In this respect, the French text of the comments should be made to agree with the English text.

M. AUGÉ-LARIBE (France) thought some remark should be inserted regarding the disposal of sewage and refuse, which were often merely thrown in front of the house.

M. PETRIK (Yugoslavia) suggested that item (f) should also provide for protection from dust.

M. AUGÉ-LARIBE (France) referred to the statement in the comments that open fires without vents were unsatisfactory, and also that the water supply and the privy were frequently inconveniently situated. He thought much stronger terms should be used, deprecating these arrangements.

M. GORNI (International Labour Office) thought Section 3 of the chapter on housing should be placed either immediately after Section 1, or at the end, so that it would apply also to the housing of agricultural workers.

M. KOLAR (Czechoslovakia) objected to the French text of Section 3 (b) “*améliorer l'agriculture*”. It was not a question of improving the methods of agriculture, but of improving the economic position of the farmer.

M. AUGÉ-LARIBE (France) said that Section 3 raised an important question. It contained two ideas which were not compatible. One paragraph stated that the construction of model houses encouraged imitation, while another paragraph stated that there should be building codes prescribing minimum requirements. The latter idea implied intervention by the authorities. He thought it would be better to allow a transitional period during which the spirit of imitation would operate.

M. RUBATTEL (Switzerland) thought that the proviso contained in Section 3 (c) was unnecessary.

Moreover, there was another method of improving rural housing which was not mentioned namely, the utilisation of building societies. In two cantons in Switzerland the authorities granted subsidies to rural workers building their own houses.

M. AUGÉ-LARIBE (France) pointed out that, in the French text, the word “*emprunts*” in Section 3, paragraph 5, should be changed to “*prêts*”. He did not understand the second sentence of this paragraph.

The Drafting Committee should bring this sentence into line with the English text.

He also proposed that relief from taxation might be included as a further encouragement for proper construction.

M. BUTINI suggested that, in the last paragraph of Section 3, it should be made clear that the standard plans should satisfy the sanitary requirements of the particular district. Such requirements might vary considerably in different places.

Sections 1 to 3 of the chapter on housing were adopted, subject to the above remarks.

THIRD MEETING (JULY 3RD, 1931, 3.30 P.M.).

Chairman : M. VIGNEROT (France).

Examination of the Preparatory Committee's Report : *Chapter IV* (continued).

C. HOUSING IN RURAL DISTRICTS (continued).

2. *Principal Defects of Rural Housing* (continued).

The CHAIRMAN stated that, in order to meet a suggestion by M. Zelenka (Czechoslovakia), the Drafting Committee was requested to enquire whether indications could be given as to the height, or, more generally, as to the dimensions, of the houses. Two other suggestions by M. Zelenka regarding the bad drainage of water and the smallness of rural buildings had been met by certain additions inserted by the Drafting Committee.

3. *Methods of improving Rural Housing (continued).*

M. AUGÉ-LARIBE (France) pointed out that building codes had existed, for instance, in France, for more than twenty years, but that they were difficult to apply. When introducing a law on hygiene, the necessary time should be allowed for the parties concerned to adapt themselves to it; otherwise, the law would remain a dead letter. In order to make the experts' wording more elastic, he proposed to state that the building regulations should allow for a certain time-limit and for certain measures of education.

On the CHAIRMAN's proposal, the paragraph in question ("there should be building codes", etc.) *was extended by the words* "as well as proper preparation by measures of education".

Paragraph 3 was adopted, subject to final drafting.

4. *The Improvement of Housing for Agricultural Workers.*

M. GORNI (International Labour Office) proposed to add the following paragraph:

"The organisation in the different countries of inspection services is desirable. Such services should see that the health conditions of the dwellings of the agricultural workers are satisfactory and that the legislative provisions on this subject are enforced. The personnel of these services should have the necessary authority to enforce these legislative provisions."

In addition, in the last paragraph, the words "on this subject" would be replaced by "on the subject of the housing of agricultural workers".

Some countries already possessed a supervisory service. The new Italian law on the *Bonifica integrale* provided for an inspection service in the case of premises to be built. The new French law on workers' houses also provided for a supervisory service. These measures might be made general.

M. AUGÉ-LARIBE (France) wished the houses to be as satisfactory as possible; but, as representative of the French agricultural associations, he wondered whether the health rules recommended by the experts could be immediately applied in his country. In any case, it was going too far to state, as did the conclusions, that the houses of agricultural workers were wretched; some of them had begun to be quite decent. He proposed the text, "When housing is defective, it accelerates the exodus", etc.

In the case of poor houses, when workers find their own accommodation, what could be done when the person in question had not the means to pay a higher rent? If the employer provided accommodation for the workers, how could he be compelled to lodge them better if he stated that he had not the means? Such a policy should be based on sufficient credit. Only such recommendations should be made to the farmers as they were capable of carrying out.

The CHAIRMAN thought the second sentence in the second paragraph would meet M. Augé-Laribe's wishes.

M. AUGÉ-LARIBE (France) said he did not request any change, provided it was understood that the paragraph only gave a recommendation in respect of certain

transitional measures before legislation with penalties was arrived at. He was, however, concerned at the reference to the recommendation of the International Labour Conference, which was of the nature of a very definite obligation.

M. KOLAR (Czechoslovakia) thought there should be means of compulsion in respect of employers refusing, out of ill-will, to improve the housing conditions of agricultural workers. The French law provided that inspectors should visit the employers and that an order should be issued with a certain time-limit which might be prolonged in accordance with a definite scale. It would be insufficient to rely on mere recommendations.

Dr. JITTA (Netherlands) said that, in the Netherlands, the general inspection of dwellings was suitably regulated by law. The intention was gradually to improve the houses. If, during one of his periodical visits, the inspector placed a notice on a house to the effect that it was uninhabitable, the house had to be evacuated within six months (longer periods being provided for as an exception). If the tenants had not the means of obtaining better accommodation, the authorities might pay a part of the new rent. Dr. Jitta proposed that the end of the first paragraph should read: ". . . to cope *gradually* with this problem".

Adopted and referred to the Drafting Committee.

M. AUGÉ-LARIBE (France) agreed with M. Gorni's proposal to introduce into the text the idea of supervision, on condition that penalties were only provided for after the lapse of a certain time.

Adopted and referred to the Drafting Committee.

M. PALLIS (Greece) understood that the Rapporteur had been thinking of conditions existing in some countries, such as England, where there were large land-owners lodging numerous agricultural day labourers. In other countries, such as the Balkans, there were many small peasant owners. Should their case be dealt with or neglected? Would their houses, which were often very defective, be visited by health inspectors? Would it not be advisable to give these farmers, at any rate, the advantage of the advice of the public health service, if it was impossible to impose special obligations by legislative measures?

The CHAIRMAN explained that Section 4 dealt exclusively with the houses of agricultural workers.

M. AUGÉ-LARIBE (France) understood this expression in a very wide sense. If "agricultural labourers" had been mentioned, he would have had some remarks to make.

The CHAIRMAN pointed out that, while the preceding sections referred to farmers in general, Section 4 referred to agricultural wage-earners.

M. GORNI (International Labour Office) agreed in principle with M. Augé-Laribe. Section 4, however, only referred to paid workers. The inadequacy of the housing of the small owners raised a serious problem. It might be possible in the section relating to "methods of improving rural housing" to add a paragraph providing this category of agricultural workers with the advantage of an inspection service.

Mr. ROSS HOOPER (Great Britain), Rapporteur, said the Committee of Experts had certainly had no idea of limiting the application of the recommendations to a special category of agricultural workers. As Rapporteur, he had thought that all the recommendations on rural housing referred to all agricultural workers, without distinction between day workers and small peasant owners. He added that, in England, there were all kinds

of rural houses — houses rented by the agricultural workers and houses more or less attached to a labour contract, while there were also many farmers owning a small house and an enclosure. These workers had to be visited by the health inspector and, if they could not follow his instructions, they received the necessary assistance to improve their housing conditions. In order that the recommendations in the report should have real value, they should be of a general character and be adaptable to special methods of application.

M. RUBATTEL (Switzerland) thought that supervision in this matter should be a general rule and should be applicable to peasants' houses. The Swiss peasants were, however, still very adverse to any idea of inspection; the work of rural assistance was only beginning. The Conference should not run the risk of an accusation that it took no account of reality, and he thought that, for the time being, the resolution submitted should be dropped.

M. PALLIS (Greece) thought it was not so difficult as it would appear to improve the housing of the small proprietors. In the districts of Croatia, in the neighbourhood of Zagreb, which he had visited the previous year, he had been struck by the improvements made in those houses, without any opposition on the part of the peasants, through the energetic action of the health officials.

M. GORNI (International Labour Office), while opposing discrimination in principle, thought that some should be shown in the case under discussion. The houses of agricultural wage-earners represented a part of their wages, and the employer undertook in the contract to provide them with satisfactory dwelling conditions. But what could be done in the case of small owners when they had no money to follow the advice given by the inspectors? This raised questions of agricultural credit, propaganda, types of dwelling, etc. On the other hand, in the case of paid workers, it should be possible to compel the employers to observe the clauses of the labour contracts.

M. AUGÉ-LARIBE (France) supported these remarks. In the case of small peasant proprietors, it would be sufficient to introduce the idea of the official assistance which they might need. In this sense, a certain supervision might be recommended in respect of this category of agricultural workers. The word "control", however, which was too strong in French and still more so in English, should be replaced by an expression indicating rather the idea of advice, which the parties concerned would receive from the health inspectors, and there should be no threat of fines.

M. RUBATTEL (Switzerland) added that, in countries with the necessary financial means for making such recommendations for supervision really effective, they would be applied, but this was not at present the case in all countries.

The Drafting Committee was required to draw up a wording which would take account of the above remarks.

Paragraph 4 was adopted, subject to drafting.

5. Means of improving Rural Housing.

Dr. JITTA (Netherlands) noted that the wording of these conclusions appeared to leave a choice between the improvement of existing houses and the building of new

houses. In many cases, it was a waste of money to try to repair really useless houses. He proposed to say at the beginning of the first paragraph :

“ It is possible that rural housing may also be improved by repairs. In this case and when properly directed, ” etc.

The CHAIRMAN said it was often possible to improve existing houses, but such improvements must be durable. It was a question of judgment.

Paragraph 5 was adopted with Dr. Jitta's amendment.

D. LAND IMPROVEMENTS OR BONIFICATIONS.

The CHAIRMAN pointed out that the wording of these conclusions was defective and would be revised by the Drafting Committee.

M. BUTTINI (Italy) referred to his remarks at the previous meeting regarding rural aqueducts and credits provided for this purpose by the Italian Government ; it would be useful to take them into account in the comments. He added that in the report he had submitted on the previous day in the absence of M. Bonamico, it had not been possible to take into account various memoranda deposited after the report had been prepared. He wished to refer to the memoranda drawn up by the Chairman of the Third Committee M. Vignerot, M. Petrik, Vice-Chairman, M. Puntoni, M. Onghena, and M. Jordana, together with the reports by Dr. Bürger, Mr. Ross Hooper and M. Krul, dealing with certain questions relating to bonifications in general. The Italian Government's report, which formed part of a wider publication, referred to the organisation of the *bonifica integrale*, in Italy and drew attention to the relations between the hydrologic and geologic regularisation of mountains, and the same regularisation of plains, together with the effects of this regularisation on the health conditions of the population in the districts concerned. Although, in Italy, a system of centralisation in one Ministry had been adopted, nevertheless, in the provinces, the services had been kept separate, while their co-ordination with the central authorities was provided for ; these services included civil engineering, the podesta service and the service of agrarian technical experts.

The CHAIRMAN added that M. Bonamico had actively co-operated in preparing the conclusions of the discussion.

Prof. PUNTONI (International Institute of Agriculture) wondered whether, in the definition given in paragraph 1, a distinction should not be made between bonifications with a mainly sanitary aim for which there were State subsidies and bonifications with a mainly agricultural aim which led only indirectly to sanitary improvements ; in the latter case, the State did not intervene financially to the same extent, and dealt, in particular, with the co-ordination of bonification work.

M. ZAMBELLI (Italy) pointed out that, in Italy, the expression “ bonification ” always implied an idea of health. When the undertaking had any other aim than health, it was referred to as a land improvement.

The CHAIRMAN pointed out that the title of Section D (“ Land Improvements or Bonifications ”) made this distinction.

With regard to paragraph 3, Dr. JITTA (Netherlands) said that, at any rate in his country, it was thought very desirable that the cattle might remain for a certain time in the fresh air and not be shut up the entire year in stables.

M. RUBATTEL (Switzerland) supported this remark. If, in the conclusion under discussion, malarial districts were referred to, this was only a special case which it would be better to omit. He proposed to retain only the first line of paragraph 3.

Prof. PUNTONI (International Institute of Agriculture) explained that, in the campaign against malaria, it had been found advantageous to divert the anopheles towards the cattle by keeping the latter in the stables.

M. PETRIK (Yugoslavia) added that this procedure was not peculiar to Italy.

M. GAUTIER (France) suggested omitting the remark in question from the text of the conclusions and inserting it in the comments.

M. BUTTINI (Italy) pointed out that, as this practice was of general interest in malarial countries, it deserved more than a mere note.

The CHAIRMAN said the Drafting Committee would endeavour to find a formula which would obviate any confusion.

With regard to paragraph 2, M. KOLAR (Czechoslovakia) proposed to add to the measures for complete sanitation the recultivation of areas devastated by mining work, especially on marshy and gas-forming soil in the vicinity of coal-pits.

M. PETRIK (Yugoslavia) suggested saying, in paragraph 2, " the cultivation *and* recultivation ", and mentioning the case of mines in the comments.

Adopted.

On the question of paragraph 4, sub-paragraph 2, M. PUNTONI (International Institute of Agriculture) thought the help of the hygienist essential, not merely during the execution of the work, but also for the maintenance of areas which had been reconditioned. In Italy, malaria as a major scourge had disappeared, but it persisted in an endemic form and had to be combated by minor bonification schemes (anti-larval campaigns, etc.).

The CHAIRMAN drew attention to the statement in the concluding sentence that the help of the hygienist was particularly necessary during the execution of the work, but it was also desirable at other periods. The idea was merely to stress the necessity for such help while the workers were present, a point which had been emphasised by M. Bonamico.

M. KOLAR (Czechoslovakia) thought the help of the hygienist should only be called in for questions of health, and not when ordinary drainage works were being carried out.

The CHAIRMAN explained that the passage should be read in the light of the definition given in paragraph 1. The case only arose when living conditions were bad, more especially on account of malaria.

Prof. PUNTONI (International Institute of Agriculture) asked whether a paragraph 6 should not be added regarding State action in the case of bonification for hygienic purposes.

The CHAIRMAN pointed out that this idea was implied in the comments. Was it necessary to pose as advisers to Governments ? In the general considerations it was stated that, in all sanitary schemes affecting rural districts, the State as well as any other bodies interested, should take action.

Prof. PUNTONI (International Institute of Agriculture) would leave it to the Chairman's discretion.

Section D was adopted, subject to drafting alterations.

A. SEWAGE DISPOSAL.

Dr. BÜRGER (Germany), Rapporteur, suggested prefacing this section of the conclusions by an introduction similar to that added to other sections, emphasising the significance and the risks of sewage from the standpoint of health, and so ensuring the thorough comprehension of the scope of the recommendations made. In some country districts there was quite a mistaken idea that waste household water was harmless and could be removed in open drains.

Approved and referred to the Drafting Committee.

1. Sewerage Systems.

On the question of paragraph 2 (" Sewers can only be installed in rural communities having public water supplies piped to the individual houses "), Mr. ROSS HOOPER (Great Britain) pointed out that, in actual practice — *e. g.*, in most mining districts in the United Kingdom — sewers existed although there was no public water supply piped to the house. He suggested the wording :

" Usually sewers are only installed in rural districts having public water-supplies ", etc.

M. GAUTIER (France) enquired whether it was to be understood that sewers were not prohibited even when houses were not connected with the public water supply ; it was better to have sewers even with no water supply than not to have sewers at all.

The CHAIRMAN replied that that was of course implied.

M. DABAT (France) thought the wording of paragraph 2 was too categorical and suggested the phrase : " . . . having public water supplies ", without mentioning their being connected to individual houses.

Mr. ROSS HOOPER (Great Britain) said the expression " public water supplies piped to the individual houses " was sufficiently broad and included the various types in actual use:

Dr. BÜRGER (Germany), Rapporteur, added that the paragraph did not necessarily imply a water supply connected with a central system ; the chief point was to have enough

water to dilute the sewage and convey it to the sewer. In the absence of a water-supply system, water could be obtained from a cistern or tank above the water-closet, etc.

The CHAIRMAN said the Drafting Committee would consider the question.

Section 1 was adopted, subject to drafting alterations.

2. Disposal of Sewer Effluents.

Regarding the comments on these conclusions, Dr. BÜRGER (Germany), Rapporteur, asked whether, to avoid misunderstanding, it would not be better to fix the distance separating the point at which sewage flowed into a stream from the point where water was taken for drinking purposes; sewage would necessarily always flow in above some point from which drinking water was drawn.

The CHAIRMAN said it would be impossible to find such a definition, since it depended on the so-called self-purification capacity of the stream. They might say that sewage should not be discharged in the neighbourhood of a point from which water was taken for drinking purposes.

Agreed.

Section 2 was adopted, subject to drafting alterations.

3. Purification of Sewage Effluents.

Dr. BÜRGER (Germany), Rapporteur, thought that paragraph 1 of sub-heading B (" Biological Methods ") was worded too strongly. There were other methods than those of sprinkling filters adapted to rural conditions — *e. g.*, surface treatment, artificial irrigation, fish ponds. The particulars given in sub-heading B (Item 4) of " Other Methods " should be inserted in the present paragraph.

The CHAIRMAN pointed out that Section 3, B, dealt with artificial biological methods, whereas Section 4 described other methods — *i. e.*, *natural* systems. The heading of Section 3, B, might be altered to read " *Artificial Biological Methods* ".

Agreed.

Dr. BÜRGER (Germany), Rapporteur, suggested that the first sentence in B should be altered to read: " The system of sprinkling filters is one of the most suitable for rural districts ".

Agreed.

The CHAIRMAN said that a reference would be inserted in Section 4 to " fish-ponds or pools ".

Section 3 was adopted, subject to drafting alterations.

4. *Other Methods.*

Dr. Juan LAZARO-URRA (Spain) referring to sub-heading B (" Surface Irrigation ") suggested that the cultivation of vegetables for raw consumption should be prohibited in such areas. There were various difficulties, legal included, involved in the question. In Spain, for instance, it was a traditional practice to use sewage for the irrigation of such crops, and this constituted an acquired right which it was not easy to suppress. Tests made in Madrid had proved clearly that the incidence of typhoid fever — which it was hard to explain in view of the exceptionally good quality of the water supply — was directly and closely connected with the fluctuations in the consumption of raw vegetables grown on sewage-irrigated land.

The CHAIRMAN suggested the addition at the end of paragraph 1 of sub-heading B of the words : " prohibition of the growing of vegetables for raw consumption ".

Dr. BÜRGER (Germany), Rapporteur, stated that for many years past sewage had been widely used in Germany for surface irrigation. The fears originally entertained for the health of labourers employed on such land had proved groundless. He supported his Spanish colleague's proposal, but thought it should be inserted in the comments and not in the conclusions.

Regarding sub-heading A (" Leaching Cesspools and Subsoil Irrigation "), it might perhaps be well to refer at the beginning to the danger of leaching cesspools located in impermeable soil and handling large amounts of sewage ; in such case, subsoil irrigation and preliminary purification would soon have to be resorted to. He also stressed the danger of rocky and fissured soil.

M. BONIS-CHARANCLE (France), in view of the various objections raised, suggested substituting the word " mentioned " for " used " in the first line of Section 4.

Agreed.

The CHAIRMAN said that, in accordance with M. Bürger's observations, the Drafting Committee would have to stress the danger of infecting subsoil supplies of water, not only on the spot, but also over a large area, and thus of contaminating water drawn from some considerable distance. In reply to a suggestion by M. Bonis-Charancle to condemn leaching cesspools wholesale, he added that attention should be directed to their dangers, and advice given that they should only be used in exceptional cases and with great precautions.

The Drafting Committee would add a sub-heading C dealing with the process of purification by means of fish-ponds.

Section 4 was adopted, subject to drafting alterations.

FOURTH MEETING (JULY 4TH, 1931, 10 A.M.).

Chairman : M. VIGNEROT (France).

Examination of the Preparatory Committee's Report : *Chapter IV* (continued).

A. SEWAGE DISPOSAL (continued).

5. *Disposal of Sewage in Unsewered Districts.*

Dr. BÜRGER (Germany) suggested that the reference to pathogenic micro-organisms should be omitted, as it had been decided to introduce an opening sentence on this subject in accordance with his proposal.

Section 5 was adopted, subject to this observation.

6. *Disposal of Manure.*

Dr. JITTA (Netherlands) suggested redrafting the first sentence as follows : " . . . in such a way as only to expose the smallest possible surface to flies. "

M. RUBATTEL (Switzerland) suggested stating that the manure pits should be covered in order to prevent accidents.

The CHAIRMAN agreed.

M. KOLAR (Yugoslavia) drew attention to a method of treating manure by high temperature in such a way that it became odourless and resembled peat.

M. RUBATTEL (Switzerland) mentioned a method of treating liquid manure with strong chemicals, which was dangerous, as it might affect the quality of the milk and even the health of the cattle. This method was prohibited by regulations in Switzerland. He promised to obtain particulars and suggested that a remark should be made in the comments on this section.

Dr. BÜRGER (Germany) pointed out that the title of the chapter was "Sewage Disposal" (in French : "*Evacuation des eaux usées* "). Sections 6 and 7, dealing with manure and garbage respectively, did not, strictly speaking, come under this heading.

Section 6 was adopted, subject to the above observations.

7. Disposal of Garbage.

M. RUBATTEL (Switzerland) asked what was the meaning of the expression *villages urbanisés* ("built-up rural villages"). As the regulations contemplated appeared to apply to those villages, he asked what were the provisions for other villages.

The CHAIRMAN explained that built-up rural villages were villages large enough to have a system for the regular collection of house garbage and refuse similar to that used in towns. The following paragraphs of this section referred to other than built-up rural villages.

Dr. BÜRGER (Germany) referred to the remark in paragraph 3 regarding the collection of garbage by a contractor for pig feeding. He thought this practice was so rare in country districts that this remark might be omitted.

M. AUGÉ-LARIBE (France) thought that, though this method was rare, it did nevertheless exist in rural districts near towns, and it was therefore better to retain the remark.

M. RUBATTEL (Switzerland) agreed with M. Bürger. There were two methods of disposing of garbage for pig feeding: (1) by sale to a contractor and (2) by sale to some person in the village who kept pigs. The former method hardly existed in Switzerland. Precautions should be taken in regard to the latter method.

The CHAIRMAN stated that, as the practice existed in some countries, the remark should be retained, but it might be inserted in the comments instead of in the text.

Dr. JITTA (Netherlands) referred to the last paragraph relating to methods of treating garbage by tanks permitting of the development of heat. He thought the Beccari system should be mentioned. It not only developed heat, but produced good manure. It had been tried in the Netherlands with good results.

The CHAIRMAN said the paragraph referred to the Beccari system among others.

Prof. PUNTONI (International Institute of Agriculture) objected to the words in the last paragraph "are worthy of further experiment and study". This text might give the impression that the system was not good, whereas it had been proved to give excellent results, and he suggested the wording "deserve most careful attention".

He noted that, in paragraph 5, it was stated that garbage should be considered as infectious. This was not correct. Experiments in Italy had shown that workers treating garbage were not particularly subject to disease. The disadvantages were the breeding of flies and the evil smell. The garbage should therefore be removed to a distance from the house.

M. AUGÉ-LARIBE (France) agreed.

Dr. BÜRGER (Germany) gave particulars of a German system of disposing of garbage by ploughing it into the soil. On four estates of a total area of 13,500 *Morgen*, 20,000 kilograms of garbage were disposed of daily. The capacity of the soil was even greater. The garbage was strewn on the soil to a height of 4 centimetres and ploughed in to a depth of 30 centimetres. The same soil could be treated in this way once in four years. It resulted in a saving of one-half the required quantity of artificial fertilisers. Particulars had been published by Dr. Erdmann in 1930 in the journal issued by the Institute for the Hygiene of Water, Soil and Air.

The CHAIRMAN, in reply to M. Puntoni's remark regarding the fifth paragraph, pointed out that it was not stated that garbage was infectious but that, for greater security, it should be treated as if it were infectious.

Prof. PUNTONI (International Institute of Agriculture) did not insist on any change in this wording, but wished to add a remark regarding the evil smell.

The CHAIRMAN thought this might be added to the fourth paragraph.

Dr. BÜRGER (Germany) asked if the Commission did not think it necessary to insert a remark regarding the disposal of animal carcasses.

The CHAIRMAN thought a sentence might be added either to the conclusion or to the comments, to the effect that, in disposing of animal carcasses, care should be taken that they do not contaminate the soil or subsoil.

Mr. HOOPER (Great Britain) said this was a question for the veterinary surgeon. For some diseases of animals — for instance, anthrax — special precautions were necessary, and the Committee was not competent to make suggestions on that subject.

M. RUBATTEL (Switzerland) agreed with Mr. Hooper, and thought that a sentence should be inserted stating that recourse should be had to veterinary advice in disposing of animal carcasses.

Mr. HOOPER (Great Britain) said the usual practice in rural districts was to bury carcasses. With regard to anthrax, of which the microbe was particularly virulent, very special precautions were taken. In drafting a sentence, the Committee should be careful not to infringe on the prerogatives of the veterinary experts.

Dr. JITTA (Netherlands) suggested that attention should be drawn to this important question in the comments. It might be added that, as the matter concerned veterinary surgeons, the Committee did not go into details.

Dr. BÜRGER (Germany) said it was not his intention to propose more than that the Committee should draw attention to the subject.

The CHAIRMAN said that the Drafting Committee would consider this question in the light of existing veterinary regulations.

M. RUBATTEL (Switzerland) thought the campaign against rats should be mentioned.

The CHAIRMAN replied that this could be referred to in the paragraph relating to flies, as both rats and flies were carriers of germs.

Section 7 was adopted, subject to the above remarks.

4. Other Methods (continued).

Dr. BÜRGER (Germany) wished to revert to Section 4. He pointed out that treatment with chlorine was a very valuable method of disinfecting sewage effluents. The chlorine killed bacteria and prevented smell. The system was easy to instal and was much used

in rural factories, such as starch works, dairies, etc. He suggested inserting a further paragraph regarding this method.

M. AUGÉ-LARIBE (France) asked what effect this system had on the fish in the streams.

Dr. BÜRGER (Germany) pointed out that the quantity of chlorine used must be calculated in accordance with the chlorine affinity of the effluent. In order to overcome smell, only small quantities should be used. In Germany it was found that about 25 to 30 milligrams per litre were required. If the effluent had undergone preliminary cleansing, this quantity was further reduced. When used in small quantities, chlorine was not harmful to fish, or at any rate not so harmful as sulphuretted hydrogen, which would otherwise be generated and which was absolutely poisonous.

The CHAIRMAN pointed out that this question was of special importance for factories, but did not concern rural sanitation in general. He thought it could be mentioned shortly in order that the reference to methods of treating sewage effluents should be complete.

GENERAL CONSIDERATIONS.

M. BONIS-CHARANCLE (France) proposed to insert, after the words "the health authorities", the words "whose task may be facilitated by private propaganda organisations".

This proposal was adopted.

M. KOLAR (Yugoslavia) noted the recommendation in paragraph 2 that school-children should receive health instruction. He thought this should include trade schools and also courses for adults. Provision should also be made for training the teachers in health subjects.

In paragraph 6, which referred to State subsidies, mention should also be made of communal grants.

In the last paragraph he suggested the words "Agricultural *and other* associations".

The CHAIRMAN asked M. Kolar to submit his suggestions in writing.

M. AUGÉ-LARIBE (France) wished to make a change in paragraph 7 regarding the enforcement of legislation. He thought the rural population should be taught to regard the authorities as friends. This idea was not conveyed by the expression "competent supervision".

The CHAIRMAN suggested the words "competent and enlightened supervision". He pointed out that other passages in the resolutions implied a sympathetic attitude on the part of the authorities. The authorities' task was, nevertheless, to see that the legislation was enforced.

Dr. JITTA (Netherlands) thought that paragraph 9 regarding the co-ordination of the work of all agencies concerned in rural sanitation should be more strongly expressed. The sentence might begin: "It is urgently necessary that there should be co-ordination..."

Dr. BÜRGER (Germany) thought that the co-operation of veterinary surgeons with the help of health officials should be mentioned.

Dr. JITTA (Netherlands) agreed and said that M. Krul and he wished to point out the value of bringing together in one conference, not only doctors, but all other experts in health work.

M. LERCH (Austria) suggested including a reference to architects and contractors, who both did important work in connection with hygiene. In Austria, there were building advisory offices to which peasants could apply for advice. The architects and contractors had to see that building regulations relating to hygiene were complied with.

The CHAIRMAN thought all parties would be satisfied if an addition were made to paragraph 9 (regarding co-ordination), mentioning doctors, architects, veterinary surgeons, hygienists, sanitary engineers, agricultural experts, etc.

This proposal was adopted.

M. AUGÉ-LARIBE (France) suggested that paragraph 11, which referred to means of communication, should specially mention the telephone.

The CHAIRMAN pointed out that this had already been specially referred to in another part of the report. He thought it hardly necessary to refer to it again.

M. AUGÉ-LARIBE (France) suggested adding in the last paragraph the words " and achievement " after the word " propaganda ".

M. RUBATTEL (Switzerland) suggested that, in the last paragraph, after the words " agricultural associations ", the words " and associations of public utility " should be added. The latter might have considerable influence on rural life.

The CHAIRMAN pointed out that this idea was already included in M. Kolar's draft.

REPORT OF THE THIRD COMMITTEE (SANITATION).

GENERAL CONSIDERATIONS.

The Conference considers that the improvement of rural sanitation, which tends to raise the standard of life in rural districts, is dependent, in the first instance, on economic conditions and education in hygiene.

School-children in rural schools, students in agricultural and normal schools should receive health instruction adapted to rural needs and conditions.

The health authorities, whose work may be facilitated by the private propaganda organisations, should strive to spread the knowledge of hygiene among the people by every available means.

The Conference recommends particularly the practice of providing examples of good hygiene and sanitation, which should be located where their advantages may be seen and appreciated by the people — e. g., model houses.

Courses in hygiene for builders, contractors and leaders among the rural population are particularly effective.

Education stimulates the desire for sanitary improvement; suitable legislation provides the means by making cheap credit accessible by grants, bonuses and loans.

Legislation is not effective without proper enforcement and competent and enlightened supervision.

While the local authorities may be responsible for sanitation, there should be central direction, supervision and stimulation.

It is essential that there should be co-ordination of the work of all agencies concerned in rural sanitation. This co-ordination implies the co-operation of the technical personnel concerned (agricultural experts, architects, hygienists, engineers, medical men, doctors of veterinary medicine, etc.).

The work of rural sanitation should be based on a close study and appraisal of all the factors at play.

Particular emphasis should be laid on the necessity for rapid and constant means of transport and communication (telephone) in rural districts for the purpose of rural housing and health services.

Associations and institutions for the improvement of rural life in many fields and, in particular, associations organised on a technical agricultural basis are potent means of propoganda and achievement, and should be led to take an interest in water supply, good housing and other aspects of rural sanitation. The health authorities should co-operate with such associations to this end.

A. SEWAGE AND WASTES DISPOSAL.

1. *Dangers of Sewage and other Wastes.*

Sewage and other wastes are not only objectionable but dangerous, because they frequently contain organisms causing disease in man (chiefly intestinal disease). This is also true of liquid household wastes. The danger is in inverse proportion to the age of the material.

These wastes should either be removed rapidly from human habitations by drains so as to prevent danger of contamination or they should be retained for a sufficiently long period to ensure the destruction of pathogenic organisms.

2. *Sewerage Systems.*

The Conference is of opinion that a water-carriage sewerage system is, in principle, the best method of removing sewage.

Sewers are usually installed in rural communities only where public water supplies exist.

The practicability of installing sewerage systems depends on the density of the population, the character of the soil and the existing economic conditions.

Open drains, intended to remove rain water and street washings, may, under special conditions and when no better system is possible, be used for slop water and other house wastes. Excreta must be excluded from such drains.

Such conditions are found in industrial rural areas where wastes like phenol exert a disinfecting action on the contents of the drains. Open drains may also be used for this

purpose in rural districts other than industrial when nothing better offers, providing they are properly fenced off, regularly supervised, and the configuration of the surface of the soil permits of a rapid flow (hilly districts).

3. *The Disposal of Sewer Effluents.*

Sewer effluents may be disposed of by permitting them to flow into a watercourse, lake or tidal basin.

Such a method of disposal is satisfactory, providing :

(a) That the quality of the water at a given distance below the sewage outfall is equal to the quality of the water above the point where sewage enters ;

(b) That the dilution is sufficiently great ; the rule that the volume of the stream should never be less than 100 times the volume of the sewage previously cleared of solid matter gives good results in practice.

4. *Purification of Sewage Effluents.*

When it becomes necessary to purify sewage effluents as in .

(a) Closely populated rural districts ;

(b) Districts without an abundance of surface water ;

(c) Districts where it is desirable to limit stream pollution to a certain maximum,

a number of methods may be adopted in rural districts. These should be simple, adapted to local conditions and require a minimum of care by unskilled staff. These methods are mechanical and biological.

A. Mechanical Methods. — The simplest mechanical method is the use of fixed racks intended to retain the solids.

Settling-tanks also effect a certain amount of purification depending upon the condition of the sewage and the velocity of flow in the tank.

B. Artificial Biological Methods. — These are always preceded by mechanical methods. The principal biological methods are :

(1) Sprinkling filters. This is one of the methods best adapted to rural conditions, being inexpensive to instal and maintain, requiring little attention and no trained personnel and being capable of easy repair.

(2) The remaining methods — such as activated sludge (as at present constituted), contact beds or sand filters — are not adapted to rural conditions.

5. *Other Methods.*

The following methods may also be mentioned :

A. Subsoil Irrigation and Leaching Cesspools. — These methods can only be used where there is no possibility of contaminating the ground water which may be used as a source of water supply.

Subsoil irrigation should be limited to the treatment of small amounts of sewage (effluents from single houses, institutions, or small settlements) and should not be used where there are fissures in the soil.

Subsoil irrigation should be preceded by some form of mechanical or biological purification.

B. Surface Irrigation. — This method is one of the best for rural conditions if the soil is suitable, the area sufficiently large, the treatment properly supervised, and the cultivation of vegetables and fruits, which grow close to the ground and which are to be eaten raw prohibited.

The main consideration should be proper disposal of sewage rather than the raising of good crops.

C. Use of Fish-Ponds for Sewage Purification. — This method might be of some value in rural areas.

6. *Disposal of Sewage in Unsewered Districts.*

The main objects of proper sewage disposal in unsewered districts are :

- (1) The protection of the surface of the soil ;
- (2) The protection of the subsoil water ;
- (3) The protection of the sewage from access of flies.

These objects can best be attained by the use of water-tight receptacles in a fly-proof superstructure.

As fresh excreta may contain pathogenic micro-organisms and intestinal parasites, provision should be made for storage of sufficient duration to destroy such organisms.

Methods of providing for such storage are water-tight tanks with two compartments for alternate use, or double-compartment tanks of which only the second can be emptied.

Another method is the use of pails. As these contain fresh material, some form of disinfectant should be used, or the contents should at least be covered with dry earth, peat or other deodorant.

The pail system operates more satisfactorily when there is a public system of collection under proper supervision. As such a system is difficult to maintain in rural districts, the disposal of the material must, unfortunately, be left to the householder, whose education in hygiene is not usually sufficient.

Single-compartment tanks may be used in villages where a proper system of collection exists. The contents should be transported in water-tight containers to a suitable distance and properly treated — as, for instance, by placing alternate layers of sewage and dried peat in a large open tank.

In rural districts where it is not necessary to prevent the contamination of ground water, ordinary unlined pits may be used.

The Java type of privy, consisting of a deep hole of small diameter, into which basket work is inserted, is apparently suitable. It requires further study.

Whatever the method of sewage disposal adopted for individual houses, the privy should be located as far as possible from the well or other source of water supply.

7. *Disposal of Manure.*

Solid and liquid stable manure should be stored in water-tight pits, situated as far as possible from the house and arranged in such a way as to expose the smallest possible

surface to flies. The pits should also be so arranged as to prevent the contents being subject to the washing action of rain-water.

Manure pits should be provided with a special water-tight compartment for the liquid manure.

The Conference recommends that the prevention of fly-breeding by measures tending to promote the development of heat in manure piles should be made the subject of further experiment and study.

8. *Disposal of Garbage.*

In built-up rural villages, the regular collection and systematic disposal of house garbage and refuse is the most effective method.

This material may be disposed of by dumping frequently in thin layers and covering with earth, ashes, or other dry refuse. Such a method of collection and disposal requires careful and competent supervision.

Garbage is also a prolific source of flies, and measures should be taken to prevent fly-breeding.

A safe rule to adopt is to treat garbage as infectious matter and to dispose of it in such a way as to prevent the pollution of the surface of the soil, the subsoil by percolation (ground water) and the houses in the neighbourhood by flies, which breed in the garbage, and to avoid bad odours.

The Conference draws attention to the methods of treating garbage by tanks permitting of the development of heat.

9. *Animal Carcasses.*

The Conference also draws attention to the necessity for treating carcasses of animals in accordance with veterinary regulations.

B. WATER SUPPLY.

An abundant supply of pure water in rural districts is not only an important factor in the protection of the health of human beings and of cattle, but is also of great value in the promotion of agriculture.

The more immediately accessible the supply, the more freely will it be used by consumers. The best solution is to connect the house or farm to the water supply or, more generally, to bring the supply within easy reach.

1. *Public Water Systems.*

(a) *For a Number of Settlements.* — The central water-supply system distributed to a number of settlements is, when practicable, to be preferred to a smaller system. This system is to be recommended particularly in the more populated areas, and for districts in which suitable water sources are few, as it permits of the most advantageous utilisation of the potable water.

The co-operation of a number of villages to secure a joint water-supply system permits of a more adequate plant, gives the opportunity to employ skilled personnel and also permits the use of methods of purification when necessary. In the case of these central water supplies, any modern method of purification may be adopted, as it will be carefully applied and supervised.

(b) *For Individual Settlements.* — The source of the village water supply should be selected after appropriate investigations in order to secure a water free from the possibility of any dangerous contamination.

The necessity for any system of purification is to be avoided, as such systems require technical supervision, which is not usually available in rural districts.

Village water supplies should be constructed with due regard for simplicity of design, economy and ease of operation and maintenance.

2. *Purity of the Water.*

When treatment is necessary, it must be safeguarded in every possible way. The lines of defence to ensure the purity of the water should be, in order :

- (1) Protection of the source ;
- (2) Mechanical purification, (sedimentation, filtration, etc.) ;
- (3) Chemical purification (disinfection) ;
- (4) Inspection and supervision.

Protection of the source and supervision of the supply are necessary in any case.

When the water is drawn from rocky formations in which fissures exist (limestone, karst) it should be adequately purified. Disinfection by chlorine is at present a practical solution.

When contamination occurs only at rare intervals and for short periods, it is advisable to apply chlorine throughout the year ; otherwise, when the occasion arises, the apparatus may be out of order. When no danger threatens, very small amounts of chlorine may be used, and these may be increased when necessary.

When there is any possibility that a water supply may be responsible for an outbreak of intestinal disease, chlorine should be applied immediately as an emergency measure and continued until the investigation is completed.

Portable chlorinating plants should be available at central institutions for use in case of emergency (such as the threatened pollution of a normally pure water supply).

3. *Supervision of Water Supplies.*

Constant supervision of all public water supplies is necessary. This supervision should relate to the source of the supply, the plant and the distributing system, as well as to the effluent, and should be closest during the seasons when the supply is most likely to be contaminated (dry season, floods, etc.).

The personnel engaged in this supervision should be trained in the hygiene of water.

4. *Individual Water Supplies.*

These may take the form of wells, springs and cisterns. They should be constructed by qualified persons who have received proper instruction in the elements of hygiene of

water ; otherwise, they are apt to be dangerously located, badly constructed and improperly protected.

The competent authorities should adopt regulations providing for the location, construction and protection of individual supplies, and these regulations should be adequately enforced.

For the guidance of local authorities, a model code should be prepared by the central health services.

5. The Central Organisation.

Progress in matters of water supply must be based on scientific research centralised in a suitable organisation, which thus constitutes a hydrological and geological intelligence service for the purpose of locating suitable sources of water supply and for the collection of all other relevant data.

Such an organisation should, as far as possible, have jurisdiction over all matters affecting water supply in the State or administrative unit.

It would be difficult to over-estimate the advantages of a central organisation of this kind. In view of the information at its disposal for the entire State or province, and the expert knowledge of the specialists attached to it, such an organisation would be in a position to ensure that the existing water sources are utilised to the best advantage and that partial solutions of water-supply problems are avoided.

Such an organisation would place at the disposal of individuals, societies and communities technical information and expert advice on matters of water supply and would act as a centre for the education of the people in the hygiene of water.

6. Financial Assistance.

Many countries have encouraged the installation of rural water supplies by affording financial assistance, and have secured excellent results by this means. In the absence of such assistance, many municipalities could not have secured a public water supply. Account should be taken of this experience.

C. HOUSING IN RURAL DISTRICTS.

1. There is urgent need for improvement in the housing conditions of rural districts. Progress in this respect is hindered by the lack of cheap credit and the fact that education in hygiene in rural districts has not reached a sufficiently high level.

The housing shortage in cities has led in most countries to concentration on the housing problem in industrial areas, and the needs of rural districts have not always received the attention they deserved.

Good housing is a fundamental requirement for rural hygiene. It is influenced by social and economic conditions, and, in its turn, exerts a strong influence on these conditions, resulting in better health and a general elevation of the standard of life.

2. The principal defects of rural housing from the point of view of hygiene are :

(a) Overcrowding. Good houses are too few. There are too few bedrooms in the existing houses. The house may be too small or, in planning it, the existing space may have been insufficiently utilised. Apart from considerations as to the necessary cubic space, attention should be drawn to the height required for living purposes.

(b) There is inadequate provision of toilet and sanitary facilities.

(c) The living quarters are insufficiently protected from the stables.

(d) Manure and other sources of pollution and odours are in too close proximity.

(e) The house is so located and constructed as to be damp.

(f) There is a lack of proper ventilation, lighting and heating.

(g) There is insufficient protection from mosquitoes, flies and dust.

(h) There is insufficient exposure to the sun.

3. Methods of improving rural housing :

(a) Education ;

(b) Cheap credit and improvement of the economic condition of the farmer ;

(c) Co-operation ;

(d) Legislation, by-laws and regulations and their proper enforcement.

The practice of making public buildings models from the point of view of hygiene and sanitation is highly recommended.

The construction of model houses at numerous strategic points encourages imitation.

Good housing will appeal more readily to the rural population if the plans are prepared after a study of local customs and social and economic conditions, so as to preserve features characteristic of the district.

Loans at low rates of interest, grants, as well as freedom from taxation, may be provided by legislation, and are potent means of improving rural housing. The award of bonuses for proper construction yields a large return for the investment of small sums.

There should be building codes prescribing minimum requirements in respect of sites, exposure, lighting, ventilation, etc. Technical supervision and enforcement are required to make these effective, as well as proper preparation by measures of education.

Such enforcement should not be left altogether to the local authorities.

The health authority should have jurisdiction over all sanitary aspects of housing.

The preparation and distribution of standard plans satisfying sanitary requirements and local needs has given good results and should be encouraged. Such houses should be of simple design and economic construction.

4. The improvement of housing for agricultural workers presents difficulties which cannot be solved by education and persuasion alone. The agricultural worker is in a particularly weak position in this respect, and suitable legislation, with proper enforcement, as well as public financial assistance, are needed to cope with this problem.

Poor housing for this class accelerates the exodus of the best workers to the cities, where in many cases more attention has been given to housing for industrial workers, and this, in turn, lowers the standard of rural life and prevents hygienic improvement.

The organisation in the different countries of sanitary inspection services is desirable. Such services should have the authority necessary to secure satisfactory housing conditions for agricultural workers and to enforce the relevant regulations.

The Conference draws attention to the recommendation of the International Labour Office (1921) on this subject.

5. Rural housing may also be improved by suitable reconditioning of existing houses. When properly directed and supervised, such reconditioning may yield excellent results, sometimes at comparatively small cost.

The construction of model villages and agricultural colonies is of particular interest and importance in respect of rural housing. The tendency to locate industrial plants in rural districts should be encouraged, such new construction offering opportunities for the building up of model villages and the application of all sanitary safeguards.

In the planning of these villages and colonies, the health authorities should have jurisdiction over all matters of hygiene and sanitation.

The Conference recommends the further study of this problem.

D. LAND IMPROVEMENTS OR BONIFICATIONS.

1. Bonifications may be defined as the complete sanitary reconditioning of the land in areas where the general living conditions of the people are bad, more especially on account of malaria and other endemic diseases which endanger the vitality of the people.

2. This complete sanitary reconstruction is not limited to drainage, but includes all measures required to bring the land under cultivation, and the provision of hygienic living conditions for the population by means of a network of good roads, suitable rural housing, a good water supply, sewage and waste disposal.

3. Under certain conditions, it also includes the irrigation necessary for farming purposes, which enables the cattle to be housed throughout the year, this practice being indicated in view of the campaign against malaria.

4. Bonifications thus bring about a marked improvement in the standard of living, both economic and hygienic, and should accordingly be regarded as one of the most striking examples of rural hygiene.

The application of the system of bonifications requires the help of the hygienist. This is particularly necessary during the execution of the work.

5. The Conference draws attention to the importance of proper drainage by water-courses, and to the serious consequences resulting from the neglect to maintain these properly, not only in respect of agriculture, but also in regard to hygiene.

E. SUBJECTS REQUIRING INVESTIGATIONS AND RESEARCH.

The Committee is of opinion that, in addition to the investigations mentioned in the Preparatory Committee's printed report, the methods of testing and analysing water and sewage in the different countries should be examined and compared.

The Committee draws the attention of the Fourth Committee and the directors of schools of hygiene to this proposal.

F. GENERAL RESOLUTION.

The Committee draws the attention of the Fourth Committee to the desirability of adopting a resolution to the effect that the Conference has brought about a close collaboration between administrators of public assistance, agricultural experts, engineers, medical officers and practitioners, representatives of health insurance institutions, agricultural associations and private health agencies.

CHAPTER VI. — MINUTES AND REPORT OF THE FOURTH
COMMITTEE AND OF THE MEETING OF DIRECTORS
OF SCHOOLS OF HYGIENE.

FIRST MEETING ¹ (JULY 6TH, 1931, 11 A.M.).

Chairman : Dr. CHODZKO (Poland).

Proposals referred to the Fourth Committee by the First, Second and Third Committees.

The MEDICAL DIRECTOR stated that the reports of the three Committees embodied a series of proposals on subsequent study to be undertaken under League auspices. The majority of these proposals was to be found in the Preparatory Committee's report. The list was as follows :

1. The programme and the organisation of schools for public health nurses should be studied by the Advisory Committee of the Health Organisation of the League.
2. The same proposal with regard to the programme and methods of training of sanitary engineers.
3. More detailed information to be obtained as to the cost of rural public health services ; study of this subject to be undertaken on uniform lines in rural districts in order to ascertain the most economic and effective form of organisation of rural health services — in particular, the cost of the method described by the Budapest Conference as compared with other methods.
4. Equipment of health centres.
5. Java latrines.
6. Treatment of refuse and manure by heat processes.
7. Industrial establishments in rural districts ; construction of model villages, etc.

¹ For the composition of this Committee, see the Minutes of the Seventh plenary Meeting.

These proposals were followed by two questions raised in the Third Committee :

8. The desirability, over and above the research referred to in the Preparatory Committee's report, of a comparative study of the methods employed for the analysis and examination of water and sewage in the various countries.

9. Consideration of the desirability of a general resolution stating that the Conference had succeeded in establishing close co-operation between public assistance administrations, scientific agriculturists, engineers, health specialists, practitioners, representatives of health insurance institutions, professional agricultural associations and private agencies.

A final proposal by M. UNGER advocated consideration of a special international sound-signal for motor-cars transporting sick persons.

The CHAIRMAN opened the discussion on the various questions enumerated by the Medical Director.

Question 1.

On the proposal of the MEDICAL DIRECTOR, *the Committee decided to refer this question to the Health Committee for consideration.*

Question 2.

A similar decision was adopted.

Question 3.

The MEDICAL DIRECTOR explained that the services referred to were rural health services as described in the Second Committee's report. A preliminary examination of this point had already taken place in the meeting of the directors of schools of hygiene¹, who would submit a definite proposal on this subject to the Fourth Committee at its next session.

The CHAIRMAN stated that the Committee would meet later to consider the proposal in question.

Questions 4, 5, 6 and 8.

The MEDICAL DIRECTOR stated that the directors of schools of hygiene¹ had also studied three of these questions named and would submit a proposal to the Fourth Committee regarding them. They might consider Question 8 (the comparative Study of Different Methods of Analysis and Examination of Water Supplies and Sewage) in connection with the other three. That question would be considered by the directors of the schools of hygiene and they would submit a definite proposal.

Approved.

¹ The Minutes of the meeting of directors of schools of hygiene are contained in document Conf. Hyg. rur./Dir. éc./P. V. 1 and 2.

Those present were :

Prof. Léon BERNARD (*Chairman*), M. PITTALUGA (Spain), Dr. BÜRGER and M. DERLICKI (Germany), M. Alexander PALLIS and Dr. Norman WHITE (Greece), Dr. Bela JOHAN (Hungary), M. W. F. J. M. KRUL (Netherlands), M. W. CHODZKO (Poland), M. H. PELC (Czechoslovakia), M. MADSEN (Denmark).

Question 7.

The MEDICAL DIRECTOR explained that this question related to rural housing as a whole. He proposed that it should be referred for study to the International Labour Office and the International Institute of Agriculture. The Health Organisation would, of course, be very pleased to co-operate with those two bodies as regarded the health aspects of the question.

M. TIXIER said that the International Labour Office would undertake the study in co-operation with the Health Section so far as health aspects were concerned, and with the International Institute of Agriculture as regarded its other aspects.

The MEDICAL DIRECTOR was certain that the International Institute of Agriculture would gladly fall in with this suggestion, since it had submitted a pamphlet on rural housing to the Conference.

Question 9.

The MEDICAL DIRECTOR proposed that mention should also be made of the co-operation which had been established with architects. The Bureau would prepare a final draft resolution for the next meeting.

The CHAIRMAN, speaking both as a member of the Conference and as delegate of Poland, requested that the resolution finally adopted should express a wish that the co-operation so happily inaugurated in the present year under the auspices of the League of Nations should develop in the near future.

Approved.

Proposal by M. Unger.

M. UNGER explained that it was very desirable that the Conference should promote the adoption of an international signal ensuring free passage for motor-cars transporting sick persons.

The MEDICAL DIRECTOR proposed that the Conference should refer this question for study to the Communications and Transit Organisation of the League.

Approved.

SECOND MEETING (JULY 6TH, 1931, 5.30 P.M.).

Chairman : Dr. CHODZKO (Poland).

Report by Professor Léon Bernard (document Conf. Hyg. rur. 38).

Professor LÉON BERNARD read the report which he had drawn up as a result of the meeting of directors of European schools of hygiene and relating to five questions to be studied by the schools and other institutes of hygiene in Europe — namely :

- (1) Milk in rural areas ;
- (2) Typhoid infections ;
- (3) Manure and flies ;
- (4) Rural sanitation equipment ;
- (5) Comparison of the various methods of analysing and examining drinking water and sewage.

The CHAIRMAN explained that the list of schools and other institutes of hygiene wishing to take part in the studies to be undertaken was not exhausted by those enumerated by Professor Léon Bernard.

He asked whether the members of the Fourth Committee had any additional remarks to make on this subject.

Professor BÜRGER stated, on behalf of the German delegation, that the Prussian Institute for the Hygiene of Water, Soil and Air (Berlin) and other institutes of hygiene in Germany, in co-operation with certain chambers of agriculture and other organisations concerned, were prepared to take part in the study of the problems recommended by the meeting of the directors of schools of hygiene.

Professor Léon Bernard's report was adopted.

REPORT OF THE FOURTH (RESOLUTIONS) COMMITTEE.

1. The Fourth (Resolutions) Committee, after examining the proposals put forward by the First, Second and Third Committees, and by delegates at the Conference, recommends the adoption of the following resolutions :

“ (a) The Conference considers that the programme of public health nursing schools should be studied by the competent committee of the League's Health Organisation and suggests that the Council of the League of Nations should refer this study to the Health Committee. ”

“ (b) The Conference considers that the programme and methods of training of sanitary engineers in the different countries should also be studied by the Health Organisation and suggests that the Council of the League of Nations should refer this study to the Health Committee.”

“ (c) The Conference considers it would be advisable to secure further information on the cost of rural health and medical services and recommends that such studies on a uniform plan should be carried out in rural districts by the various schools of hygiene under the auspices of the Health Organisation of the League of Nations. ”

“ (d) The Conference recommends that the study of the following subjects of particular interest to rural sanitation should be undertaken under the auspices of the Health Organisation of the League of Nations by the various schools of hygiene and institutes for the hygiene of water :

“ 1. The Java type privy ;

“ 2. Heat treatment of garbage and manure to prevent fly-breeding ;

“ 3. Methods of testing and analysing water and sewage in use in the different countries. ”

“ (e) The Conference recommends that the study of housing conditions in rural districts proposed by the Third Committee should be referred to the International Labour Office and the International Institute of Agriculture, in collaboration with the Health Organisation of the League of Nations, when questions of hygiene are involved. ”

“ (f) The Conference draws attention to the importance of the rapid transport of the sick in rural districts, and considers there would be advantage in the international adoption and use of a special sound signal for motor ambulances. The Conference suggests that the Council of the League of Nations might refer the study of this subject to the League's Organisation for Transit and Communications. ”

“ (g) The Conference desires to emphasise the importance for rural hygiene of close collaboration between administrators of public health and assistance, agricultural experts, engineers, nurses, architects, medical officers and practitioners, representatives of health insurance institutions, agricultural associations and private health agencies. ”

The Rural Hygiene Conference has furnished a striking illustration of the fruitful results of such collaboration, and this collaboration, begun under the auspices of the League of Nations, should be continued and extended.

ANNEXES.

DOCUMENTS AND REPORTS SUBMITTED TO THE EUROPEAN CONFERENCE ON RURAL HYGIENE.

- 1. TECHNICAL RECOMMENDATIONS BY THE PREPARATORY COMMITTEE.**
 - 2. " SICKNESS INSURANCE AS A FACTOR IN RURAL HYGIENE " : REPORT SUBMITTED TO THE CONFERENCE BY THE INTERNATIONAL LABOUR OFFICE.**
 - 3. EXTRACTS FROM THE REPORT ON WATER SUPPLIES IN RURAL DISTRICTS SUBMITTED TO THE CONFERENCE BY M. KRUL, DIRECTOR OF THE NATIONAL BUREAU FOR WATER SUPPLY AT THE HAGUE.**
 - 4. LIST OF DOCUMENTS DISTRIBUTED TO THE CONFERENCE.**
-

ANNEX 1.

TECHNICAL RECOMMENDATIONS BY THE
PREPARATORY COMMITTEE.
(EXTRACTS FROM THE REPORT OF THE PREPARATORY
COMMITTEE, DOCUMENT C.H.1045).

CHAPTER II. — REPORT OF THE EXPERTS ON THE FIRST ITEM
ON THE AGENDA.¹

*“ Guiding Principles and Suitable Methods for ensuring Effective Medical
Assistance in Rural Communities. ”*

“ In the largest sense, effective medical assistance may be considered as indicating a medical service organised in such a way as to place at the disposal of the population all the facilities of modern medicine in order to promote health and to detect and treat illnesses from their incipency. ”

2. In order to furnish effective medical assistance to the rural population, the experts are unanimous in the belief that 2,000 is the maximum number of persons who can be given proper medical attention by a duly qualified medical practitioner, on the understanding that in proportion to the growth of the health services and the needs of the people, this number may be reduced to one thousand.

¹ The following experts prepared this report at Geneva, May 9th to 11th, 1931 :

- Professor KONRICH (*Chairman*), from the Reichsgesundheitsamt, Berlin ;
Dr. Alfredo CANAL-COMAS, Physician at Granollers, Catalonia ; Representing the Medical Officers of Rural Districts in the National Medical Association of Spain ;
M. BOIS-CORJON, Director of the Central Office of Agricultural Mutual Benefit Societies, Paris ;
Dr. E. H. F. DECOURT, Representative of the French Medical Syndicates, Member of the Council of the Confederation ; Secretary-General of the International Professional Association of Physicians, and Principal Editor of the official bulletin ;
Dr. Dino RIO, Chief of the Section on Medical Assistance of the General Health Administration, Ministry of the Interior, Rome ;
Dr. Frederic MESTRE PRÓN, Professor of Sanitary Administration at the School of Hygiene, Madrid.
Dr. Walther MIEMIETZ, Vice-President of the Medical Association for the Province of Brandenburg, Wriezen ;
M. M. SARRAZ-BOURNET, Associate Inspector-General of the Administrative Services, Ministry of the Interior, Member of the Superior Council of Public Welfare of France, Paris ;
M. Karl UNGER, Director of the National Union of Rural Health Insurance Institutions of Germany, at Perleberg (Potsdam).

3. Such medical assistance also requires a technically qualified auxiliary personnel comprising one or more nurses, or, provisionally, in the absence of qualified nurses, other persons possessing the minimum necessary technical training.

4. It is recommended that, in the smallest rural settlement, the patient should be able to find a person capable of rendering first-aid and of carrying out the doctor's orders.

5. The rural population and rural doctors should be in a position to utilise the services of centres of diagnosis and, if necessary, of specialised treatment; such centres should be suitably equipped and provided with a qualified staff; anti-tuberculosis and anti-venereal dispensaries, etc.

These services should maintain liaison with the patient's physician, who should be informed of the results of the examinations, or, if necessary, kept in touch with the treatment and its results.

6. Rural medical assistance also implies facilities for hospitalisation in appropriate, suitably equipped institutions.

It is recommended that there should be such a hospital for a population of from twenty to thirty thousand people, a rational organisation requiring about two beds per thousand of the population.

However, each such institution should have not less than some fifty beds.

Permanent means of communication (telegraph, telephone, etc.) and constantly available means of transport should be at the disposal of patients and doctors to permit of rapid hospitalisation in urgent cases.

7. Rural medical assistance should utilise the services of laboratories.

Simple examinations and analyses may be carried out in the hospital laboratories.

More complicated examinations and analyses (bacteriological, pathological, serological, etc.) should be carried out in large, specially-equipped laboratories.

8. Rural medical assistance should also be able to utilise medical specialists.

The specialists should keep in touch with the patient's doctor, informing him of the results of the examination and of the treatment and its results.

9. Means of Realisation.

A. Principles of Collaboration. — The realisation of effective medical assistance in rural districts demands the collaboration of the public authorities — health and welfare (assistance) — of the medical profession, of health insurance institutions, of private agencies, etc.

B. The Public Authorities. — The public authorities should ensure that the entire population benefits from an effective medical assistance. By means of a rational organisation of the health services, adequately staffed with specialists, they should attempt to develop the preventive tendencies of rural medical assistance.

In the interest of effective medical assistance, it would also be desirable for the public authorities to seek to organise a rational and co-ordinated health programme on a territorial basis, taking account of local conditions.

The public authorities should stimulate, assist and co-ordinate the efforts of agencies and groups which attempt to realise effective medical assistance. They should seek to fill the gaps and avoid the duplications which may occur in the organisation of this assistance.

C. Health Insurance. — The experts consider that when health insurance applies to the entire body of agricultural labourers, it permits the realisation of effective medical assistance in rural districts under the best conditions.

D. Public Assistance. — Nevertheless, where health insurance has not yet been established, rationally-organised free medical assistance may intervene usefully in completing a system which partially satisfies the needs of rural populations.

CHAPTER III. — REPORT OF THE EXPERTS ON THE SECOND ITEM ON THE AGENDA.¹

“ The Most Effective Methods of Organising Health Services in Rural Districts.”

1. General Considerations. — There are two principal forms of rural health organisation: the form in which the State administers the local services, and the form in which the State has only supervisory functions, the local authorities being responsible for the local health administration.

Both may give good results, and the form best suited to the rural districts of a given country depends on the manner in which the general administration of that country is organised.

¹ These reports were prepared by the Commission on Rural Health Centres which met at Budapest in October 1930 and at Geneva on April 28th to 30th, 1931. The following experts participated:

At Budapest and Geneva:

- Dr. W. CHODZKO, Director of the School of Hygiene at Warsaw (*Chairman*);
- Dr. Bela JOHAN, Director of the State Institute of Hygiene, Budapest;
- Dr. M. KACPRZAK, Chief of the Statistical Department, State Institute of Hygiene, Warsaw;
- Dr. A. METZ, Medical Officer of Health of the County and District of Holbaek, Denmark;
- Prof. J. PARISOT, Professor of Hygiene and Preventive Medicine, Nancy;
- Dr. Hynek PELC, Chief of the Department of Social Hygiene, State Institute of Hygiene, Prague;
- M. M. PETRIK, Chief of the Division of Sanitary Engineering Institute of Hygiene, Zagreb;
- Dr. G. SEIFFERT, Counsellor to the Bavarian Ministry of the Interior, Munich;
- Dr. A. STAMPAR, Inspector-General of Health, Ministry of Health, Belgrade;
- Dr. J. H. TUNTJER, Inspector, Child Welfare, Tuberculosis and Venereal Diseases Service, Netherlands Ministry of Labour, Commerce and Industry, Groningen.

At Geneva alone:

- M. Antoine LABRANCA, Chief of Division in the General Public Health Direction, Ministry of the Interior, Rome;
- Dr. J. THURNHER, Representing the Austrian Union of Sickness Insurance Funds, Vienna;
- M. VIMEUX, Director-General of the National Union of Agricultural Mutual Benefit Societies, Paris.

At Budapest alone:

- Dr. F. RUIS MOROTE, Public Health Inspector at Caceres, Spain;
- Dr. Mil. RANKOV, Director of the Tropical Diseases Institute at Skopje, Yugoslavia;
- Dr. Kornél SCHOLTZ, Secretary of State, Ministry of Labour and Social Welfare, Budapest;
- Miss M. STELLER, Chief of the Public Health Nursing Service, State Institute of Hygiene, Budapest.

When it is necessary to organise the rural health service there is need for a State organisation which will assume control over local health work. As the country develops, its local administrative organisation becoming sufficiently strong to carry out public health work, and the education of its people in hygiene being sufficient to cause them to support the local health service, there may be a gradual decentralisation in health matters until the responsibility can be assumed safely by the local authorities.

Even when such a decentralisation has taken place, the State should preserve its right to frame the health policy which it is the duty of the local authorities to carry out, as well as its right to supervise the work and remedy the deficiencies of the local health service.

2. The public health officer fully responsible for the promotion of the health work in a rural district should give his whole time to his official duties : the practice of medicine¹ in particular is incompatible with the work of such an official. He should be a doctor trained in hygiene and preventive medicine according to the recommendations of the Conferences of Directors of Schools of Hygiene at Paris and Dresden (document C.H.888). His compensation should be sufficient to assure him a comfortable living. He should enjoy security of tenure in office, subject to the proper discharge of his duties, and have the right to a pension when age or the completion of a fixed number of years of service make it necessary for him to retire.

3. The optimum size of a rural district for which one full-time health officer may be responsible will vary with the density of the population, the means of communication, the prevailing diseases, and other local conditions. Subject to these variables a population of from twenty thousand to one hundred thousand, or an average of fifty thousand, may be fixed, it being understood that one or more full-time assistant health officers will be needed for populations in excess of fifty thousand.

The rural health district must always correspond with the administrative district in view of the difficulties which would otherwise result. As, in European countries, such administrative districts almost always have populations in excess of fifty thousand, they may be suitably staffed by the appointment of one full-time health officer with the proper number of assistants.

4. The experts consider that the health authorities of the rural districts described above should be responsible for the protection and promotion of the public health in all its aspects. The district health officer, as executive officer of the health organisation, should be entrusted with the realisation of the entire programme in order to ensure the economy and efficiency resulting from unity of direction.

5. The minimum staff for such a rural health district should consist, in addition to the health officer, of one or more public health nurses, a sanitary inspector, and a clerk.

The nurse should have a diploma in generalised public health nursing from a recognised school of health nursing or its equivalent. The experts consider that the programme of such nursing schools should be studied by the competent commission of the League's Health Organisation.

The sanitary inspector should have received suitable training at a school or institute of hygiene. Under the direction of the health officer, he should be able to inspect foods,

¹ This recommendation refers to the *private* practice of medicine. In some countries where medical assistance is a responsibility of the public health service, work in the field of medical practice may be a duty of the public health officer.

investigate and abate nuisances and carry out the work of rural sanitation planned by the sanitary engineer.

6. Although in many European countries, the rural district as defined above cannot alone afford to employ a sanitary engineer, the services of such an engineer should be available in all rural districts. Such engineers may be employed by the Central Health Organisation, the State or the Province. Their work should be that described by the Conference at Budapest.

It is important that the programme and methods of training these engineers in all countries should be perfectly adapted to the work they are required to do. The experts believe that the study of this subject should be undertaken by the Health Organisation of the League of Nations.

7. The programme of the health services in such a rural district.

A. Notifiable Diseases and Vital Statistics. — The effective work of rural health services depends on the completeness of their information on the prevalence of infectious diseases and on the accuracy with which causes of death are certified.

All doctors practising in rural health districts should be required by law to notify the health authorities immediately of every case of an infectious disease¹ which they have examined. In the absence of doctors, heads of families, teachers and local officials should be required to notify suspected cases to the health authorities.

The attending physician should be required by law to fill in a standard certificate of the cause of death and to transmit that certificate to the local health authorities without delay.

The health officer should utilise every means to keep in touch with the prevalence of infectious diseases in his district—routine epidemiological investigations of cases and contacts, charts and graphs, a diagnostic (consultation) service. The returns of causes of deaths should be studied regularly to the end that the general health programme may be suitably adapted to local needs.

B. Statistics on Social and Economic Conditions. — In addition to vital statistics, which permit the health authorities to appraise the results obtained and to adapt their programme to local needs, statistics relating to social and economic conditions (composition of the population, housing, hospitals and other medical institutions, etc.) collected by various agencies, in particular by health insurance institutions, should be utilised by such authorities.

C. Branches of Work. — The programme of the rural health services should include measures for dealing with all the health problems which a survey of the district has revealed to be of real importance ; in particular it should relate to :

- (1) Infectious disease control ;
- (2) The campaign against the so-called social diseases ;
- (3) Maternal and infant welfare and school hygiene ;
- (4) Sanitation ;
- (5) Hygiene of milk and foods ;
- (6) Education in hygiene.

¹ Diseases required by law to be notified.

Provision should also be made for first-aid and for the transportation of the sick in urgent cases.

Laboratory facilities should be available in accordance with the recommendations of the Budapest Conference.

8. In order to ensure the interest and enlist the support of the public, the experts consider it advisable for the health officer to set up advisory councils or consultative committees, composed of leaders in the community or of representatives of agencies¹ which carry on health work.

In the latter case, the Committee should co-ordinate the work of the agencies concerned, and for this reason is worthy of special recommendation.

9. In view of the wide variations in health programmes in the different countries and the considerable differences in local conditions, it is not possible at present to recommend a model budget for a rural health district, or to state what should be the *per capita* expenditure for health purposes. It is also impossible to decide on the percentages of the budgets of States, provinces, districts and communes which should be allocated to the health services.

The experts consider it advisable to secure further information on the cost of rural health services and, to this end, recommend that studies on a uniform plan should be carried out in rural districts under the auspices of the Health Organisation of the League of Nations.

The purpose of these studies should be to determine which effective form of rural health organisation is most economical and, in particular, the cost of the method described by the Budapest Conference in comparison with other methods in use.

10. Official funds for health work in rural districts are derived in varying proportions from the State, the province, the county, the district and the commune. While the State may have to provide the largest proportion when the rural health services are being organised, or in the case of poor districts, it is essential that the proportion contributed by the local authorities should gradually increase.

11. In order to avoid deficiencies and prevent duplications in the promotion of the health of the rural population, it is desirable that collaboration should be established between the public health services and social insurance institutions.

This collaboration might relate particularly to the following work :

- Joint study of plans for the provision of sanitary equipment in rural districts ;
- Establishment of vital statistics ;
- Campaign against tuberculosis, venereal diseases, cancer, mental diseases, etc. ;
- Maternal and infant welfare ;
- Child welfare ;
- Education in hygiene of the rural population.

The collaboration might be realised by means of " Committees of Co-operation " composed of representatives of the public health service and insurance institutions.

12. Collaboration between the health authorities and private health agencies is highly important in the interests of economy and efficiency. The work of private agencies

¹ This recommendation does not apply to health insurance institutions which are treated in paragraph 11.

is of great value in view of the interest they arouse in hygiene, and their contribution to the available health resources and equipment.

Useful collaboration between the health authorities and private health agencies presupposes :

(1) The existence of an effective rural health service and a health programme adapted to local needs.

(2) That the work of private health agencies should be set out in the programme adopted by the responsible local health authorities. In this way, the health officer will play an important rôle in the technical direction of the work of these and other similar agencies, as he is responsible for all public health work in his district.

(3) That, in each rural district, it would be preferable to have a single private health agency concerned with all the health work with which such agencies usually deal.

13. Co-operation between the public health authorities and the agricultural associations of all kinds is also highly desirable. Inspired by the desire to raise the standard of life in rural districts, these associations offer a valuable means of securing the co-operation of the rural population. The results of their work are reflected in health as well as in economic and social conditions, and they are concerned with housing and sanitation as well as with other hygienic measures.

14. The experts desire to draw attention to the higher health standard in rural districts which is obtained by the improvement of general education by such means as the folk high schools in Denmark. Raising the general level of education by such means results in a greatly increased appreciation of hygiene and provides a fertile soil in which to implant ideas of health and sanitation.

B. Rural Health Centres.

1. It is necessary at the outset to specify that rural health centres, considered as agencies particularly adapted to the promotion of public health in rural districts, constitute an integral part of the general health organisation. They are, in consequence, closely related to and dependent on all the elements which form that organisation—in particular, the State or Provincial Institutes of Hygiene, which, in several countries, constitute the most fully developed centre on which all others may depend for technical guidance.

2. It is to be understood that the considerations which follow relate to average centres, and that, in addition to these, there may be a large number of different types, the development of any particular centre being necessarily conditioned by local exigencies.

3. There are two methods of classifying rural health centres ; they may be designated as small or primary centres and as larger or secondary centres, according to their varying organisation and development ; or they may be divided into village or communal, corresponding to primary, and district (*arrondissement*) corresponding to secondary, centres, according to the administrative subdivisions in which they work.

The Conference expressed its preference for the first of these classifications, that is, their sub-division into primary and secondary health centres.

During its second meeting the Commission decided to recommend that there should also be branch health centres of the most simple type to enable the work of such centres to be carried into the smaller villages.

4. Definition. — The rural health centre may be defined as an institution for the promotion of the health and welfare of the people in a given area, which seeks to achieve its purpose by grouping under one roof or co-ordinating in some other manner, under the direction of the health officer, all the health work of that area, together with such welfare and relief organisations as may be related to the general public health work.

In rural districts where such public health work has been organised for some time, it may be difficult to group all health activities under one roof or in the same organisation. Nevertheless, an attempt should be made to co-ordinate the work of existing agencies in the most effective way.

On the other hand, where a modern public health organisation is to be created in new territory¹, the health centre, as defined above, is the best method of attaining the desired result.

I. THE PRIMARY HEALTH CENTRE.

5. In the general public health armament of a given country, the primary health centres with its branch centres represents the terminal stage ; it is the smallest agency adapted to serve the public health needs of the smallest rural area.

The working programme of this centre should be established on the basis of a preliminary survey concerning :

1. The topographical conditions of the district — density of the population, distribution (dispersion) of homes, means of communication. This information will facilitate the selection of the sites, and the determination of the number of health centres and branch health centres required.

2. The health and epidemiological conditions among the people ; this information will be equally useful in establishing the centre's programme of work.

6. The Minimum Programme of a Rural Health Centre.

In addition to the campaign against those diseases which the survey has shown it to be of the first importance to prevent, the minimum programme of work will consist of :

- (a) Maternal welfare ;
- (b) Infant welfare, including pre-school and school hygiene ;
- (c) Popular health education ; a practical example may be furnished by the provision of shower-baths ;
- (d) Sanitation ; in general, the centre should deal with all the sanitary conditions affecting the people ;
- (e) Finally, provision of first aid in urgent cases.

7. In areas where the absence or insufficient number of physicians prevents the adequate provision of medical treatment, and in the case of patients unable to receive proper treatment elsewhere, the health centre should undertake this work.

¹ The term " new territory ", as employed here, implies that an effective *health service* in the modern sense does not exist.

On the other hand, in areas where medical care and treatment are adequately provided, the centre should limit itself to such treatment as may be necessitated by the requirements of social prophylaxis.

The adoption of this policy by the health centre will assist in securing the co-operation of the practising physician, who will be all the more disposed to co-operate, as the centre, in view of its equipment, is in a position to provide him with valuable assistance in his daily practice.

8. Personnel.

(a) The Director. — The primary health centre, like all other health organisations is under the general direction of the public health officer and of the health administration of the State.

Its actual administration may be entrusted either to an expert medical officer of health (trained in a school of hygiene) or to a general practitioner with a satisfactory knowledge of medicine and the necessary supplementary training (refer to the reports and conclusions of the Conferences of Directors of Schools of Hygiene). This training should, in particular, relate to social hygiene and preventive medicine on the one hand, and on the other to the knowledge required to meet the specific needs of the centre he directs.

(b) The Public Health Nurse (Health Visitor). — No organisation concerned with social hygiene can afford to dispense with the services of the public health nurse.

Generalised (polyvalent) rather than specialised public health nursing should be the rule in rural districts.

Depending upon the various activities of the centre, and the amount of work to be done, one nurse may serve one or more centres.

By means of an intelligent adaptation of her work to the minimum programme of the centre, and taking into consideration such varying factors as the number of families and of patients requiring her attention, the density of the population, the distribution (dispersion) of homes and the means of communication, a nurse may undertake to serve a population of between six and eight thousand.

The nurses employed in the primary and secondary centres should be in possession of diplomas as general public health nurses (from a recognised or State school) and should have received, during their professional education, theoretical and practical training which would fit them for their rural work.

When it becomes necessary to organise or extend the rural health service, in the absence of sufficient graduate nurses, possessing diplomas in general public health nursing to fill all the vacancies, is it wise to resort as an emergency measure and only temporarily to the services of a personnel which has received only elementary and partial training ?

Without doubt, but this method should be applied only on condition that it is altogether provisional, and on the understanding that the personnel so employed shall leave the service at the end of fixed period (at the latest as soon as such personnel can be replaced by graduate public health nurses) unless they undertake to complete the training leading to the award of the diploma mentioned above.

(c) The Midwife. — Should the services of midwives be utilised in the work of the centres, and if so, under what conditions and in what way ?

The fact that the midwife is in a position to render important services to the centre in the care of pregnant women (pre-natal care) as well as in the supervision of the infant during the first days of life, is beyond question.

In these respects, the midwife will become a useful assistant to the nurse entrusted with this work, solely on the condition, however, that she possess the proper qualifications, not only as a result of her training (diploma in midwifery) but also on account of the special instruction she has received in the work entrusted to her.

Under these conditions, the midwife may be attached to the personnel of the centre, to carry out these well-defined tasks, under the direction of the medical director of the centre. The possibility of utilising her services in this capacity will be facilitated in the case of midwives already in the employ of willages (communes).

(d) The Sanitary Inspector. — The sanitary inspector will be entrusted with the supervision and execution of minor sanitary improvements (under the technical supervision and direction of the sanitary engineer attached to the secondary centre) as well as of the measures having to do with general health work such as disinfection, etc.

II. THE SECONDARY HEALTH CENTRE ¹.

9. The secondary health centre is a more fully developed organisation than the primary centre on account of its greater completeness of equipment, its larger personnel and the wider scope of its work.

The secondary centre directs and co-ordinates the work of primary centres and, at the same time, ensures liaison between them and all other health and welfare agencies — in a word, with all agencies connected with the promotion of public health.

10. Programme. — In addition to its work as a primary centre (in its immediate neighbourhood) and to the prevention of those diseases which have been shown to be important problems by the preliminary survey already mentioned, the secondary centre should deal with the following :

- (1) The campaign against tuberculosis ;
- (2) The campaign against venereal diseases ;
- (3) Maternal welfare work ;
- (4) Infant welfare work (including the child of pre-school age) with special emphasis on the welfare of the child of school age (school polyclinics) ;
- (5) Health education — first, for the general population ; second, by means of special courses and field work for (a) doctors, (b) nurses, (c) midwives, (d) sanitary engineers and inspectors ;
- (6) Sanitation ;
- (7) Laboratory analyses, of a simple and routine character.

The Conference was of the opinion that, in addition to this work, the centre might undertake the provision of first aid in urgent cases and ensure the prompt transport of sick and accident cases by supervising the proper organisation of this service.

¹ In some countries in Europe, there are provincial or county health officers who have jurisdiction over areas larger than those served by secondary health centres. Such health officers may co-ordinate the work of the secondary health centres.

11. Personnel.

(a) **Medical Director.** — The Medical Director of the secondary centre should be a full-time physician trained in public health ; this work should preferably be entrusted to the medical officer of health in charge of the district.

(b) **Nurses.** — The rules set out above concerning public health nurses also apply here, it being understood, however, that, in view of the greater development of the secondary centre, the nursing staff attached to it should be in proportion to the work.

(c) **Midwives.** — The considerations set out above concerning the employment of midwives apply also to the secondary centre.

(d) **The Sanitary Engineer.** — Sanitary engineering work forms an integral part of the work of the secondary centre.

This service should be directed by a sanitary engineer with special training for rural work who will be attached to the staff of the centre or seconded for that purpose from the Central Institute, according to local conditions.

The sanitary engineering work in the district served by the secondary centre will, in general, deal with all matters concerning major and minor sanitation, such as provision of pure water, sewage and refuse disposal, housing, etc.

(e) **The Sanitary Inspectors.** — As many as may be necessary, in view of local conditions (see the considerations above respecting these inspectors).

(f) **Laboratory Technicians.** — In the administration of the public health services, it should be emphasised that, as a general rule, the laboratory investigations (which not only necessitate the most careful technique, but also a fully experienced staff and the most complete equipment) should be undertaken at the Institute of Hygiene, and that only analyses of the most elementary and routine character should be made at the secondary centre.

Consequently, it will not be necessary in most cases to secure for the centre the services of an expert laboratory technician, as it should be possible to utilise the existing staff for the elementary work which may have to be done.

The State Institute or central hygienic laboratory will utilise the secondary centre as a depot and centre of distribution for its sample containers.

This is the personnel essential for the administration of such a centre, but in case of greater development of one or more of its sections, it may become necessary to secure the services of other technicians (for X-rays, etc.).

Naturally, a suitable subordinate personnel will be required for its internal administration.

12. **Committees which might assist the Primary and Secondary Health Centres.** — The Conference was of opinion that the work of these centres might receive greater support through the establishment of committees ; first, the official health committee provided for by the sanitary legislation of the State ; secondly, a non-official committee, including in its membership representatives of the local administration, the medical profession, social insurance organisations, the teaching profession, the clergy, private welfare agencies, and, in general, of all who might contribute to the development and the prosperity of the centre on account of their moral, political or financial influence.

13. **Equipment.** — The secondary centre should be fully equipped in accordance with the requirements of public health and modern medicine. In particular, there should be : a standard Röntgen ray outfit (a mobile outfit as well, if necessary) ; shower-baths ; motors for the transport of the staff.

The Conference considered that failure to provide the staff with the means of transport to enable them to do their work rapidly and to reach all parts of their district would reduce greatly the scope of their technical work.

14. Relationship of the centre to other health agencies. — Certain of the agencies with which the health centre should be in relationship (secondary health centres, specialised dispensaries, institutes of hygiene) also form integral parts of the general health organisation of the country. In such cases, the proper relationship already exists. With others (establishments for treatment and prevention, hospitals, sanatoria, preventoria, social insurance institutions) relationships should be established which will permit the centre to obtain their help either directly or through the secondary centres.

CHAPTER IV. — REPORT OF THE EXPERTS ON THE THIRD ITEM ON THE AGENDA. ¹

“ Sanitation in Rural Districts : The Most Effective and Economical Methods. ”

GENERAL CONSIDERATIONS.

The experts consider that the improvement of rural sanitation which tends to raise the standard of life in rural districts is dependent in the first instance on economic conditions and education in hygiene.

Schoolchildren in rural schools should receive health instruction adapted to rural needs and conditions.

The Health Authorities should strive to spread the knowledge of hygiene among the people by every available means.

The experts recommend particularly the practice of providing significant examples of good hygiene and sanitation, which should be located where their advantages may be seen and appreciated by the people — *e.g.*, model houses.

¹ The following experts prepared this report at Geneva on May 12th to 15th, 1931 :

M. VIGNEROT (Chairman), Chief of Rural Engineering, Ministry of Agriculture, Paris ;
M. M. PETRIK, Chief of the Division of Sanitary Engineering, Institute of Hygiene, Zagreb ;
M. Alexander SZNIOLIS, Chief Engineer, School of Public Health, Warsaw ;
Mr. O'DWYER, Chief Inspector of Sanitary Engineering, Dublin ;
Mr. J. F. DUNCAN, Secretary-General of the Scottish Farm Servants' Union, Lanarkshire ;
M. W. F. J. M. KRUL, Director of the Bureau of Water Supplies, The Hague ;
Professor GOTSCHLICH, University Institute of Hygiene, Heidelberg ;
Professor BÜRGER, State Institute for the Hygiene of Water, Soil and Air, Berlin ;
M. Ludovic BONAMICO, Chief Engineer of the Bureau of Civil Engineering, Rome ;
M. G. ONGHENA, Chief Engineer, Union of Belgian Farmers, Louvain ;
M. VAN DER KAA, Chief Inspector of Housing, The Hague ;
M. Julio JORDANA, Engineer, Hydrographic Confederation of the Ebro, Zaragoza ;
Mr. H. Ross HOOPER, Consulting Engineer, Chippenham, England.

Courses in hygiene for builders, contractors and leaders among the rural population are particularly effective.

Education stimulates the desire for sanitary improvement ; suitable legislation provides the means by making cheap credit accessible by grants, bonuses and loans.

Legislation is not effective without proper enforcement and competent supervision.

While the local authorities may be responsible for sanitation, there should be central direction, supervision and stimulation.

There should also be co-ordination of the work of all agencies concerned in rural sanitation.

The work of rural sanitation should be based on a close study and appraisal of all the factors at play.

Particular emphasis should be laid on the necessity for rapid and constant means of transport and communication in rural districts for the purpose of rural housing and health services.

Agricultural associations for the improvement of rural life in many fields are potent means of propaganda and should be led to take an interest in water supply, good housing and other aspects of rural sanitation. The health authorities should co-operate with such associations to this end.

A. Sewage Disposal.

1. SEWERAGE SYSTEMS.

The experts are of opinion that a water carriage sewerage system is the best method of removing sewage.

Sewers can only be installed in rural communities having public water supplies piped to the individual houses.

The practicability of installing sewerage systems depends on the density of the population, the character of the soil and the existing economic conditions.

Open drains, intended to remove rain water and street washings may, under special conditions and when no better system is possible, be used for slop water and other house wastes. Excreta should be excluded from such drains.

Such conditions are found in industrial rural areas where wastes like phenol exert a disinfecting action on the contents of the drains. Open drains may also be used for this purpose in rural districts other than industrial when nothing better offers, providing they are properly fenced off, regularly supervised and the configuration of the surface of the soil permits of a rapid flow (hilly districts).

2. THE DISPOSAL OF SEWER EFFLUENTS.

Sewer effluents may be disposed of by permitting them to flow into a watercourse, lake or tidal basin.

Such a method of disposal is satisfactory providing :

(a) That the quality of the water at a given distance below the sewage outfall is equal to the quality of the water above the point where sewage enters ;

(b) That the dilution is sufficiently great : the rule that the volume of the stream should never be less than 100 times the volume of the sewage previously cleared of solid matter gives good results in practice.

3. PURIFICATION OF SEWAGE EFFLUENTS.

When it becomes necessary to purify sewage effluents as in :

- (a) Closely populated rural districts ;
- (b) Districts without an abundance of surface water ;
- (c) Districts where it is desirable, to limit stream pollution to a certain maximum,

a number of methods may be adopted in rural districts. These should be simple, adapted to local conditions and require a minimum of care by unskilled staff. These methods are mechanical and biological.

A. Mechanical Methods. — The simplest mechanical method is the use of fixed racks* intended to retain the solids.

Settling-tanks also effect a certain amount of purification depending upon the condition of the sewage and the velocity of flow in the tank. In practice, a tank with a capacity of 0.62 of the daily volume of the dry-weather flow, the width equalling one-third of the length, gives good results.

B. Biological Methods. — These are always preceded by mechanical methods. The principal biological methods are :

(1) Sprinkling filters : These are best adapted to rural conditions, being inexpensive to instal and maintain, requiring little attention and no trained personnel and being capable of easy repair ;

(2) The remaining methods — such as activated sludge (as at present constituted), contact beds or sand filters — are not adapted to rural conditions.

4. OTHER METHODS.

The following methods may also be used :

*A. Leaching Cesspools * and Subsoil Irrigation.* — These methods can only be used when the ground water is not employed as a source of domestic water supply.

Subsoil irrigation is well adapted for small amounts of sewage such as the effluents from single houses, institutions or small settlements.

Subsoil irrigation should be preceded by some form of mechanical or biological purification.

B. Surface Irrigation. — This method is one of the best for rural conditions if the soil is suitable, the area sufficiently large and the treatment properly supervised.

The main consideration should be the proper disposal of the sewage rather than the raising of good crops.

5. DISPOSAL OF SEWAGE IN UNSEWERED DISTRICTS.

The main objects of proper sewage disposal in unsewered districts are :

- (1) The protection of the surface of the soil ;
- (2) The protection of the subsoil water ;
- (3) The protection of the sewage from access of flies.

These objects can best be attained by the use of water-tight receptacles in a fly-proof superstructure.

As fresh excreta may contain pathogenic micro-organisms and intestinal parasites, provision should be made for storage of sufficient duration to destroy such organisms.

Methods of providing for such storage are watertight tanks with two compartments for alternate use, or double compartment tanks of which only the second can be emptied.

Another method is the use of pails. As these contain fresh material some form of disinfectant should be used, or the contents should at least be covered with dry earth, peat or other deodorant.

The pail system operates more satisfactorily when there is a public system of collection under proper supervision. As such a system is difficult to maintain in rural districts the disposal of the material must unfortunately be left to the householder whose education in hygiene is not usually sufficient.

Single-compartment tanks may be used in villages where a proper system of collection exists. The contents should be transported in watertight containers to a suitable distance and properly treated, as, for instance, by placing alternate layers of sewage and dried peat in a large open tank.

In rural districts where it is not necessary to prevent the contamination of ground water ordinary unlined pits may be used.

The Java type of privy, consisting of a deep hole of small diameter, into which basket work is inserted, is apparently suitable. It requires further study.

Whatever the method of sewage disposal adopted for individual houses, the privy should be located as far as possible from the well or other source of water supply.

6. DISPOSAL OF MANURE.

Solid and liquid stable manure should be stored in watertight pits situated as far as possible from the house and arranged in such a way as to expose the smallest possible surface to flies. The pits should also be so arranged as to prevent the contents being subject to the washing action of rain water.

Manure pits should be provided with a special watertight compartment for the liquid manure.

The experts recommend that the prevention of fly-breeding by measures tending to promote the development of heat in manure piles should be made the subject of further experiment and study.

7. DISPOSAL OF GARBAGE.

In built-up rural villages, the regular collection and systematic disposal of house garbage and refuse is the most effective method.

This material may be disposed of by dumping frequently in thin layers and covering with earth, ashes or other dry refuse. Such a method of collection and disposal requires careful and competent supervision.

Another method of disposal is to feed the garbage to pigs, either collectively or on the individual farms. When this method is adopted collectively, the collection and disposal is usually let out to a contractor whose sole object is the fattening of the pigs and who is apt to neglect sanitary considerations.

Garbage is also a prolific source of flies and measures should be taken to prevent flybreeding.

A safe rule to adopt is to treat garbage as infectious matter and to dispose of it in such a way as to prevent the pollution of the surface of the soil, the subsoil by percolation (ground water) and the houses in the neighbourhood by flies which breed in the garbage.

Methods of treating garbage by tanks permitting of the development of heat are worthy of further experiment and study.

B. Water Supply.

An abundant supply of pure water in rural districts is not only an important factor in the protection of the health of human beings and of cattle, but is also of great value in the promotion of agriculture.

1. PUBLIC WATER-SUPPLY SYSTEMS.

(a) *For a Number of Villages.* — The system of central water supply distributed to a number of villages is, when practicable, the best for rural conditions. A large supply is always to be preferred to a smaller one. This system is to be recommended particularly in the more populated areas, and for districts in which suitable water sources are few, as it permits of the most advantageous utilisation of the potable water.

The co-operation of a number of villages to secure a joint water-supply system permits of a more adequate plant, gives the opportunity to employ skilled personnel and also permits the use of methods of purification when necessary. It follows that the source which can be developed most economically may be selected, as purification will remove the possibility of danger. In the case of these central water supplies, any modern method of purification may be adopted as it will be carefully applied and supervised.

(b) *For Individual Villages.* — The source of the village water supply should be selected after appropriate investigations in order to secure a water free from the possibility of any dangerous contamination.

The necessity for any system of purification is to be avoided as such systems require technical supervision, which is not usually available in rural districts.

Village water supplies should be constructed with due regard for simplicity of design, economy and ease of operation and maintenance.

2. PURITY OF THE WATER.

When treatment is necessary, it should be safeguarded in every possible way. The lines of defence should be ;

- (1) Protection of the source ;
- (2) Purification (sedimentation, filtration, etc.) ;
- (3) Disinfection ;
- (4) Supervision.

Protection of the source and supervision of the supply are necessary in any case.

When the water is drawn from rocky formations in which fissures exist (limestone, karst) it should be adequately purified. Disinfection by chlorine is at present a practical solution.

When contamination occurs only at rare intervals and for short periods it is advisable to apply chlorine throughout the year, otherwise, when the occasion arises, the apparatus may be out of order. Nevertheless, during the periods of the year when no danger threatens, very small amounts of chlorine may be used, and these may be increased when necessary.

When there is any possibility that a water supply may be responsible for an outbreak of intestinal disease, chlorine should be applied immediately and continued until the investigation is completed.

Portable chlorinating plants should be available at central institutions for use in case of emergency, such as the threatened pollution of a normally pure water supply.

3. SUPERVISION OF WATER SUPPLIES.

Constant supervision of all public water supplies is necessary. This supervision should relate to the source of the supply, the plant and the distributing system, as well as to the effluent, and should be closest during the seasons when the supply is most likely to be contaminated (dry season, floods, etc.).

The personnel engaged in this supervision should be trained in the hygiene of water.

4. INDIVIDUAL WATER SUPPLIES.

These may take the form of wells, springs and cisterns. They should be constructed by qualified persons who have received proper instruction in the elements of hygiene of water, otherwise they are apt to be dangerously located, badly constructed and improperly protected.

The competent authorities should adopt regulations providing for the proper location, construction and protection of individual supplies, and these regulations should be adequately enforced.

For the guidance of local authorities, a model code should be prepared by the central health services.

5. THE CENTRAL ORGANISATION.

Progress in matters of water supply must be based on scientific research centralised in a suitable organisation, which thus constitutes a hydrological and geological intelligence service for the purpose of locating suitable sources of water supply and for the collection of all other relevant data.

Such an organisation should as far as possible have jurisdiction over all matters affecting water supply in the State or province.

It would be difficult to over-estimate the advantages of a central organisation of this kind. In view of the information at its disposal for the entire State or province, and the expert knowledge of the specialists attached to it, such an organisation would be in a position to ensure that the existing water sources are utilised to the best advantage and that partial solutions of water-supply problems are avoided.

Such an organisation would place at the disposal of individuals, societies and communities technical information and expert advice on matters of water supply and would act as a centre for the education of the people in the hygiene of water.

C. Housing in Rural Districts.

1. There is urgent need for improvement in the housing conditions of rural districts. Progress in this respect is hindered by the depressed condition of agriculture, the lack of cheap credit and the fact that education in hygiene in rural districts has not reached a sufficiently high level.

The housing shortage in cities has led in most countries to concentration on the housing problem in industrial areas, and the needs of rural districts have not always received the attention they deserved.

Suitable housing is a fundamental requirement for rural hygiene. It is influenced by social and economic conditions and in its turn exerts a strong influence on these conditions, resulting in better health and a general elevation of the standard of life.

2. The principal defects of rural housing from the point of view of hygiene are :

(a) Overcrowding. Good houses are too few. There are too few bedrooms in the existing houses. The house may be too small or, in planning it, the existing space may have been insufficiently utilised.

(b) There is inadequate provision of toilet and sanitary facilities.

(c) The living quarters are insufficiently protected from the stables.

(d) The house is so located and constructed as to suffer from dampness.

(e) There is a lack of proper ventilation, lighting and heating.

(f) There is insufficient protection from mosquitoes and flies.

(g) There is insufficient exposure to the sun.

3. Methods of improving Rural Housing. — These are :

(a) Education ;

(b) Cheap credit and improved methods of agriculture ;

(c) Legislation, by-laws and regulations, provided there is sufficient supervision and enforcement.

The practice of making public buildings models from the point of view of hygiene and sanitation is highly recommended.

The construction of model houses at numerous strategic points encourages imitation.

Good housing will appeal more readily to the rural population if the plans are prepared after a study of local customs and social and economic conditions, so as to preserve features characteristic of the district.

Loans at low rates of interest and grants may be provided by legislation, and are potent means of improving rural housing. The award of bonuses for proper construction yields a large return for the investment of small sums.

There should be building codes prescribing minima requirements in respect of sites, exposure, lighting, ventilation, and all sanitary requirements. Technical supervision and enforcement are required to make these effective.

Such enforcement should not be left altogether to the local authorities.

The health authority should have jurisdiction over all sanitary aspects of housing.

The preparation and distribution of standard plans satisfying the sanitary requirements has given good results and should be encouraged. Such houses should be of simple design and economic construction.

4. The improvement of housing for agricultural workers presents difficulties which cannot be solved by education and persuasion alone. The agricultural worker is in a particularly weak position in this respect, and suitable legislation, with proper enforcement, as well as public financial assistance, are needed to cope with this problem.

Poor housing for this class accelerates the exodus of the best workers to the cities, where in many cases more attention has been given to housing for industrial workers, and this in turn lowers the standard of rural life and prevents hygienic improvement.

The experts recommend that the attention of the Rural Hygiene Conference should be drawn to the recommendation of the International Labour Conference (1921) on this subject.

5. Rural housing may also be improved by suitable reconditioning of existing houses. When properly directed and supervised, such reconditioning may yield excellent results sometimes at comparatively small cost.

The construction of model villages and agricultural colonies is of particular interest and importance in respect of rural housing. The tendency to locate industrial plants in rural districts should be encouraged, such new construction offering opportunities for the building up of model villages and the application of all sanitary safeguards.

In the planning of these villages and colonies, the Health Authorities should have jurisdiction over all matters of hygiene and sanitation.

The experts recommend the further study of this problem.

D. Land Improvements or Bonifications.

1. Bonifications are defined by the experts as the complete sanitary reconditioning of the land in areas where the general living conditions of the people are bad, more especially on account of malaria and other endemic diseases which endanger the vitality of the people.

2. This complete sanitary reconstruction is not limited to land drainage, but includes all measures required to bring the land itself under cultivation, and the provision of hygienic living conditions for the population by means of a network of good roads, suitable rural housing, a good water supply, sewage and waste disposal.

3. Under certain conditions it also includes the irrigation necessary for farming purposes, as well as to enable the cattle to be housed throughout the year, this practice being especially indicated in view of the campaign against malaria.

4. Bonifications thus bring about a marked improvement in the standard of living, both economic and hygienic, and should accordingly be regarded as one of the most striking examples of rural hygiene.

The application of the system of bonifications requires the help of the hygienist. This is particularly necessary during the execution of the work.

5. The experts desire to draw the attention of the Rural Hygiene Conference to the importance of proper drainage of water by water-courses, and to the serious consequences resulting from the neglect to maintain these properly, not only in respect of agriculture but also in regard to hygiene.

ANNEX 2.

SICKNESS INSURANCE AS A FACTOR IN RURAL HYGIENE.

REPORT SUBMITTED TO THE CONFERENCE BY THE
INTERNATIONAL LABOUR OFFICE.

SUMMARY.

Introduction.

- I. Object and Tendencies of Sickness Insurance for Agricultural Workers.
 - II. Organisation of Medical Aid in Rural Districts through Sickness Insurance.
 - III. Co-operation between Health Services and Sickness Insurance in Rural Districts.
-

INTRODUCTION.

Insurance originally grew out of the guild system and commerce, and has made its way but slowly into the rural districts. The peasant began by insuring his property against the elements. The hardships which often accompany country life have made him feel the need for insurance against the risks which menace his health and working capacity. To-day the necessity of constant effort for the maintenance of health and for the prevention of any loss of productive power is becoming equally evident to the rural and to the urban populations.

The extension of social insurance and of sickness insurance in particular to those engaged in agriculture is one of the most important measures taken to raise the standard of health and hygiene in rural districts. The present report gives an account of the nature and extent of the contribution of sickness insurance to the improvement of rural health.

The report consists of three parts.

The *first* part sets forth the *objects and tendencies of sickness insurance for agricultural workers*. Insurance aims at maintaining health, preventing avoidable illness, curing the sick and restoring them to health. The extent of its action depends on the persons covered by insurance, the force of its action depends on the administration of its benefits.

The *second* part describes the *organisation of medical aid in rural districts through sickness insurance*. With a view to maintaining health and to detecting and treating illness in its earliest stages, an insurance scheme establishes an organisation of services and material equipment which enables it to provide efficient medical aid.

The *third* part deals with the *co-operation between health services and sickness insurance in rural districts*. Convinced of the value of the co-ordination of all work aiming at the improvement of rural hygiene, sickness insurance co-operates with the health services in order to render more efficient the protection of rural populations against sickness.

I. OBJECT AND TENDENCIES OF SICKNESS INSURANCE FOR AGRICULTURAL WORKERS.

NECESSITY AND OBJECT OF SICKNESS INSURANCE.

The maintenance of the health and productive capacity of the workers is of capital importance not only for the workers themselves but also for the national communities desirous of developing their productivity. This object can only be achieved by constant and systematic endeavour to prevent and remedy any loss of health and working capacity.

Social insurance undertakes this systematic effort by adopting measures which are common to every social institution : it confers on persons whose economic position is precarious a definite right to assistance by the community, that right being based on their own contributions to the resources of the community, but, having regard to considerations of economy, it limits the benefits which have to be provided by the community to that which is at once necessary and sufficient for the purpose to be achieved.

Sickness insurance is based upon the mutual aid of those persons who have the greatest need of protection against the possible consequence of sickness. It is administered by the parties concerned, as their own business, the intervention of the public authorities being limited to the supervision of the management.

In the beginning, insurance dealt only with the consequences of sickness, and compensated wholly or in part insured persons who had suffered loss of earnings or other economic loss. Since then, it has progressed. The insured person receives only part of the benefits in cash, the other part being supplied to him in kind. Medical aid occupies the foreground, and insurance is interested more in restoration to health than in compensation. In the latest phase of its development, insurance aims at individual and

general prevention with the object of preserving health and protecting it from every possible danger. Thus insurance has gradually become an organised system for the defence and improvement of health.

DEVELOPMENT OF SICKNESS INSURANCE FOR AGRICULTURAL WORKERS.

Intended at first for urban populations, sickness insurance is now widely applied to agricultural workers. For many years it was alleged that difficulties of organisation owing to the dispersion of rural populations prevented the extension of sickness insurance to agriculture. Experience, however, has proved that these difficulties can be overcome. As the relations between the agricultural labourer and his employer gradually lost their patriarchal character, and as agricultural labourers formed their own trade unions, sickness insurance for agricultural workers became essential. It is now more necessary than ever if the exodus from the country is to be checked.

In countries which have introduced a general scheme of compulsory sickness insurance, agricultural workers have been included, either from the outset or in successive stages. At the present time, in Europe, there are some five or six million agricultural wage-earners who are compulsorily insured against sickness, leaving out of account a large number of other workers in occupations connected with agriculture who are members of voluntary schemes of sickness insurance subsidised by the State.

In the following paragraphs a sketch is given of the present position of sickness insurance for agricultural workers in Europe.

Compulsory Insurance.

Agricultural wage-earners are compulsorily insured on the same footing as wage-earners in other occupations in the following countries : Austria, Bulgaria, Czechoslovakia, France, Germany, Irish Free State, Netherlands, Norway and the United Kingdom. In other countries — Poland, Rumania and the Union of Soviet Socialist Republics — certain classes of agricultural wage-earners, or agricultural wage earners in certain districts, are compulsorily insured against sickness.

In the *United Kingdom* and the *Irish Free State*, wage earners in agricultural occupations have been covered since 1911 by the general scheme of sickness and disablement insurance under exactly the same conditions as those which apply to wage-earners in industry and commerce.

In *Germany*, the scheme of sickness insurance for agricultural wage-earners, who number about three millions, was unified by the social insurance code of 1911, which abolished the several regional schemes of insurance for agricultural workers, and placed agricultural workers on an entire equality with other workers subject to compulsory insurance.

In *Norway*, agricultural workers are covered by the general scheme of wage-earners' sickness insurance established in 1915.

In *Czechoslovakia*, the general scheme of sickness insurance was extended to include all wage-earners in agricultural occupations, who, since 1926, are afforded the benefits, in cash and in kind, of invalidity insurance on the same terms as industrial wage-earners.

Bulgaria, since 1924, has applied its social insurance legislation to agricultural wage-earners, with the sole exception of certain classes of seasonal workers.

In *Austria*, the scheme of sickness insurance for agricultural wage-earners has been unified by an act of 1928 which established a complete system specially adapted to the needs of rural populations.

In *France*, the new general social insurance law of April 30th, 1930, has granted special advantages to workers engaged in agricultural and forest occupations. Wage-earners in these occupations are compulsorily insured, as are also share-farmers who work ordinarily alone and do not possess any part of the live-stock at the time when they begin farming. Moreover, voluntary insurance is open under easy and very favourable conditions to other share-farmers and independent farmers who, without being wage-earners, live mainly by the product of their work and whose earnings do not exceed a comparatively high maximum.

Voluntary Insurance.

The object pursued by the French law, which was to bring within the ambit of social insurance all workers, whether wage-earners or not, in agricultural occupations, has been attained without compulsion in a single country — *Denmark*. In circumstances which are exceptionally favourable, by means of insurance which is voluntary but which is heavily subsidised by the public authorities, the Danish sickness insurance funds cover nearly three-fifths of the entire population, and thus include, without any important omission and without distinction of occupation, almost all the adults whose social condition calls for mutual aid.

Though not achieving the same result, voluntary sickness insurance has also made its way into the rural districts of other countries — *Belgium*, *Spain* and *Switzerland*, in this last country thanks mainly to the fact that insurance has been rendered compulsory by the cantons or the communes.

In other countries which have already accepted the idea of compulsory sickness insurance, Governments have made plans for extending sickness insurance to cover wage-earners in agricultural occupations. Bills to this effect have already been either tabled or discussed in *Belgium* (sickness, invalidity), *Rumania* (sickness), and *Poland* (invalidity). The development of sickness insurance for agricultural workers is more advanced in *Italy*, where under the auspices of the Ministry of Corporations and by agreement between the two national confederations of employers and agricultural workers, the National Federation of Sickness Insurance Funds for Workers in Agriculture has recently been created.

The depression from which agriculture in Europe has been suffering for several years has doubtless increased the difficulties and checked the movement for the extension of sickness insurance for agricultural workers. Nevertheless, sickness insurance has been proved just as valuable in rural districts as in urban areas, and in no country will it be possible in the long run to exclude workers in agricultural occupations from its benefits.

ORGANISATION OF SICKNESS INSURANCE FOR AGRICULTURAL WORKERS.

Though sickness insurance for agricultural workers has not reached the same standard in the different countries, its development during the post-war period appears to be along convergent lines, and everywhere there seems to exist a desire to extend and intensify insurance in rural districts.

The circle of compulsorily insured persons is widening. All agricultural wage-earners, whether or not they live in their employer's house, are subject to compulsory insurance, whatever the nature and form of their remuneration. With the exception of the wife, no member of the employer's family who works for remuneration is exempt from com-

pulsory insurance. The wage-limit prescribed in several countries in connection with liability to insurance does not affect the great majority of agricultural wage-earners, and even the salaried workers who supervise and direct agricultural work are only rarely excluded from compulsory insurance by the wage-limit. Some classes of persons working on their own account whose economic and social situation resembles that of day labourers and farm servants are subject to insurance on the same footing as wage-earners.

The widest facilities for voluntary insurance have in recent legislation been offered to peasants and farmers, even to peasants who work alone or with the help of members of their family, or who do not employ regularly more than two wage-earners.

Sickness insurance is essentially concerned with the family. It affords protection to the working-class family and not to the worker only. Post-war legislation provides the family of the insured person with free medical treatment and drugs, or at least requires insurance institutions to pay part of the cost of such benefits. For the first time the entire insured population is subject to regular and systematic medical supervision.

The class of benefits provided by an insurance scheme is the best criterion of its value and shows the particular task assigned to sickness insurance in the general work for rural hygiene.

The benefits of sickness insurance are adapted to the threefold purpose of its health work : to maintain and strengthen health, to prevent sickness, and to cure disease in its earliest stages.

The object of the curative benefits is to diagnose the symptoms of disease, to determine their significance for the patient, to relieve his sufferings, to offer him all the assistance he needs, and to secure by appropriate treatment a rapid and complete cure.

The benefits which aim at the maintenance of health include all measures tending to increase the physical resistance of the insured population against disease and all instruction given to the individual in personal and domestic hygiene.

Preventive benefits are based upon the systematic seeking out of cases where medical intervention is necessary, and on the determination of the physical condition of the individuals concerned, their economic situation and their family circumstances. Where necessary, medical and economic measures are taken for the protection of the insured person until a lasting result is obtained.

These tendencies are clearly shown in all countries where sickness insurance has been in operation for many years. They were found by the International Labour Conference, which at its 1927 session undertook a general examination of sickness insurance, to be so similar and so sound that it decided to draw up for agricultural wage-earners, as for wage-earners in all other occupations, a system of international regulations for sickness insurance.

INTERNATIONAL REGULATIONS FOR SICKNESS INSURANCE OF AGRICULTURAL WORKERS.

Under the Convention which was drawn up as the result of the International Labour Conference's discussions and which is already in force in six European countries having several million agricultural wage-earners, states undertake to establish compulsory sickness insurance for wage-earners in every agricultural undertaking whatever.

The Convention guarantees to insured persons, in exchange for a contribution deducted from their wages, not only subsistence allowances in case of loss of wages through sickness, but also a right to medical benefit during the first twenty-six weeks or sickness at least. Medical benefit comprises treatment by a fully qualified medical man and a supply of medicines and appliances adequate as regards quantity and quality. The

Convention leaves each State free to authorise or prescribe the conditions under which medical benefit, as thus defined, may be granted to the members of an insured person's family.

The International Labour Conference laid down in the Convention the minimum conditions from the medical point of view that any sickness insurance must fulfil. The Conference further drew up, in the form of a recommendation addressed to national legislatures, a set of general principles which long experience has shown to be the best for promoting the organisation of effective medical aid. These principles relate to the development of various forms of medical treatment, the supply of drugs, dental treatment and hospital treatment; they urge sickness insurance institutions to assist in inculcating the rules of hygiene upon the workers and to grant preventive treatment to as large a number of persons as possible as soon as the premonitory symptoms of disease appear.

These principles, representing a selection, from general rules which have proved their value, constitute a health programme for sickness insurance institutions and are the basis of their daily work among insured persons and their families.

II. ORGANISATION OF MEDICAL AID IN RURAL DISTRICTS THROUGH SICKNESS INSURANCE.

ELEMENTS OF EFFICIENT MEDICAL AID IN RURAL DISTRICTS.

If it is to be adequate and efficient, every system of organised medical aid must afford the population all the means required for the maintenance of health and the detection and treatment of disease in its earliest stage. Insurance must provide this medical aid because the law requires it to do so in the interest of insured persons and in the general interest.

Sickness insurance institutions enable insured persons to procure medical treatment and any sanitary assistance they require, to choose a doctor they have confidence in, to avail themselves of the services of specialists, and to obtain admission to a hospital, sanatorium or convalescent home. The same facilities are, according to recent insurance legislation, likewise granted to members of the families of insured persons.

The doctor who undertakes the treatment and supervision of insured persons is required to take all necessary measures to alleviate suffering and to restore the health of the patient. The efforts of sickness insurance to supplement and perfect its system of medical aid have entailed a considerable increase in its expenditure on benefits in kind as compared with expenditure before the war. The principles of economy on which the administration of social insurance institutions is based require that the doctor should comply with these principles in drawing up his prescriptions. If he has a choice of several methods of proved efficacy for the prevention, alleviation or cure of the complaint from which the patient is suffering, the doctor, having regard to the constitution, mental disposition and social and occupational situation of the patient, must choose the method which will bring about his cure and restoration as speedily as possible, at the smallest possible cost and with the maximum chance of success. In order to make the task of the practitioner easier, insurance institutions endeavour to place at his disposal all the latest facilities for diagnosis and treatment, and to take all steps to instruct insured persons in the rules of hygiene which they should observe in order to maintain their health.

MEDICAL BENEFITS OF SICKNESS INSURANCE.

1. *Predominance of Benefits in Kind.*

Benefits in kind are the foremost consideration of insurance institutions, and account for the greater part of their funds.

In *Czechoslovakia*, for instance, the rural sickness insurance institutions expend on an average, per case of sickness (confinements excepted), 110.56 crowns for sickness benefit; 70.30 for doctors' fees; 34.30 for drugs; 64.19 for hospital expenses; total 279.35 crowns (1927).

As benefits in kind develop, the place of the doctor in sickness insurance becomes more important, and the greater also is the need of insurance institutions to have in their service a sufficient number of doctors suitably distributed over the whole national territory and in all the rural areas.

2. *Facilities afforded by Sickness Insurance to improve the Distribution of Doctors.*

In areas where doctors are lacking, sickness funds endeavour to make it easier for them to set up in practice; besides affording the essential encouragement of entrusting him with the treatment of insured persons, the sickness funds also assist the doctor by securing him accommodation, by enabling him to maintain one or even two surgeries, or by granting him adequate mileage allowances and special allowance in areas which are particularly difficult to cover.

In sparsely-populated areas, doctors who undertake the treatment of insured persons receive from insurance institutions special advantages such as additional remuneration and opportunities of following post-graduate courses (*e.g.*, insurance doctors in the Scottish Highlands).

By this variety of measures, sickness insurance has facilitated the access of rural populations to the doctors and done much to improve the distribution of practitioners.

In certain countries, sickness funds, acting in conjunction with the medical profession, endeavour to draw up a plan for the systematic distribution of doctors throughout the national territory, with the object of assisting young doctors who could not set up in the towns to obtain practices in the rural districts.

3. *Specialists and Dental Surgeons.*

The system of medical aid afforded by sickness insurance also includes, in the majority of countries, the services of specialists and dental treatment. The principle of free choice operates here also, and insured persons are entitled to choose the specialist or the dental surgeon. When necessary, insurance institutions repay the cost of travelling to consult a specialist.

4. *Facilities for Diagnosis.*

The first condition which must be satisfied by an adequate and efficient system of medical aid and by a vigilant system of prevention is that it should secure sound diagnosis. In the present state of medical science and technique the thorough examination of patients requires special methods and apparatus such as X-rays, and bacteriological, chemical, microscopic, serological, and histological examinations. If the practitioner has not the experience or the apparatus necessary for such examinations, insurance institutions arrange for them and pay the expenses. Specialised diagnosis and treatment centres,

dispensaries for the treatment of tuberculosis and venereal diseases, baby clinics, and other similar institutions, help the practitioner in making his diagnosis and drawing up his plan of treatment. These specialised centres and institutions give the doctor valuable information, and even, when circumstances require, provide treatment.

5. *Facilities for Treatment.*

The practitioner in rural districts, more often than his colleague in the towns, needs assistance in the application of special methods of therapy.

For ultra-violet ray treatment, insurance institutions contract with specially-equipped establishments ; some possess establishments of their own. The same is the case with hydrotherapy and mechanotherapy.

The conditions peculiar to rural life render it necessary to organise a service of trained nurses and visiting nurses.

The work of nurses in rural districts on behalf of sickness insurance has in certain countries been regulated in detail, as, for example, in *Germany*, where rules were laid down by the Federal Committee of doctors and sickness funds on April 10th, 1924.

6. *Hospital Treatment.*

Not only the urban, but also the rural population avails itself to an ever-increasing extent of treatment in hospitals and other curative institutions.

The objects of hospital treatment comprise not only curative measures, but also diagnosis and the detection of diseases by observation of the patient.

Insurance institutions leave to the public authorities, the State and the local governments the function of establishing and managing hospitals, and only undertake this task themselves in special circumstances.

Nevertheless, sickness insurance is helping considerably to improve and modernise hospital equipment.

The cost of hospital treatment represents an appreciable proportion of sickness insurance expenditure.

In *Czechoslovakia*, the rural sickness insurance institutions expended in 1927, per insured person, 40.38 crowns for medical treatment ; 19.14 for drugs ; 28.80 for maintenance in hospitals.

In *Austria*, the agricultural sickness funds expended, per insured person per annum 16.05 schillings for medical and dental treatment ; 4.92 for drugs ; 8.28 for hospital treatment ; 2.84 for obstetrical treatment ; 2.59 for general preventive treatment (1928).

In *Germany*, rural sickness funds devoted 28.9 per cent of their expenditure to medical treatment ; 13.4 per cent to drugs ; 37 per cent to sickness cash benefit ; 16.2 per cent to hospital treatment ; 4.5 per cent to obstetrical treatment (1926).

Insurance institutions bear the cost of conveying patients to and from hospitals ; some institutions have their own ambulances.

In order to assist the hospitals and to lessen the drawbacks of hospital treatment for insured persons, and also to reduce their own hospital expenses, a great number of sickness insurance institutions enter into contracts with hospitals and set up their own establishments for special treatments, particularly that of tuberculosis. Certain insurance institutions, moreover, have provided infirmaries for chronic cases on whom hospital space would be wasted, as well as convalescent homes and colonies.

7. *Auxiliary Medical Staff.*

Among the auxiliaries of the doctor, the *trained nurse* takes first place, since her help is indispensable for certain forms of treatment in the patient's home.

It is the duty of the public authorities to see that there are a sufficient number of *midwives* in the rural districts. Sickness-insurance institutions also encourage midwives to establish themselves in the country by granting them a favourable scale of remuneration and by entrusting them with the care of insured women before and after confinement, unless special institutions for this purpose have been created in the district.

Masseurs and other skilled auxiliaries also receive considerable professional and financial assistance from the sickness insurance.

The regular employment of *visiting nurses* becomes indispensable to sickness insurance in the systematic development of its treatment and preventive services in rural districts.

THE CONTRIBUTION OF SICKNESS INSURANCE TO THE PREVENTION OF SICKNESS AND THE PRESERVATION OF HEALTH.

Sickness insurance contributes considerably to the work of prevention and to the improvement of public health.

It is not easy to estimate the value of this contribution, or to deduce it from the budgets of insurance institutions, in which treatment benefits take the foremost place. It consists in particular measures which differ from one district to another and are conditioned by the nature and urgency of local needs.

1. *Local Hygiene.*

Insurance institutions contribute to the development of local hygiene by encouraging the building of healthy dwellings by making advances on mortgage, by spreading a knowledge of the rules of hygiene whereby the domestic habits of the rural population are improved, and by making available means of disinfection, means of destroying insects, etc.

A great many sickness funds create and maintain, either on their own account or in co-operation with the local authorities, bathing establishments available to the entire population.

By organising an efficient system of medical aid for insured persons and their families, sickness funds provide an indirect but real contribution to the facilities for diagnosis and treatment available to the uninsured population.

By the grant of adequate and efficient medical and obstetrical assistance through a properly qualified staff, social insurance institutions are combating superstition and quackery.

2. *Popular Instruction in Hygiene.*

Recognising the necessity of inculcating the practice of the rules of hygiene, many sickness funds have set up special services for health propaganda, their duties including the preparation of films, lantern-slides and tracts, and the organisation of permanent or travelling health exhibitions open to the public, free of charge.

By the nature and extent of the medical aid which it affords to insured persons and their families, and by its activity in the prevention of disease and the protection of health, sickness insurance is indeed reducing the risk for which it is liable, and it is at the same time a powerful factor in raising the standard of rural hygiene.

III. CO-OPERATION BETWEEN HEALTH SERVICES AND SICKNESS INSURANCE IN RURAL DISTRICTS.

THE VALUE AND OBJECT OF CO-OPERATION.

Responsible as they are for the health of their members, sickness funds endeavour to bring about conditions conducive to the preservation of a good state of health. Their efforts would not be fully successful if they did not take into account, when drawing up and carrying out their programme, the work of health services and public assistance institutions. The principles of economy upon which sickness insurance is based require it to be always seeking, by the avoidance of gaps and overlapping, the greatest efficiency through the co-ordination of its work with that of all other institutions having a similar object.

Such a co-ordination of effort is more necessary in the rural districts than in the towns. Rural populations must have an organised system of health protection. Housing conditions and domestic habits are often unhygienic. Rural populations frequently lack drinking-water, opportunities for baths, means of disinfection, etc. The distances between houses make it difficult to arrange for consultations, for it is not easy to find suitable premises. A further trouble is that rural populations stubbornly resist the first attempts at health protection, but this resistance must be overcome in their own interest. In view of the extent and difficulty of the task, all efforts must be inspired by a common will.

Co-operation in the field of health protection has a definite object in view which is determined primarily by local conditions and needs. Each co-operating party contributes to the execution of the programme jointly agreed upon, by performing the function it has undertaken.

FIELDS AND METHODS OF CO-OPERATION.

The preparation in common of a plan for the medical and sanitary equipment of rural districts must be undertaken by health services and social insurance institutions as the first step towards co-operation on a large scale.

Among other fields in which organised co-operation is necessary, mention may particularly be made of the campaigns against tuberculosis, venereal disease, cancer and mental diseases, maternity and infant welfare, child welfare, and the instruction of rural populations in hygiene.

The order in which these different tasks could be generally taken up depends on the comparative urgency of this and that preventive or protective measure. Sometimes the organisation of child welfare or the campaign against tuberculosis will appear the most urgent, sometimes it will be better to deal first of all with venereal disease or alcoholism.

Co-operation will be carried out by means of joint committees composed of representatives of health services and social insurance institutions together with delegates of the medical profession and public assistance institutions. These committees, while not encroaching upon the autonomy of the several parties, will draw up a programme of joint action, and will decide the best methods of procedure and the contribution to be made by each party to their joint undertaking for the defence and improvement of rural hygiene.

ANNEX 3.

EXTRACTS FROM THE REPORT ON WATER SUPPLIES IN RURAL DISTRICTS.

PRESENTED BY M. W. F. J. M. KRUL, DIRECTOR OF THE NATIONAL BUREAU FOR WATER SUPPLY AT THE HAGUE.

I. IMPORTANCE OF GOOD WATER SUPPLIES IN RURAL DISTRICTS.

When water systems were installed in the rural parts of the *Netherlands*, farmers and cattle-breeders began only gradually to show any appreciation.

Nevertheless, particularly on account of co-operative dairies and agricultural associations, the favourable experience of the pioneers did not fail to cause imitation on the part of others.

In *Denmark*, which is above all a country devoted to cattle-raising, small groups of peasants installed quite simple rural water systems without any encouragement from the authorities. In 1924, there were 1,200 such systems carrying water to 34,000 houses.

In many villages in the hilly parts of *Poland*, it was the peasants who planned and installed local water systems ; in a number of cases the mains are several kilometres in length.

II. COLLECTIVE SYSTEMS.

1. *Regional and Centralised Systems*

(a) *Regional Systems of Distribution.*

Every province in the *Netherlands* has adopted regulations prohibiting the installation of a water service before securing permission from the provincial authorities. Such permission may be refused in the interests of the more economical supply of a certain region. Legislation on this subject for the whole country is being prepared.

In several European countries, the system of regional supplies has developed fairly rapidly.

In *Germany*, in addition to industrial districts where model systems of considerable size have been installed, it is mostly in *Bavaria* and *Wurtemberg* that many collective water systems are found, on account of the geo-hydrological and topographical situation as well as the work of the central institutes for water supply in those States.

In *Saxony*, the Government has increased the available supplies secured from the Mulde and Wilzsch rivers by means of storage basins. The water, after purification, will be distributed in the first instance to fifteen settlements with a combined population of 125,000 inhabitants.

In the region of Santerre (the Aisne), *France*, eighty-nine communes, with a combined population of 44,000 inhabitants, receive water from a single system divided into four sections.

It is principally in the hilly industrial regions of *Belgium* that larger or smaller regional water systems are found. These are, however, not real examples of rural water supplies. In the agricultural lowlands, regional systems are still few in number.

There is an increasing tendency in *England* to construct regional water systems.

Such systems are very popular in *Czechoslovakia*. At the end of 1918, there were thirty-two regional supplies serving eighty-five settlements, with a combined population of 137,000. At the end of 1929, there were forty-three systems for 214 settlements, with a total population of 206,000. In *Bohemia*, eighty-six water supplies, of which twelve were regional, were installed in 1929.

The first system of this kind is now being installed in *Yugoslavia*. It will supply a number of settlements on the Adriatic coast.

In the *Netherlands*, these systems, of which several supply relatively large populations, are found mostly in the rural districts. The oldest system, installed in 1913, is that of the island of Zuid-Beveland, supplying twenty-five communes.

The largest, installed in 1920, is in the province of South Holland. It supplies 106 communes, with a total population of 400,000. The annual yield of water reaches ten million cubic metres; the total length of mains is 1,700 kilometres and the capital invested amounts to seventeen million florins.

There are at present in the Netherlands fourteen regional systems supplying approximately 500 rural communes.

We are so fully convinced of the value of regional water supplies that we plan to install such a system in the new polder "Wieringermeer", the first part of the "Zuyderzee" to be drained. In spite of the fact that this polder has an area of 20,000 hectares and that houses and farm buildings will be constructed only gradually, cisterns, which would be the only possible sources of individual water supply (the ground water being salty) will be prohibited. Moreover, the cost of a regional water system is not too great in comparison with the cost of the other undertakings which have been necessary to open up this new territory.

In certain instances, the fact that water must be secured at a long distance from a city makes it possible to supply the rural districts situated along the water main. An example of this is found in *Wurtemberg* (Germany), where more than one hundred villages are supplied from the main which carries water from the pumping-station in the valley of the Danube to Stuttgart. The water is pumped to a reservoir in each village, and the local distribution is carried out by the village.

(b) *System of Distribution for Individual Villages.*

All chemical and biological systems of purification, even the very simple modern systems using chlorine, require technical supervision and maintenance, which a small communal service is not in a position to furnish.

Small village systems should be allowed only when no purification is necessary and when the supply of the village does not prevent the economical solution of water supply for the whole region.

It is impossible to avoid partial, uneconomic solutions without effective legislation based on suitable investigations of the problem of water supply in the whole country.

It is not astonishing that, in areas where the necessary supply of sufficiently pure water may be secured at a suitable level, the number of small supplies should increase rapidly.

In *Switzerland*, for example, where good water is plentiful, nearly all the villages are furnished with piped water supplies.

On account of the development of modern technical methods, particularly in respect of pumps and motors, and the distribution of electricity in rural districts, it is possible to utilise conveniently situated sources, such as deep wells or other low-level waters. Large economies result from the use of shorter mains, less expensive pumping stations, reduced cost of upkeep and the fact that electric machinery requires a minimum of attention.

In *Denmark* the number of rural water supplies increased from 62 in 1900 to 1,200 in 1924. These systems supply 34,000 houses.

In *France*, in 1930, of 37,963 communes, 8,004, or 23 per cent had systems of water supply in use or under construction.

In *Czechoslovakia*, at the end of 1928, there were 1,940 village water systems. In 1930 and 1931, 304 systems were constructed.

In *Poland*, in villages where the land has been divided into a large number of small holdings and in the new villages constructed on such lands, the Minister of Agriculture causes water systems to be constructed, using deep wells as sources. The water is pumped by a windmill, with an internal-combustion motor in reserve.

For financial reasons, water from a central system is sometimes distributed to the consumers by means of street hydrants. In *Poland*, for example, it is the exception in villages for houses to be connected to the street mains.

2. Purity of Water.

When the source of the water is not absolutely above suspicion, it is necessary to establish a protected area. The laws of the country should facilitate the establishment of such an area.

The *French* Law of February 15th, 1902, on the protection of the public health provides for the protection against contamination of water from springs or wells, but does not provide for surface waters which require purification. The same law regulates the disposal of wastes as well as the sinking of wells in a given area surrounding the source, and permits expropriation of lands in that area when that is necessary in the public interest.

The possibility of expropriation is provided for by law in nearly all countries.

In *Belgium*, the Law of August 1st, 1924, provides for the protection of mineral or thermal sources.

In *Switzerland*, the Law of December 10th, 1907, prohibits the construction of buildings or the extension of other undertakings which might be detrimental to the purity or decrease the capacity of sources of water supply.

In *Germany*, water sources may be protected by police regulations, prohibiting the carrying out of detrimental undertakings in a given area.

In *Prussia*, a special law was enacted in 1908 to protect medicinal water sources.

In *Prussia* and *Baden*, the law on the use of water prohibits taking ground water in such a way as would be detrimental to a source of supply; the fact that damage is caused must be proved. Contamination of the ground water detrimental to water-supply sources is prohibited in *Prussia*, *Baden* and *Saxony*.

In *England*, the "Waterworks Clauses Act" (1847) protects ground waters only from mines. The central "Advisory Committee on Water" has drafted regulations to increase the possibility of protecting water sources.

III. SUPERVISION OF WATER SUPPLIES.

In view of the fact that the contamination of a public water supply may have disastrous consequences, the public authorities should take measures to ensure a maximum of safety to consumers.

In *Germany*, all wilful, as well as all involuntary, pollution of pure water is punishable if any damage is caused (*Reichsstrafgesetzbuch*).

In *France*, a draft law is in preparation, providing several penalties for persons who, by lack of attention, negligence, lack of care, or failure to comply with the health regulations, cause the delivery to the consumer of water detrimental to the public health.

In *England*, water-supply plans must be submitted for approval to the Ministry of Health if it is necessary to raise a loan. The plan is studied in detail according to standard rules.

In *Denmark*, the law provides that ground waters are, in principle, the property of the State, and that only water companies which have received a concession may develop such sources.

In *Germany*, the grant of such a concession is necessary before using river or lake waters.

The permanent supervision of water systems is regulated satisfactorily in *Germany*. Article 35 of the Federal law on epidemics (July 30th, 1900) provides that in all Germany State officials may supervise all water supplies distributed to the public. Moreover, all the German States appear to enforce the "Rules for the Establishment, Development and Supervision of Public Water Systems not used solely for Technical Purposes" which the Federal Council approved on June 16th, 1906, recommending that they should be adopted for guidance by the Governments of all the States.

These provisions were supplemented in the different States by special legislative provisions.

In *Prussia*, Article 74 of the "Rules of Service for District Medical Officers" (*Kreisärzte*, September 1st, 1909) recommends that such officers should pay particular attention to the proper distribution of water to the people, and that they should advise on plans for water systems. The situation is about the same in other German States.

The medical officer sees to it that the water is regularly examined bacteriologically. Sanitary supervision extends also to the personnel of waterworks if such personnel comes into direct contact with the water. The stools and urine of this personnel, especially newly engaged persons, are subjected regularly to bacteriological examination in order to determine whether typhoid or dysentery bacilli are present.

The district medical officer is accompanied by a technician when he inspects complicated systems. Such inspections take place once every three years for small systems, biennially or annually for larger systems.

In *France*, the Superior Council of Public Health has prepared general instructions for municipalities to guide them in the use of methods of purifying and sterilising drinking water.

In *England*, the systems must be inspected and supervised at regular intervals by the officials of county health departments.

In the *Netherlands*, the inspectors of the hygiene of water, soil and air make regular examinations of water. For the technical inspection of water systems, they may have the assistance of the National Bureau for Water Supply. In the *Netherlands*, as elsewhere, the sanitary inspector may not have the means to correct the defects found. In *England*, on the contrary, the Public Health Act (1875) and the Waterworks Clauses Act (1847), as well as special regulations, require the majority of water systems to distribute pure water in sufficient quantity to the consumer on pain of prosecution.

In *Germany*, the law on epidemics (*Reichsseuchengesetz*, June 30th, 1900) requires the communes to remedy the defects found by State officials.

The effluents of water-supply systems should be bacteriologically examined frequently, by standard methods as far as possible, to determine the total bacterial count as well as the possible presence of colon bacilli.

IV. INDIVIDUAL SUPPLIES.

The *Prussian* Institute for the Hygiene of Water, Soil and Air at Berlin-Dahlem has given for some years appropriate training in the hygiene of water to well-sinkers, in collaboration with the German association of well-sinkers. Ten of these courses have been given and about two hundred well-sinkers have been trained. It would be wise to supplement these courses in future by further instruction.

The laws of many countries contain provisions respecting individual water supplies.

The *English* Public Health Act (1875) provides that rural district councils shall see to it that each house in the district is furnished with water from a source located within a reasonable distance and giving a sufficient supply of pure water for the use of the householders and for other domestic purposes.

The owner of every house built or reconditioned since 1878 must secure from the rural district council a certificate stating that he has complied with this requirement.

In *Saxony*, the right to build on any lot is accorded only if a sufficient supply of pure water exists nearby. A Ministerial Decree contains the same requirement for *Wurtemberg*.

In the *Netherlands*, the Housing Law (1901) requires municipalities to adopt the regulations required to furnish all houses within their territory with good water.

These regulations, in the case of many communes, require the owners of houses located within a certain distance of mains from a central water system, to connect the houses to such mains, unless, of course, such houses have already another supply always furnishing good water in sufficient amounts.

In *France*, the use of private or communal wells may be prohibited by the mayor, or if necessary, by the prefect.

In *Prussia*, the law (*Wassergesetz*) requires every house-owner to connect the house to the main unless a pure water supply is furnished by other means.

In certain countries, the construction of wells is subject to the approval of the authorities. In *Prussia*, for example, local regulations have been adopted on this subject. (*Brunnenordnungen*). In *Saxony* and *Wurtemberg*, the construction of wells and cisterns is subject to authorisation. The *Polish* Ministry of the Interior has provided by decree for the proper construction of wells. The central authorities frequently prepare model regulations for local adoption. For example, the *French* model code of sanitary regulations intended for the rural communes, and prepared by the Superior Public Health Council, contains rules for the construction of wells and cisterns. The *Prussian* Government has prepared a model for the *Brunnenordnungen*.

In the *Netherlands*, the Director-General of Public Health, in collaboration with the Chief Inspector of Housing, has prepared a model for municipal regulations on housing in which rules for the construction of wells and cisterns appear.

The collaboration of the rural population is necessary for the improvement of private water supplies. However, the people frequently show that their knowledge of the hygiene of wells and cisterns is insufficient. The public should be instructed in this matter.

In *Yugoslavia*, the health services have constructed model springs, wells and cisterns in all parts of the country where water-supply systems do not exist.

There are hundreds of these models, and they are distributed over the whole territory of the State in such a way that they are known to large numbers of people. Moreover, the institutes of hygiene organise public lectures, give courses for peasants and distribute simple plans for the development of springs and the construction of wells and cisterns.

In *Poland*, model wells have been constructed for municipal buildings, post offices, schools, etc., in villages.

V. THE CENTRAL ORGANISATION.

In order to improve rural conditions of water supply, a motive force of great energy is needed. Such energy is best guaranteed by a central organisation provided with the necessary powers. Some countries have developed such central organisations with great success.

The oldest of these is the *Wurtemberg* Office for the Construction of Public Water Systems, dating from 1869.

The Bavarian Institute for the Supply of Pure Water dates from 1900.

The high level of water supplies in these two States is without doubt due to the work of these institutes.

In 1901, the Institute for the Hygiene of Water, Soil and Air was Founded in Prussia. It is administered by the State with the collaboration of the Union for the Hygiene of Water, Air and Soil, from which it receives financial support. The members of this union (municipalities, industries, individuals) have the right to receive advice from the institute at reduced prices. The institute has a large number of scientific workers in hygiene, chemistry, bacteriology, biology and engineering. It carries out scientific investigations, the results of which are published in special communications or periodicals, gives advice, when asked, at cost price, collects hydrological data as well as other information and exercises an educational influence by means of a museum, by assisting with exhibitions and by giving courses to special groups of technicians or hygienists (courses to well-sinkers mentioned above).

The National Society of Water-Supply Systems was founded in *Belgium* in 1914. The capital is furnished by the State, the provinces and the communes. The society first made an inventory of sources of water in the whole country and estimated the future needs for water. It prepares plans for water supplies, directs the work and supervises the operation. In general, a special society is formed under the direction of the National Society for the development of a regional water supply.

In *Poland* the Institute for Water Supplies and Sewers is an interesting example of initiative on the part of the municipalities. Cities are members of this institute as well as specialists in water supply and sewerage. Its budget, which, from 41,000 zlotys in

1928, reached 500,000 zlotys in 1931, is made up of members' fees and the profits on its work. It acts as technical adviser to cities, and especially to small towns which ordinarily do not know to whom to apply for advice.

It has been so successful that at present it is asked to prepare complete plans for water-supply and sewerage systems.

In *England*, the Government set up, in 1923, an Advisory Committee on Water. Its members are judges, directors of large water systems and representatives of the Ministry of Health.

In the *Netherlands* the National Bureau for Water Supply (*Rijksbureau voor Drinkwatervoorziening*) was established in 1913. It is attached to the Ministry of Health (at present the Ministry of Labour, Commerce and Industry). Its primary duty is to advise the Central Government on all matters concerning water supply, such as the award of grants, the study of water-supply proposals for which grants are asked, the preparation of plans, the suppression of the construction and exploitation of subsidised water supplies, the preparation of legislation, etc.

In the second place, the Bureau places its services at the disposal of provincial and municipal authorities as well as private corporations for preliminary, technical and financial studies, the supervision and direction of construction, the maintenance and enlargement of water systems. The cost of this work is repaid to the Bureau; it is only in exceptional circumstances that its work is done free of charge.

In addition, the Bureau organises popular lectures in rural districts, has a collection of lantern slides and films, etc. It carries on geological and hydrological investigations and collects and examines all data concerning water and soil (more than 18,000 reports on the boring of wells, 42,000 samples from such borings and 9,000 water analyses have been collected, and these numbers are increasing continually). The results of these investigations, as well as those on the various technical and scientific problems regarding the whole work and material of a water system, are published irregularly in the form of reports and communications.

In addition to the director, the staff of the Bureau includes eight engineers, a chief and associate chief (doctors of chemistry) of the chemical and bacteriological division (laboratory), a geologist, a hydrologist (mining engineer) and technical officials, chemists and subordinate administrative personnel.

The Government submits important problems regarding water supplies to a permanent commission — the Central Commission for Water Supply (*Centrale Commissie voor Drinkwatervoorziening*) — set up in 1913 in association with the *Rijksbureau*. The members of this Commission are jurists, members of Parliament, agronomists, hygienists, technicians and the director of the *Rijksbureau*.

The *schools of hygiene* of Athens, Budapest, London, Prague, Warsaw and Zagreb require mention in this chapter. In these schools are taught the principles underlying the construction of water supplies, as well as the elements of chemistry, bacteriology, biology and epidemiology. They act as centres of training for sanitary engineers and inspectors, as well as for minor health staff.

VI. FINANCIAL ASSISTANCE IN ORDER TO IMPROVE WATER SUPPLIES IN RURAL DISTRICTS.

Special laws have been enacted in many countries for this purpose.

In *Italy*, in 1885, the Ministry of Finance fixed the interest on loans for water supplies at 4.5 per cent (funds derived from the *Cassa dei Depositi et Prestiti*). Many loans were made, but this law was found to be inadequate; and, in 1887, loans were granted at 3 per cent, with amortisation in thirty years for communes with populations of less than

10,000 inhabitants. In 1888, a law was enacted requiring all communes to furnish pure water to their inhabitants. A new law was enacted in 1900, prolonging until 1905 the period during which advantage could be taken of the law of 1887, fixing the period of amortisation at thirty-five years and raising to 20,000 the maximum population. In 1902, this maximum was raised to 50,000 ; in 1905, to 60,000 ; and in the same year the period of amortisation was extended to fifty years. In 1907, the limit of population was raised to 100,000. The law of 1911 provided for loans without interest to communes with populations of less than 50,000 and required the State to contribute 2 per cent of the interest on loans to communes with populations between 50,000 and 100,000. In 1919 and 1921, the maximum amounts of these loans was raised to 200,000 lire.

At present, the situation is as follows : grants may be made for sanitary improvements, especially in the poorer regions ; loans at low interest may be obtained for such a purpose, and these methods have resulted in loans totalling 1,500 millions lire in round numbers (plus 1,000 million for waterworks, 150 millions for sewers and 126 millions for other sanitary improvements). Special provisions are applied for water supplies in regions subject to bonification. The Italian policy is to :

- (1) Grant loans at low rates for as long periods as possible ;
- (2) Raise progressively the maximum limit of population of communes which benefit from these loans ;
- (3) Make grants to the poorer regions, especially where malaria prevails.

Every rural commune in *France* may obtain financial assistance from the Government for a water system, in the form of grants or loans. A rural commune is one whose population is less than 5,000 and which pays less than 100,000 French francs in taxes per year. Such a commune may obtain a grant amounting to 50 per cent of the cost, and, in special cases, in reconstructed regions, 60 per cent to 90 per cent.

Larger communes do not receive grants, but may obtain loans. Grants are obtained from the national Budget and from taxes on racing and gambling.

The grants made by the Ministry of Agriculture for water supplies (from the *pari mutuel*) reached more than 48 million francs in 1927, 90 millions in 1928, and 154 millions in 1929. In addition to the sums obtained from the *pari mutuel*, the law of December 30th, 1928, provides one hundred millions yearly for the five-year period 1929-1933, and a law enacted in 1930 provides 125 millions more each year for four years for loans at low interest to communes. Half of the whole sum is for road-building, half for water supplies.

In addition to the funds accorded by the central authorities, the departments provide loans and grants and the *Caisse régionale de crédit agricole* makes loans for water supplies in agricultural regions, on the advice of the rural engineering service, at 3 per cent with amortisation in twenty-five years.

In *England*, the Ministry of Health assists the rural villages to obtain loans for water supplies. In 1914, these loans amounted to £233,000, while in 1925 they had increased to £426,000. The Government also gave financial assistance for water systems in order to relieve unemployment.

In *Belgium*, the State may furnish without interest one third of the amount necessary for the construction of waterworks, and the province may contribute from one-sixth to one-third also without interest.

In *Prussia*, the law requires State experts to prepare the plans for the poorer communes and permits the award of grants by the health authorities for domestic water supplies, and by the agricultural authorities when the proposed water supply would benefit agriculture.

On the proposal of the State Institute for Water Supply in *Bavaria*, grants may be awarded to communes, to co-operative societies and to limited liability companies for regional water supplies. These grants may reach 5 per cent to 6 per cent of the cost.

Loans are not given by the *Czechoslovak* authorities ; but, as a rule, the commune is permitted to ask for a grant, which is usually accorded. These grants amount to from 30 per cent of the cost (village supplies) to 50 per cent (regional water supplies). Grants are allowed by the Health Ministry (10 per cent to 15 per cent of the cost), the Ministry of Agriculture (15 per cent to 20 per cent), and the provincial authorities (10 per cent to 15 per cent). Cities do not receive grants. Plans must be submitted for approval to the authorities making the grants, and, if no grants are awarded, to the health departments and technical expert of the district. Larger grants are awarded for regional supplies, and the results of this policy appear in the figures given above.

Grants for the construction of wells and other individual water supplies are only given in *Sub-Carpathian Russia*, the least developed region in *Czechoslovakia*.

Even larger grants are given to cities, providing that the diameter of the water-mains is large enough to supply water to the villages and small towns in the neighbourhood of their mains.

In the rural districts of *Yugoslavia*, the central and provincial authorities bear all the expense of constructing water supplies, except for labour and transport, which may be furnished by the population. Such assistance is given even to the most developed districts, and also to cities. This assistance may take the form of grants or loans without interest, secured from the funds reserved for this purpose by the central or provincial authorities or the various institutes of hygiene. It is also used for the development of springs, wells and cisterns.

In the *Netherlands*, the State contributed to the payment of interest on loans contracted by communes in only two instances after the war, when the rate of interest was very high. The commonest form of financial assistance consists in State participation in the risk of operating a regional water service, by guaranteeing the payment of interest, and, if necessary, meeting the deficits by advances for which no charge is made. Ordinarily, the State guarantees two-thirds ; the province, the balance. In addition, the State bears the cost of the preparation of plans in respect of regional supplies.

Up to the present, the forms of assistance described above have sufficed to stimulate the communes in the *Netherlands*. To supply the poorer regions where water systems do not exist, grants will be necessary.

The system of water supplies being so important for the fire department, grants from the villages or insurance companies would be justified.

As a matter of fact, such grants are made in *Switzerland*, where insurance is administered by the State.

In *Poland*, the Public Mutual Insurance Institute grants loans to communes for the construction of wells. During the last six years, funds for this purpose amounted to 1,200,000 zlotys.

ANNEX 4.

LIST OF DOCUMENTS DISTRIBUTED TO THE CONFERENCE.

	Document No.
1. Report of the Preparatory Committee on the Principles governing the Organisation of Medical Assistance, the Public Health Services and Sanitation in Rural Districts.	C.H.1045.
2. Report by Professor J. Parisot, Professor of Hygiene and Preventive Medicine at the Faculty of Nancy, Rapporteur on Medical Assistance in Rural Districts.	Conf.Hyg.Rur./5.
3. Report by Dr. A. Stampar, Rapporteur on the Organisation of Health Services in Rural Districts.	Conf.Hyg.Rur./1.
4. Report by M. W. F. J. M. Krul, Director of the National Bureau for Water Supply, The Hague, Rapporteur on Water Supplies in Rural Districts.	Conf.Hyg.Rur./7.
5. Report by Professor Bürger, of the Prussian National Institute for the Hygiene of Water, Soil and Air, Berlin, Rapporteur on the Disposal of Sewage in Rural Districts.	Conf.Hyg.Rur./25.
6. Report by Mr. H. Ross Hooper, Civil Engineer, Chippenham, England, Rapporteur on Rural Housing.	Conf.Hyg.Rur./3.
7. Report by M. Ludovic Bonamico, Chief Engineer of the Civil Engineering Department, Rome, Rapporteur on Bonifications in Rural Districts.	Conf.Hyg.Rur./6.
8. "Mortality in Rural Districts in Europe", by M. K. Stouman.	C.H.1052.
9. Report by Dr. H. C. Pelc, of the State Institute of Hygiene, Prague, on "Rural Hygiene" (English only).	Conf.Hyg.Rur./30.
10. Note by Dr. Chodzko on : " <i>Les progrès de la Tuberculose dans le milieu rural</i> " (French only).	Conf.Hyg.Rur./33.
11. Note by Professor Derlitzki, Director of the Experimental Institute for the Study of Rural Labour, Pomritz (Saxony), on the Hygiene of Rural Labour.	Conf.Hyg.Rur./37.
12. The <i>Medico Condotta</i> in the Health Organisation of Italy, by Dr. A. Lutrario.	C.H.958.

13. Memorandum prepared by the Health Section on the Organisation of Effective Medical Assistance in Rural Districts. C.H.959.
14. Report on the Organisation of Assistance and Health Inspection in the Rural Districts of Italy, by Dr. Dino Rio, Head of the Medical Assistance Section, Public Health Department, Italy. C.H.960.
15. Note on Medical Assistance in Rural Districts in France. C.H.963.
16. Memorandum on Medical Assistance in Rural Districts in Great Britain, by Mr. Michael Heseltine, Assistant Secretary, Ministry of Health, England. C.H.964.
17. Note on Medical Assistance for Rural Populations in Germany, by Dr. Walther Miemietz, Wriesen. C.H.965.
18. "Methods employed in Germany for the Provision of Medical Assistance in Rural Districts", by M. Karl Unger, Director of the National Union of German Rural Health Insurance Funds, Perloberg. C.H.966.
19. Report by Dr. A. Shearer, Scotland, on "Medical Service in the Highlands and Islands of Scotland" (English only). Conf.Hyg.Rur./28.
20. Report by Dr. Vittorio Puntoni, Rome, Representative of the International Institute of Agriculture of the Preparatory Committee: "Anti-Rabic Dispensaries in Italy, a New Organisation for Rural Health Assistance". Conf.Hyg.Rur./9.
21. Report by Professor Ricardo Jorge on Medical Assistance in Portugal. Conf.Hyg.Rur./12.
22. Report by Dr. Kessiakoff, Director of the Bulgarian Health Service, on "The Organisation of the Rural Medical Service in Bulgaria". Conf.Hyg.Rur./16.
23. List of Members of the First Committee. Conf.Hyg.Rur./20 (1).
24. Report of the First Committee. Conf.Hyg.Rur./27.
25. Note by Dr. Chodzko, Director of the School of Hygiene, Warsaw, on Rural Health and Social Assistance Centres and the Effective Sanitation of the Countryside. C.H.925.
26. A Scheme for the Organisation of Rural Health Centres, prepared for the Budapest Conference on Rural Health Centres. C.H.933.
27. Note by the Health Section on Health Centres. C.H.934.
28. Note on Health Centres in France. C.H.935.
29. Note on Rural Health Centres in the Netherlands, by Dr. J. H. Tuntler, Inspector of Infant Health Services and Tuberculosis, Groningen. C.H.936.

30. Preliminary Draft of the Czechoslovak Committee for "*la Standardisation de l'équipement des dispensaires*" (French only). C.H.938.
31. "Health Centres in Czechoslovakia", by Dr. H. Pelc (English only). C.H.939.
32. "The Public Health Nursing Service of a Health Centre", by Miss M. Stellar, Head of the Health Nursing Service, Institute of Hygiene, Budapest (English only). C.H.940.
33. "Activities of a Health Centre in the Field of Sanitary Engineering", by M. Milivoj Petrik, Chief of the Division of Sanitary Engineering, Institute of Hygiene, Zagreb (English only). CH.942.
34. "Rural Health Centres in Hungary", by Dr. Bela Johan, Director of the State Institute of Hygiene, Budapest (English only). C.H.941.
35. Note prepared by the Health Section for the Second Session of the Committee on Rural Health Centres (Geneva, April 28th, 1931). C.H. 979.
36. Report on Rural Health Centres, by Dr. Bela Johan, Director of the State Institute of Hygiene, Budapest. C.H.980.
37. Report on the Most Effective Methods for organising Health Services in Rural Districts, by Dr. J. H. Tuntler, Inspector of Infant Health Services and Tuberculosis, Groningen, Netherlands. C.H.983.
38. Report on the Participation of Provident Funds and Insurance Institutions in the Organisation of Health Services in Rural Districts, by M. P. Vimeux, Director-General of the National Agricultural Provident Union (France). C.H.991.
39. Report on the Organisation and Duties of a Rural Health Service, by Dr. G. Seiffert, Counsellor of the Bavarian Ministry of the Interior, Munich. C.H.992.
40. Report on the General Principles that should guide the Realisation of Health Organisation in Rural Districts, by Professor Jacques Parisot, Professor of Hygiene and Preventive Medicine, Nancy. C.H.993.
41. Report on Health Organisation in Rural Districts in Denmark, by Dr. A. Metz, County Medical Officer, Holbaek, Denmark. C.H.994.
42. Report on the Organisation of Health Services in Italy, with Special Reference to Rural Districts, by Dr. Antonio Labranca, Inspector-General of Health, Rome. Conf.Hyg. Rur./2.

43. Statement by Dr. A. Ismail, Director-General of Public Health, Ankara, on "The Present State of Rural Health Organisation in Turkey". Conf.Hyg.Rur./24.
44. "*La coopération agricole tchécoslovaque*", by Dr. Ladislav F. Dvorak (French only).
45. "*Considérations sur l'état sanitaire de la population tchécoslovaque au cours des années 1918-1928*" (French only).
46. "*Grundlagen und Gliederung der ländlichen Gesundheitspflege*", by Hermann Lothring, Prague.
47. Report by Dr. N. M. J. Jitta on "*L'Hygiène rurale dans les Pays-Bas*" (French only). Conf.Hyg.Rur./32.
48. Report on Rural Hygiene in Poland, submitted by the Polish delegation. Conf.Hyg.Rur./36.
49. Pamphlet by the Union of Yugoslav Health Co-operative Associations: "Principles of Rural Hygiene and Health Co-operatives" (English only). Conf.Hyg.Rur./14.
50. Report by Dr. S. Tubiasz, Ministerial Counsellor at the Ministry of the Interior, Public Health Service, Warsaw, on "Health Centres in Poland". Conf.Hyg.Rur./21.
51. List of Members of the Second Committee. Conf.Hyg.Rur./22 (1).
52. Report of the Second Committee. Conf.Hyg.Rur./31.
53. Report on the Disposal of Liquid Sewage and Refuse in Rural Districts, by M. Milivoj Petrik, Chief Sanitary Engineer at the Institute of Hygiene, Zagreb. C.H.981.
54. Statement on Housing in Rural Districts considered from the Standpoint of Agricultural Workers, by Mr. J. F. Duncan, Secretary-General of the Scottish Farm Servants' Union. C.H.985.
55. Report on Water Supplies in Rural Districts, by M. Milivoj Petrik, Chief Sanitary Engineer at the Institute of Hygiene, Zagreb. C.H.988.
56. Report on Water Supplies in Rural Districts, by M. W. F. J. M. Krul, Director of the National Bureau for Water Supplies, The Hague. C.H.989.
57. The Organisation of the *Génie rural* in France, by M. M. Vignerot, Chief Engineer of the Rural Engineering Department of the Ministry of Agriculture, Paris. C.H.995.
58. Report on the Housing Problem in Rural Districts, by M. Milivoj Petrik, Chief Engineer of the Sanitary Engineering Division, Institute of Hygiene, Zagreb. C.H.997.

59. Report on Rural Sanitation in Germany, by Dr. Gotschlich, Director of the Institute of Hygiene of the University of Heidelberg. C.H.1017.
60. Report submitted by the International Labour Office on the Housing of Agricultural Workers. C.H.1020.
61. "Rural Sanitation in Poland", by M. A. Sziolis, Chief Engineer, State School of Hygiene, Warsaw (English only). C.H.1025.
62. "Land Improvement in Belgium", by M. J. Onghena, Chief Engineer of Boerenbond Technical Services, Belgium. C.H.1026.
63. "The general Principles of Rural Sanitation in England", by Mr. H. Ross Hooper, Civil Engineer, Chippenham, England (English only). C.H.1027.
64. "Bonifications in Rural Districts", by M. M. Petrik, Chief of the Division of Sanitary Engineering, Institute of Hygiene, Zagreb. C.H.1028.
65. "Housing Conditions in the Irish Free State", by Mr. Nicholas O'Dwyer, Chief Engineer of the Sanitary Engineering Department, Dublin (English only). C.H.1029.
66. "Sanitation in Rural Districts in Germany", by Dr. Bernhard Bürger, Director of the Prussian National Institute for the Hygiene of Water, Soil and Air, Berlin. C.H.1030.
67. "Rural Sanitation and the New Irrigation System in Spain", by M. Julio Jordana, Engineer of the Agricultural Service of the Hydrographic Confederation of the Ebro, Saragossa. C.H.1032.
68. Report on Bonifications, submitted by the International Institute of Agriculture, Rome. Conf.Hyg.Rur./10.
69. Report on Housing, submitted by the International Institute of Agriculture, Rome. Conf.Hyg.Rur./11.
70. Report on Rural Housing in England and Wales, by Mr. H. Ross Hooper, Civil Engineer, Chippenham, England. Conf.Hyg.Rur./4.
71. "Sanitary and Health Services in Rural Districts in Italy" and the "*Bonifica Integrale*" (published by the Italian Delegation to the Conference). Conf.Hyg.Rur./13.
72. Report by Dr. M. H. van der Kaa; Inspector-General of Housing in Holland, on "*L'amélioration des habitations rurales*" (French only). Conf.Hyg.Rur./19.
73. Report by M. Juan Lazaro-Urra, Professor at the School of Sanitary Engineering, Madrid: "*Approvisionnement des petites agglomérations en eau de pluie*" (French only). Conf.Hyg.Rur.23/.

74. Report by Dr. Zelenka on Sanitation and the Improvement of Rural Housing in Czechoslovakia. Conf.Hyg.Rur./35.
75. List of Members of the Third Committee. Conf.Hyg.Rur./15 (2).
76. Report of the Third Committee. Conf.Hyg.Rur./29.
77. Draft resolution on the Constitution of a Fourth Committee on "International Studies in Rural Hygiene". Conf.Hyg.Rur./18.
78. Report by the Chairman of the Meeting of Directors of Schools of Hygiene (Professor Léon Bernard). Conf.Hyg.Rur./38.
79. Report of the Conference on Rural Health Centres held at Budapest, October 27th to 31st, 1930. C.H.947.
80. Conference on Rural Health Centres, Budapest, October 27th to 31st, 1930 : General Outline of the Programme for the Division of Sanitary Engineering, as planned for the Athens Centre of Hygiene, by Mr. Daniel E. Wright. C.H.937.
81. Report of the Fourth Committee (Resolutions). Conf.Hyg.Rur./34.
82. Note concerning the Spanish Government's Proposal for convening a European Conference on Rural Hygiene. C.H.912.
83. Letter by the Secretary-General, with Annexes C.543 and C.535.1930.III, concerning the Spanish Government's Proposal with regard to convening a European Conference on Rural Hygiene. C.H.917.
84. Report of the Sub-Committee for the Study of the Spanish Government's Proposal. C.H.926.
85. Circular Letter to non-European Governments informing them of the Date of the Conference and inviting them to send Observers. C.L.301 (a). 1930, and Annex.
86. Circular Letter to European Governments informing them of the Date of the Conference and inviting them to send delegates. C.L.301. 1930, and Annex.
87. Memorandum prepared for the Second Session of the Preparatory Committee, for the European Conference on Rural Hygiene. C.H.948.
88. Report of the Second Session of the Preparatory Committee, Paris, December 8th and 9th, 1930. C.H.952.
89. Report to the Council concerning the Spanish Government's proposal, by the Representative of the Irish Free State. C.584. 1930. III.

90. Report to the Council by the Representative of the Irish Free State concerning the Preparatory Committee's Suggestions for the Appointment on the Committee of French and English Experts. C.697. 1930. III.
91. Circular Letter sent by the Secretary-General to European Governments informing them that the Opening of the Conference was postponed to June 29th. C.L.9. 1931. III.
92. Circular Letter sent by the Secretary-General to non-European Governments informing them that the Opening of the Conference was postponed to June 29th. C.L.9 (a). 1931. III.
93. Report on the Third Session of the Preparatory Committee, held at Geneva, May 1st and 2nd, 1931. C.H.1037.
94. Correspondence with the Hungarian Health Authorities concerning the Continuation of the Study of Rural Health Centres in connection with the Opening of a Rural Health Centre at Godollo and a School of Public Health Nursing at Budapest. C.H.907.
95. List of Documents placed at the Disposal of the Conference (Complete Bibliography). Conf.Hyg.Rur./8.
96. List of Delegates and Observers at the European Conference on Rural Hygiene (Geneva, June 29th). Conf.Hyg.Rur./17.
97. Minutes of the First Meeting of the Conference (June 29th, 1931). Conf.Hyg.Rur./P.V.1.
98. Minutes of the Second Meeting of the Conference (June 30th, 1931). Conf.Hyg.Rur./P.V.2.
99. Minutes of the Third Meeting of the Conference (June 30th, 1931). Conf.Hyg.Rur./P.V.3.
100. Minutes of the Fourth Meeting of the Conference (July 1st, 1931). Conf.Hyg.Rur./P.V.4.
101. Minutes of the Fifth Meeting of the Conference (July 1st, 1931). Conf.Hyg.Rur./P.V.5.
102. Minutes of the Sixth Meeting of the Conference (July 2nd, 1931). Conf.Hyg.Rur./P.V.6.
103. Minutes of the Seventh Meeting of the Conference (July 2nd, 1931). Conf.Hyg.Rur./P.V.7.
104. Minutes of the Eighth Meeting of the Conference (July 6th, 1931). Conf.Hyg.Rur./P.V.8.
105. Minutes of the Ninth Meeting of the Conference (July 6th, 1931). Conf.Hyg.Rur./P.V.9.

Document No.

106. Minutes of the Tenth Meeting of the Conference (July 7th, 1931).

Conf.Hyg.Rur./P.V.10.

107. *Daily Bulletin* No. 1, June 29th, 1931.
Daily Bulletin No. 2, June 30th, 1931.
Daily Bulletin No. 3, July 1st, 1931.
Daily Bulletin No. 4, July 2nd, 1931.
Daily Bulletin No. 5, July 3rd, 1931.
Daily Bulletin No. 6, July 4th, 1931.
Daily Bulletin No. 7, July 6th, 1931.
Daily Bulletin No. 8, July 7th, 1931.
-

Official No.: **C. H. 1060.**

Geneva, October 15th, 1931.

LEAGUE OF NATIONS

Health Organisation

REPORT

ON

.....RNAL WELFARE

**AND THE HYGIENE OF INFANTS
AND CHILDREN OF PRE-SCHOOL AGE**

BY THE

**Reporting Committee appointed to deal
with these Questions**

(Report adopted by the Health Committee at its Eighteenth Session, held in October 1931.)

Series of League of Nations Publications

III. HEALTH ✓
1931. III. 13.

TABLE OF CONTENTS.

	Page
COMPOSITION OF THE COMMITTEE	6
INTRODUCTION	7
PREAMBLE :	
Statistics, Enquiries, Legislation	8
I. MATERNAL WELFARE :	
Rate of Maternal Mortality	13
Dangers	13
Maternal Morbidity	13
Causes of Maternal Mortality and Morbidity :	
(a) Medical Causes	14
Puerperal Sepsis	14
Toxæmia	15
Difficult Labour	15
Hæmorrhage	15
Miscellaneous	16
(b) Economic and Social Causes	16
Housing and Sanitation	16
Employment	17
Reduction of Maternal Morbidity and Mortality	17
(a) Medico-social Enactments for the Protection of Maternity	18
Compulsory Notification of Puerperal Sepsis	18
(b) Provision of Facilities for Advice and Treatment :	
Pre-natal Supervision	20
The Pre-natal Clinic	20
(i) Medical Work	20
(ii) Educational and Social Work	20
Organisation	21
Post-natal Supervision	22
Maternity Hospitals	23
Homes for Infants and for Mothers and Babies	23
(c) High Standard of Professional Education for Doctors and Midwives	23
(d) Education of the General Public	24
Abortion and Contraception	24

II. INFANT WELFARE :

Dangers due to Obstetric and Developmental, to Alimentary and to Infective Conditions	27
(a) The Reduction of Still-Births and Early Infant Mortality :	
Definition	27
Causes	28
Preventive Measures	29
(b) Infant Welfare (from One Week to One Year) :	
Special Dangers and their Causes	31
Preventive Measures :	
Nursing Allowances	31
Infant Welfare Centres	32
Homes for Mothers and Babies or for Infants alone	33
Resident Nurseries	33
The Boarding-out of Infants	33
Crèches, Day Nurseries, Rooms for Nursing Mothers	34
Hospital Services	34
Prevention of Tuberculosis	35
Prevention of Syphilis	35
Slum Demolition	35
Milk	35
Health Visitors (Visiting Nurses)	36
Educational Propaganda	37

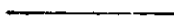
III. HEALTH OF THE PRE-SCHOOL CHILD :

Statistics	40
The Dangers and their Causes :	
Medical Causes	41
Infectious Diseases	42
Diseases of the Respiratory System	43
Tuberculosis	43
Accidents	44
Gastro-intestinal Affections	44
Other Diseases	44
Morbidity	45
Social Considerations	45
Campaign against Disease	46
Nutrition	47
The Care of Teeth	48

	Page
General Hygiene (Light, Fresh Air, Cleanliness)	48
Chronic Infections	49
Physical Education	50
Acute Infections	50
Diphtheria	50
Scarlet Fever	51
Measles	52
Whooping-Cough	53
Other Acute Infections	54
Chronic Infections :	
Tuberculosis	54
Syphilis	55
Rheumatic Manifestations	56
Physically Abnormal Children	56
Mentally Abnormal Children	58
Preventive Measures	59
Consultation Centres	59
Institutions for Children	62
Housing	62
Day Nurseries, Nursery Schools, Nursery Classes	62
Residential Institutions	66
Institutions for Sick Children	68
Institutions for Abnormal Children	69
Staff	70
The Nurse's Duties	70

GENERAL.

I. Training of Staff (Doctor, Midwife, Health Visitor)	72
II. Organisation and Co-ordination of Work	74



COMPOSITION OF THE COMMITTEE

Dame Janet CAMPBELL, M.D., D.B.E.,	London (<i>Chairman</i>).
Professor R. DEBRÉ,	Paris.
Professor S. A. GAMMELTOFT,	Copenhagen.
Professor E. GORTER,	Leyden.
Professor F. ROTT.	Berlin-Charlottenburg.

Secretaries :

Dr. P. WORINGER,	Strasburg.
Professor O. E. W. OLSEN,	Health Section of the Secretariat of the League of Nations.

INTRODUCTION

The task of the Committee responsible for drawing up this report was outlined by the Chairman of the Health Committee at the opening of the sixteenth session. This task consists in giving the health administrations of the countries asking the assistance of the Health Organisation — and other administrations desiring to organise their health services — information as to the most suitable means of preventing maternal and infant mortality.

The Reporting Committee has been able to base part of its work on the results of the enquiries into infant mortality carried out by the Health Organisation in several countries of Europe and South America. Its report is also based on an analysis and a comparison of the experience acquired by different countries in connection with the subjects dealt with, as contained in the ample documentation available, and on the studies carried out in the course of journeys undertaken by certain members of the Committee.

The Reporting Committee has therefore endeavoured to draw up the main outlines of a plan of campaign which, in its opinion, constitutes an adequate basis of organisation, easily adaptable to special conditions.

It goes without saying that, in considering questions of maternity and infant hygiene, it is important not to lose sight of the other branches of modern public health administration with which these are bound up. Any scheme for the organisation of a health service, either central or regional, should therefore take into account from the outset the necessity of close co-ordination between the various interests concerned. Only by such co-ordination can the best results from the point of view of public health be attained, while permitting a rational utilisation of the human and material resources available.

The Committee has therefore refrained in its report from entering into the details of questions relating to finance, buildings, equipment and the allocation of staff which, for the reasons indicated, could only be discussed in relation to the other activities of the health service in question.

PREAMBLE

Statistics.
Enquiries.
Legislation.
Plan of the Report.

When it is desired to organise a campaign against maternal and infant mortality and morbidity in any country, it is first of all necessary to enquire into the existing situation and to discover what are the evils to be combated. Therefore one of the first tasks will be to ascertain as accurately as possible the statistical data concerning the rates and causes of death, in order to adapt the methods employed to the principal dangers. But for statistics to be useful they must be explicit and accurate. Most present-day statistics give an insufficiently exact idea of the distribution and causes of deaths at the different ages. For example, for the pre-school age period, the figures available in many countries only give the total mortality of the group of children from one to five years; yet it is necessary to know the rate for each year of age in order to know when action is most urgently needed. Moreover, for various reasons, the causes of death given are, unfortunately, not always accurate. For example, in certain cases, when the doctor is called in at the last moment, he is unable to make a precise diagnosis without an autopsy; in other cases, where it is chiefly important to know the original disease, only the final affection is indicated, such as "bronchopneumonia" in the case of measles or rickets, or "meningitis" in the case of tuberculosis, or similar headings in the case of syphilis. The statistical system, therefore, might usefully be reconsidered with a view to improvement if it is to render the full service required of it in regard to the protection of mothers and children. Again, efforts for maternal and infant welfare also include a study of diseases which are not necessarily fatal and consequently do not appear in the death returns. As a rule we are even less well informed as to morbidity than as to mortality. Consequently, to supplement the data which are inadequate, a special enquiry into the principal causes of death and the principal prevailing diseases might with advantage be undertaken in any region in which it is desired to establish measures for maternal and infant welfare. Such an enquiry should include both rural districts and large towns.¹

Generally speaking, all avoidable deaths among infants and childbearing women may ultimately be traced either (1) to economic causes; (2) to inadequate provision for health or hygiene; or (3) to causes due to ignorance or prejudice. Further enquiry is therefore essential to examine: (1) economic factors: such as the mode of life of the inhabitants, their standard of living and its hygienic consequences (particular attention should be paid to the conditions under which pregnant women are employed and any overwork which may result therefrom), the conditions of employment of the

¹ See, in this connection, the reports on the enquiries undertaken under the auspices of the Health Organisation in Europe and South America (documents C.H.820 and C.H.908(1)).

mothers with young children and the consequences of the separation of the mother and child which may follow ; (2) health conditions ; the local provision made for maternal and child welfare, including pre-natal supervision, obstetrical assistance, the supervision of new-born children and infants ; and, lastly, (3) educational and personal causes : such as the local customs in regard to confinement, the rearing of new-born children and infants, and particularly the faults of hygiene resulting from ignorance, prejudice, etc.

According to the district, one or other of these factors is likely to play a predominant part. The more complete this preliminary enquiry, the easier will be the subsequent preparation of a plan of campaign. Indeed, it is only after a careful examination of all conditions likely to affect the problem that it is possible to make the necessary provision for a scheme to reduce maternal and infant mortality.

Even in a country in which a system of maternal and infant protection is already in existence, enquiries of this kind may be of great value ; they will reveal any deficiencies of the organisation, and will make it possible to introduce improvements or new methods, so as to attain still better results. For example, in the campaign against maternal mortality it is not enough to have secured a certain reduction in the number of deaths ; but, after a time, a further enquiry should be undertaken and a sufficient number of fatal cases of childbirth should be studied in order to determine the actual circumstances in which they occurred. As a result of such investigation it will be possible to ascertain, for example, whether the number of doctors or qualified midwives is sufficient, whether there are adequate facilities for pre-natal supervision and whether women avail themselves thereof, whether there is a sufficient number of beds in lying-in hospitals and if it is easy to obtain admission. Whenever possible such an enquiry should be conducted by the public health administration and its competent officers, not with the idea of criticising or blaming the persons responsible for the care of the patients, but in order to discover the weak points of the existing maternity service and find out how this service can be improved or extended in order to ensure the necessary protection for all women, however poor, at the time of confinement. The method should be applied in a similar way to deaths of children of different ages in order to test the efficacy of the system of infant welfare.

Certain *legislation* is desirable to ensure the protection of mothers and children. The principal aims of such legislation should be :

- (1) To secure sufficient rest for the mother before and after childbirth ;
- (2) To secure protection for children whose families are not able to provide suitable conditions for their physical and mental development ;
- (3) To ensure protection against infectious disease.

Various countries have made certain regulations regarding *rest for the mother*, though these are not uniform.

The Washington Draft Convention of 1919 is an example of the type of legislation which is designed to protect the employed woman. It provides that no woman, whether married or single, shall be permitted to work during the six weeks following her confinement in any industrial or commercial undertaking as defined in Article I

of the Convention, and further that, if she is employed therein, she shall have the right to leave her work upon the production of a medical certificate stating that the confinement will probably take place within six weeks. The draft Convention also provides that the mother should be paid benefits sufficient for the full and healthy maintenance of herself and her child during the six weeks before and after confinement, and in addition receive free attendance by a doctor or a certified midwife.

This scheme involves considerable financial expenditure if the allowance for "full and healthy maintenance" is interpreted as meaning something equivalent to the wage normally earned by the woman. It has the disadvantage of making provision only for industrially employed women, who are usually a small proportion of the total number of childbearing women. It seems unfortunate to make special provision for the maternal welfare of only one section of the community, and any money which is available for this purpose should preferably be expended for the benefit of all women and not only employed women. It will probably be found practicable in most countries to devise a modified scheme, more closely related to the actual social conditions and existing facilities for medical aid, by means of Health Insurance or the Public Health Administration, which will apply to all women and will not place an undue financial burden upon the resources of the country. A well-conceived system of *sickness insurance* covering, among others, the risks of maternity, both for insured women themselves and for the members of the insured person's family, such as already exists in several countries, is one solution which may be suggested.

The protection of children whose families do not provide a suitable environment for their physical and mental development needs to be regulated by law. The circumstances in which society may be called upon to take the place of the family are varied. Orphans, abandoned children, children neglected by their parents owing to sickness, poverty or moral turpitude, and lastly those whose parents are in hospital or prison, may need assistance from public relief organisations and bringing up at the expense of the State.

Society also owes a duty to crippled or infirm children, who often impose too heavy a burden on their family and require special education; in such cases the State may properly provide for medico-pedagogic treatment.

All children placed with foster mothers need strict supervision, and it is therefore necessary to make systematic arrangements for this purpose, consisting chiefly of visits to the houses in which they are boarded out.

Lastly, the *campaign against infectious diseases* can be supported by legislation which might provide for the following:

- (1) Notification of infectious diseases;
- (2) Removal of patients, their brothers and sisters and the children next to them in class, from schools, nurseries and kindergartens as and when necessary;
- (3) Disinfection;
- (4) Detection of germ-carriers in communities of children;
- (5) Closure of schools, nurseries and kindergartens in case of epidemic;

- (6) Hospital treatment of patients;
- (7) Preventive vaccination;
- (8) Organisation of sero-prevention by means of the serum of convalescents.

We shall revert to certain points of detail in special chapters.

* * *

The campaign against maternal and infant mortality falls naturally into three parts : the protection of maternity, the protection of the infant, and the protection of the pre-school child;¹ our survey will therefore be divided into these three main chapters. But we shall see that, as regards infants, it is an advantage to discuss separately mortality in the first seven days of life, as this is due to causes entirely different from those affecting the remainder of the first year and thus calls for different prophylactic methods. In practice, the causes of this early mortality are closely allied to those of still-birth, and these two questions should therefore be considered together.

We have adopted a common plan for the different chapters as far as the subject permitted. After a short mention of the mortality rates of the particular groups in question, we discuss the principal dangers and their medical and social causes. We then describe the way in which these perils can be combated, reviewing the different preventive methods and their value, showing how the material resources available should be organised and utilised, and defining the functions and duties of the different classes of medical personnel. Finally, in a general chapter which follows the three main special chapters, we deal with questions common to all three parts, particularly with the training of doctors, midwives and nurses from the point of view of social and preventive work; we conclude with a general scheme for the organisation of maternal and infant protection, and for the co-ordination of this work with other official and voluntary agencies.

¹ *Note by the Health Section.* — A memorandum on the hygiene of children of school age and adolescents will be prepared by a Reporting Committee specially set up for the purpose.

I. MATERNAL WELFARE

Rate of Maternal Mortality.

Dangers

Maternal Morbidity.

Causes of Maternal Mortality and Morbidity :

(a) Medical Causes :

Puerperal Sepsis ;
Toxæmia ;
Difficult Labour ;
Hæmorrhage ;
Miscellaneous ;

(b) Economic and Social Causes :

Housing and Sanitation ;
Employment.

Reduction of Maternal Morbidity and Mortality :

(a) Medico-social Enactments for the Protection of Maternity :

Compulsory Notification of Puerperal Sepsis ;

(b) Provision of Facilities for Advice and Treatment :

Pre-natal Supervision :

The Pre-natal Clinic :

(i) Medical Work ;
(ii) Educational and Social Work ;

Organisation ;

Post-natal Supervision :

Maternity Hospitals ;
Homes for Infants and for Mothers and Babies ;

(c) High Standard of Professional Education for Doctors and Midwives ;

(d) Education of the General Public.

Abortion and Contraception.

It is beyond doubt that many maternal deaths might be avoided and that much sickness might be prevented if it were possible to secure for all pregnant and parturient women adequate medical, nursing and domestic attention. The prevention of obstetric disaster is not an altogether simple problem. It depends partly upon the professional skill of the doctor and midwife ; partly on the provision of facilities, such as hospital accommodation, medical or nursing attention, etc., for the patient unable to secure these for herself ; and to no small extent upon the willingness and intelligence of the patient in seeking and following such advice as is available for her.

It will be convenient to consider in the first place the incidence of maternal mortality and some of its causes, and subsequently to suggest ways in which an effective maternity service may be built up.

RATE OF MATERNAL MORTALITY.

By the maternal mortality rate is meant the death rate which is directly or indirectly due to childbearing. This rate shows considerable variation in different countries, but it is doubtful whether the statistics published are prepared in such a way as to enable accurate comparisons to be made between the figures given for different countries; this question should be the subject of special statistical investigation. Generally speaking, in most countries the maternal death rate appears to be relatively stationary. It shows little tendency to decline, indeed in some countries it is rising rather than falling.

DANGERS.

Most deaths due to childbirth may be classified in three groups :

(a) Deaths due to puerperal sepsis, including all local or general infections arising in the generative tract as a result of abortion or parturition ;

(b) Deaths directly due to obstetrical causes — which may be traumatic, including difficult or complicated labour, ante-partum or post-partum hæmorrhage, etc., or toxic, including toxæmias of pregnancy, etc. ;

(c) Deaths due to associated disease which is accentuated by the fact of pregnancy — *e.g.*, tuberculosis, heart disease, etc. — or which is particularly serious when occurring at the puerperal period — *e.g.*, influenza, scarlet fever, measles, etc.

All these groups are of interest in relation to maternal welfare, but deaths in groups (a) and (b) are those which are most important from the point of view of practical prevention.

MATERNAL MORBIDITY.

The maternal death rate may be regarded as an index of the physical damage caused by pregnancy and childbearing, and it provides a fairly accurate return as to the number of fatal cases. But to these actual deaths must be added a far larger number of cases in which non-fatal injury has resulted from childbearing. Many women survive, with greater or less permanent or temporary incapacity, conditions which prove fatal in others. It is quite impossible to estimate at all exactly the amount of such injury. Much of it is unnoticed or unrecognised at the time of confinement, and many women regard weakness or pain as an inevitable result of bearing a child, and therefore take no trouble to seek medical advice. But judging by the large proportion of patients in attendance at gynæcological clinics who require treatment to remedy injury caused by previous childbirth, the total amount of damage must be high. Much of this could be prevented by skilled care before or during parturition or by adequate examination and treatment afterwards, and such attention would unquestionably prevent a great deal of unnecessary physical disability and suffering among women.

The relation of still-births and neo-natal mortality to maternal mortality is discussed in the following chapter. Here it is only necessary to refer to the obvious association between maternal ill-health or injury and the effect upon the foetus. An illness, such as toxæmia, for example, may injure the child as well as the mother; difficult labour not infrequently leads to infant death before or after birth. In such circumstances, the safety of the child can only be secured indirectly through measures designed primarily to benefit the mother.

CAUSES OF MATERNAL MORTALITY AND MORBIDITY.

These may be (*a*) medical or (*b*) general, including social, economic, and environmental causes.

(*a*) MEDICAL CAUSES.

From the point of view of the prevention of maternal mortality, it is the obstetrical causes of death which are of most importance. If the patient is already suffering from some serious disease when she becomes pregnant, the treatment she requires is mainly for the primary illness, the pregnancy being incidental, and its management depends upon the general physical state of the woman. It is essential that a woman suffering from tuberculosis or heart disease, for example, should be under effective treatment during her pregnancy.

Deaths from obstetrical causes may be divided into four main groups — namely: puerperal sepsis, toxæmia, difficult labour and hæmorrhage. A certain number of additional deaths occur from miscellaneous causes, but may perhaps be disregarded in framing a scheme for general maternal welfare.

Puerperal Sepsis.

Puerperal fever leads to more deaths and more injury than any other complication of childbearing; but it is one of the causes which it is most easy to prevent by observing antiseptic principles, the favourable results of which have been so strikingly demonstrated since their introduction. The infection may be localised or general. It is usually due to the access of pathological organisms (most commonly a hæmolytic streptococcus) to an unhealed wound surface in the generative tract at the time of a premature or full-term labour or during the puerperium (the raw surface of the recently denuded placental site, lacerations of the cervix, vagina, perineum, etc.). The result of the introduction of infection depends not only on the virulence of the infecting agent, but also on the general resistive power of the patient, and a serious infection is far more likely to occur if the patient is exhausted by hæmorrhage, or after a prolonged or difficult labour which has involved much manipulation and bruising or laceration of the tissues.

The source of the infection is usually extrinsic, the organism being conveyed to the woman during or after labour through the hands of the attendant, by the use of imperfectly cleansed instruments, by unsterilised dressings, by the woman's own fingers, and so forth. There may be an intrinsic infection from organisms present in the vagina, blood or elsewhere, or a true autogenous infection from a septic focus,

for example the teeth or tonsils, in the woman's own body. It is possible for infection to be caused by a healthy "carrier" who harbours hæmolytic streptococci in, for example, the nasopharynx.

Effective ante-natal examination and supervision should enable the doctor to foresee exhausting or difficult labour, which not only favours the introduction of infective organisms, but reduces the capacity of the patient to resist them, and to take the necessary precautions to deal with local foci of infection (teeth, tonsils, etc.). For the same reasons it should be advised that sexual intercourse should cease six weeks before parturition. Careful obstetric technique at the time of delivery, the avoidance of unnecessary examination or operative procedure, and skilled nursing during the puerperium, should reduce the danger of infection to a woman, while the immediate isolation of a patient found to be suffering from puerperal sepsis, even of a minor degree, would prevent communication to other patients. Sepsis is well known to be the chief risk incurred when attempts are made to interrupt a pregnancy by artificial means. This risk is never negligible even when due surgical precautions are taken, and when the attempt is made by the woman herself or an unqualified abortionist it is proportionately increased.

Toxæmia.

Albuminuria followed by eclampsia is the commonest manifestation of toxæmia, though other forms leading to ante-partum hæmorrhage, hyperemesis gravidarum, chorea and mania, etc., occur. Eclampsia can be prevented almost entirely by ante-natal supervision (examination of urine, estimation of blood-pressure, etc.) and treatment including, as certain experiments have shown, a special diet adopted in good time, provided the patient is willing to accept and follow advice.

Difficult Labour.

This may be caused by disproportion between the foetal head and the pelvis due to an over-large or post-mature foetus or a contracted pelvis. There may be delay due to multiple pregnancy; to a persistent occipito-posterior presentation or other malpresentation of the foetus; there may be obstruction from a tumour or other cause. Most of such conditions may be detected during pregnancy and suitable treatment recommended.¹ It is essential that any operative measures, at whatever stage of the pregnancy they are undertaken, should be carried out in hospital and not in the patient's own dwelling, particularly in emergency cases of obstructed labour for which the patient has made no previous preparation. If motor transport is available, it is often far safer to remove the woman to a hospital, even a comparatively distant one, than to attempt difficult obstetric work in unsuitable surroundings.

Hæmorrhage.

This is a less controllable cause of death than the conditions already mentioned. It is often impossible to foresee ante-partum hæmorrhage, and the remedy here must

¹ True prophylaxis in the case of contracted pelvis due to rickets should of course go back to the patient's earliest youth.

be prompt treatment in hospital rather than any action taken by the obstetrician beforehand. Post-partum hæmorrhage can often be avoided by preventing exhaustion and fatigue, but, if it occurs, prompt and vigorous treatment by the doctor is demanded.

Miscellaneous.

Certain infectious diseases such as influenza, scarlet fever, typhoid fever, undulant fever, etc., contracted by a pregnant or parturient woman may assume an exceptionally serious character or lead to the death of the fœtus. In case of epidemics, special care should therefore be taken to protect pregnant or parturient women from infection.

The existence of active pulmonary tuberculosis in a pregnant woman may render necessary an interruption of pregnancy; in any case it will necessitate the strictest measures being taken to protect the child at the time of parturition.

Adequately compensated heart affections may not be affected by pregnancy or parturition; but they require to be watched during this period.

Tumours of the uterus and ovaries and deformity of the pelvis, which may render parturition difficult, should be detected before or during pregnancy in order that the appropriate treatment may be given in time.

(b) ECONOMIC AND SOCIAL CAUSES.

The circumstances under which a woman lives, the state of her health and nutrition during childhood and adolescence, her daily life and occupation, may all exercise some, though often a remote, effect upon her health during pregnancy and childbirth. Any conditions which prevent the full physiological development of the growing girl may have an injurious effect from the obstetric point of view. Malnutrition, for example, whether due to insufficient or unsuitable food, to lack of exercise and fresh air, or to unsatisfactory hygiene, may cause stunted growth and general physical weakness. Rickets in childhood is one of the causes of bony deformity, including pelvic contraction which may give rise to difficult labour in later life. Osteomalacia is another well-known cause in certain countries.

The chief social conditions which may affect childbearing are, first, housing and sanitation, and secondly employment, and both of these are to some extent dependent upon poverty.

Housing and Sanitation.

A sanitary, wholesome dwelling is of obvious importance at the time of the confinement, quite apart from its effect upon the general health of the inmates. It enables the labour to be conducted with due regard to antiseptic principles, while extraneous sources of infection are reduced. Overcrowding, lack of proper disposal of sewage or refuse, insanitary privies, defective water-supply, lighting and ventilation, are usually accompanied by a low standard of cleanliness, and are all conditions which might favour the introduction of infection at the time of confinement. One would therefore expect the incidence of puerperal fever to be high in such circumstances. It is, however, well known that a woman delivered in the most deplorable

surroundings often makes a perfect recovery, whereas a clean, convenient dwelling is no bar to the occurrence of sepsis if infection is introduced from without. It is, however, obvious that uncleanness and lack of conveniences and facilities must add enormously to the difficulty of applying effectual antisepsis, and especially to the risks of any operative procedure.

Therefore if the home conditions are unsatisfactory, every endeavour should be made to obtain better accommodation for the patient before attempting delivery, even in normal cases, while if any complication is anticipated, nothing should be left undone to secure removal to hospital.

Employment.

The industrial employment of women may affect maternal welfare indirectly or directly. Indirectly the work they do may be such as to result in displacement of the uterus and weakness of the pelvic organs and of the muscles of the abdomen and the uterus. Further studies are necessary to throw full light on these important problems, which are not yet sufficiently understood. The aim of industrial hygiene must be to mitigate these harmful effects.

As regards the influence of physical effort on pregnancy itself, the data available seem to show that a prolongation of labour and a reduction in the weight of the newborn infant may be the direct consequences of work continued until the moment of delivery. The effects of work on abortion, labour and pathological parturition are not sufficiently known, and the different factors require further study.

It may often be better that the woman should continue familiar work at a regular wage rather than restrict herself to domestic duties which may actually be more exacting. But precisely what kinds of work are harmful, and in what way, remains to be elucidated.

In any case, the employment of the pregnant woman should be under observation, whether the work is done in her own house or elsewhere, so that relief may be found for her if she begins to suffer from undue fatigue or excessive strain.

Pregnancy in the unmarried woman is not in itself more hazardous than in the married, but the desire to conceal the condition not only leads to attempted abortion, but may prevent the future mother seeking advice or making due preparation for the birth.

REDUCTION OF MATERNAL MORBIDITY AND MORTALITY.

The causes of maternal mortality and morbidity being partly social and partly medical, it follows that measures which may serve to reduce sickness and death among mothers must be such as will improve the medical and nursing services for maternity, and will also educate the woman and her friends to realise the value of early, frequent and continuous supervision, careful treatment and efficient obstetric assistance. These measures may be divided into :

- (a) Medico-social enactments for the protection of maternity;
- (b) The provision of facilities for supervision and treatment;

- (c) A high standard of professional education for the doctor and midwife, so as to ensure suitable obstetric attention;
- (d) The education of public opinion.

(a) MEDICO-SOCIAL ENACTMENTS FOR THE PROTECTION OF MATERNITY.¹

It is desirable that the mother should be assured of a sufficient period of rest from unduly heavy or unsuitable work both before and after the birth of her child. As far as employed women are concerned, it is possible by legislation to prohibit employment for a certain period before and after confinement and dismissal on account of absence due to pregnancy; such legislation does not benefit the married woman who is only engaged in domestic work, whose case must also be taken into consideration, and it cannot easily be enforced unless adequate financial provision is made to replace the wages which would otherwise have been earned.

The object of measures of this kind is not merely to assist the mother over a difficult period, but also to safeguard her health and to raise the standard of midwifery practice and of infant welfare generally. Therefore, in any case, a condition of granting assistance for women in childbirth together with an allowance during lactation must be that adequate medical and social supervision should be maintained. Otherwise there will be no satisfactory return for the heavy financial expenditure involved. It may, for example, be desirable to give certain benefits, such as midwifery or medical attendance, as part of a maternity service rather than as a cash benefit, and to require the woman to remain under suitable supervision before confinement, and to place the child under regular medical supervision afterwards.

Voluntary associations which are in a position to supplement assistance given by the State or by health authorities should be invited to co-operate closely with the official organisation in order to secure a wise distribution of the available money and to prevent overlapping of benefits or anything in the nature of indiscriminate charity. Such associations should also aim at the promotion of hygiene and preventive medicine generally and not merely at the assistance of individual persons.

Close co-operation between health services, sickness insurance institutions, private associations, etc., may be ensured by "Co-operation Committees", which have been found useful in certain countries.

Compulsory Notification of Puerperal Sepsis.

Puerperal sepsis being the most common complication which has to be dealt with, both from the point of view of prevention and of subsequent treatment, it is necessary to have accurate information as to its incidence in hospitals and in private houses, and, for this reason, puerperal sepsis should be made a *notifiable disease*.

In some countries where notification of "puerperal fever" has been attempted, this has proved only partially successful, because only the most severe or even moribund cases have been reported, the slighter forms of infection escaping unnotified.

¹ See also "Washington Convention" and "Social Insurance", pages 9 and 10.

Unfortunately, there is a certain stigma attaching to the occurrence of puerperal infection, and no doctor or midwife is anxious to have it known that a case has occurred in his or her practice. Therefore if the diagnosis is doubtful, the natural tendency is to consider the symptoms due to some cause other than infection and to refrain from notifying the disease. Such incomplete notification is, however, almost useless. It not only fails to furnish the information needed to control the spread of infection, but the Public Health Administration has seldom any opportunity for offering treatment to women who are unable to provide this for themselves until it is too late for such treatment to be effective.

On account of the difficulty of framing any narrow yet sufficiently comprehensive definition of puerperal sepsis to give clear guidance as to the condition to notify, it has been found useful to select, without regard to the cause of the fever, the most common and obvious symptom associated with puerperal sepsis — namely, pyrexia — and require this to be notified, if it occurs in any woman, say within twenty-one days of abortion or childbirth. It is true that some cases of true puerperal sepsis are not febrile, and that in febrile cases the pyrexia is caused by some relatively unimportant infection (e.g., *B. coli* or mastitis); but having regard to the importance of obtaining early information as to all puerperal infection, it is better to receive too many rather than too few reports and, on the whole, the notification of *puerperal pyrexia* rather than puerperal sepsis is probably the best way of obtaining reasonably correct information as to its incidence and location. The type of pyrexia to be notified should be accurately defined and the temperature should be taken in the rectum and not in the mouth or axilla.¹

Having obtained early information as to cases of puerperal sepsis, the business of the Public Health Administration is, first, to ensure that the spread of infection shall be prevented, and, secondly, that arrangements have been made for the patient to receive such medical treatment and nursing as she requires. If the patient is at home, the midwife in charge of the case must either discontinue her attendance and disinfect herself thoroughly before going to other patients, or must give her whole time to the care of the infected woman. Enquiry may be made from the doctor who is called in whether he is satisfied that his patient has all that she requires, and, if not, whether she is in need of more highly skilled nursing than the midwife can provide, whether it is desirable for her to be transferred to hospital for treatment, or whether any special bacteriological or pathological investigation should be made. Steps should then be taken through the health centre to see that what is necessary is done.

Puerperal sepsis should seldom occur in a maternity hospital, but will inevitably arise from time to time, and then the question of preventing the spread of infection becomes a matter of great importance. Overcrowding in the wards, and lack of sufficient air or scrupulous cleanliness, predispose to the incidence of infection. Any carelessness in the technique of delivery or in the subsequent nursing of the patient naturally increases the danger. All potentially septic cases (e.g., abortion, or patients who have been examined before admission, etc.) should be rigidly excluded from

¹ In England puerperal sepsis is defined as: "Any febrile condition . . . occurring in a woman within twenty-one days after childbirth or miscarriage in which a temperature of 38° C. or more has been sustained during a period of twenty-four hours or has recurred during that period".

the " clean " wards in the hospital. Should puerperal pyrexia occur in a maternity ward, the patient should be isolated at once for observation without waiting until a definite diagnosis has been made.

(b) PROVISION OF FACILITIES FOR ADVICE AND TREATMENT.

Pre-natal Supervision.

It is becoming generally recognised that midwifery should not only include proper attendance at childbirth but that supervision should commence as early as possible in pregnancy and continue until the woman is fully restored to health after delivery. This pre-natal and post-natal attention naturally places considerable additional work and responsibility upon the doctor and midwife, for which the woman is seldom able to pay adequately. For this reason, and also because pre-natal care is largely concerned with the social as well as the medical aspect of midwifery, much of the organisation of pre-natal supervision should devolve upon the Public Health Administration.

The reasons for pre-natal supervision are now fairly well understood. The purpose of physical examination is to ensure, as far as possible, that complications of pregnancy shall be detected and treated as soon as they become evident, and that probable difficulties in labour should be foreseen and dealt with. Eclampsia, for example, may be almost entirely prevented if treatment is available when symptoms first appear; or the dangers of difficult or obstructed labour may be avoided if the condition is recognised in time to enable the advantages of induction or Cæsarean section or other treatment to be considered. Again, the early and regular treatment of syphilis would benefit the child as well as the mother, and attention to a gonorrhœal discharge or other infective condition may prevent subsequent puerperal sepsis.

Pre-natal Clinic.

The pre-natal clinic has a twofold function :

(i) *Medical*, including the examination and routine supervision of the woman from the point of view of her general health and special condition, and also arrangements for local, general or obstetric treatment which may be required either at the clinic or elsewhere ;

(ii) *Educational and social*, including the practical teaching and advice given to the mother at the clinic in regard to the management of her own health and that of the infant, and the systematic visiting of all women throughout their pregnancy, so that regular attendance at the clinic may be secured and relief given for domestic difficulty or hardship.

Pre-natal clinics may either be attached to maternity hospitals, in which case they can also serve as consulting clinics for difficult cases referred by private doctors or from other clinics ; or may be established in connection with health centres as part of the maternal and child welfare work which is carried on at the centre. A woman

should be specially encouraged by visiting nurses and midwives to report her pregnancy to the doctor at the clinic as early as possible. Part of the "maternity benefit" or other money grants given in connection with maternity may be made dependent upon notification and examination at a pre-natal clinic, say before the fifth month of pregnancy, unless there is some good reason why this was not possible. The notification of pregnancy is a measure which has been recommended by some experts.

But pre-natal supervision must be fully effective, since inadequate care might easily create a sense of false security. There must be regularity of attendance at the clinic. It is not enough for the patient to come once for examination and then do nothing further. She may be perfectly normal at the fifth or sixth month and yet develop some dangerous pathological condition subsequently. Therefore, although in the majority of cases the remainder of the pregnancy would be uneventful, in a few, the continuance of watchful attention can be the only chance of saving the life of the mother or the child, and for the sake of these few, all women should be encouraged and persuaded to take full advantage of the advice offered.

Organisation.

The clinic will not be successful unless it is properly organised, and the following notes may be useful as indicating the minimum requirements in regard to premises, staff, routine work, etc.

Premises. — Elaborate accommodation is not necessary, but due privacy should be secured for each woman, both for undressing and for the medical examination. Sanitary provision is required and a small clinical testing-room where specimens can be examined forthwith.

Staff. — The doctor in charge should be trained and experienced in obstetrics and in pre-natal work, and should fully understand the scope and importance of pre-natal supervision. A woman doctor is often particularly successful in obtaining the confidence and trust of the patients who attend the clinic, an important matter as attendance is voluntary and the women must be persuaded rather than compelled to follow advice, the value of which they may not altogether appreciate.

The doctor should be assisted by a trained visiting nurse, and it is often useful to attach a well-qualified midwife to the staff. In a large clinic further assistance will be needed for clerical and educational work.

Pre-natal Examination. — At the first visit, a full medical and obstetrical history should be taken and a physical examination made. This should include an estimation of the blood pressure as a standard for future reference, examination of the urine, and whenever practicable a sero-diagnostic test for syphilis. The heart, lungs and digestive system should be investigated; the teeth should be looked at and arrangements made for dental treatment if required; search should also be made for vaginal discharge or other possible foci of infection. If signs of organic disease are discovered, appropriate steps should be taken for suitable treatment elsewhere.

From this time onward, the urine should be regularly tested and the patient should remain under the general observation of the doctor or midwife at the clinic.

During the last month, the urine should be examined weekly and the blood pressure also taken, and, at about the thirty-fourth to thirty-sixth week, a careful examination should be made to ascertain the position of the foetus and the relation of the head to the pelvis.

Advice should be given in regard to diet, exercise, rest, general hygiene, daily routine, etc. If the confinement is to take place at home, the dwelling should be inspected and the woman instructed in the preparations she should make for her confinement and for the clothing and care of the infant.

Co-operation with Private Doctors and Hospitals. — Records should be kept of all observations made at the clinic, and these should be available to any doctor or midwife who may be in charge of the expectant mother. Private doctors should be invited to send their patients to the clinic for supervision and should then be kept regularly informed of any special advice given or treatment recommended. Midwives should also be made welcome at the clinic and encouraged to accompany their patients.

The clinic should be in close touch with maternity and other hospitals to which patients requiring treatment may be referred.

No treatment should usually be given at the clinic other than minor treatment which can be carried out by a nurse.

Any subsidiary assistance, such as the provision of milk or additional food, or the supply of temporary domestic help for the woman who is incapacitated through illness or poverty from making arrangements for herself, may be organised through the social service work of the health centre.

Post-natal Supervision.

A woman may suffer from injuries received during her confinement (*e.g.*, lacerations of the perineum or cervix) which have been untreated or have not completely healed at the end of the lying-in period, or the uterus and pelvic organs may not be fully restored to normal. It is often difficult to detect this within a week or two of delivery and therefore it is very desirable that the mother should be carefully examined about six weeks afterwards, by which time normal conditions should be re-established. Though not necessarily serious in themselves, such injuries often give rise to considerable weakness, discomfort, and even pain, while a chronically unhealthy condition of the cervix may predispose to malignant disease in later life. Early treatment is likely to be effective. Therefore it is important that women shall be encouraged to go back to the clinic for post-natal examination in order that any damage or pathological weakness may at once be detected and rectified.

This should be impressed upon the woman herself and also upon the midwife and the doctor in charge of the confinement. The examination can most suitably be made at the pre-natal clinic where the woman is already known and where a record of her previous health is available. The staff of the pre-natal clinic should therefore make sure that this post-natal supervision is carried out by the attending doctor, or should exercise supervision themselves. Apart from an obstetric examination, the mother frequently needs advice as to the management of her own health during breast feeding. This, however, can best be given at the infant consultation to which she takes her baby.

Maternity Hospitals.

The normal delivery may properly take place in the woman's own home if she wishes to remain there. If the home is for any reason unsuitable for a confinement (overcrowding, dirt, poverty, isolation) or if there is reason to anticipate any complication, arrangements should be made, whenever possible, to send the woman in good time to a maternity hospital. In the vicinity of the larger towns, this is comparatively easy, but there may be no hospital accessible to many villages or people living in sparsely populated rural districts. In such circumstances, the Public Health Administration should consider whether it is practicable to set up a small maternity home containing a few beds, in association with the health centre, and in charge, and under the strict supervision, of the director of the centre and his staff, assisted perhaps by the communal midwife, for women from the district served by the centre who cannot safely be confined in their own homes. The importance of preventive medicine should be fully recognised by the staff of the maternity hospital and it should be, not only a place of treatment, but also a place of education in the first principles of the care and management of infancy.

Homes for Infants and for Mothers and Babies.

There must also be maternity homes capable of admitting pregnant women for a prolonged period either for economic or social reasons (destitution, illegitimate birth), or for medical reasons (need for special attention or permanent supervision). These institutions may be attached to lying-in hospitals or placed under the direction of the maternity services. It may sometimes be useful to make arrangements for women to work there (workrooms).

(c) HIGH STANDARD OF PROFESSIONAL EDUCATION FOR DOCTORS AND MIDWIVES.

We shall revert in the last chapter to the training to be given to the staff responsible for maternal welfare and, for the moment, we shall confine ourselves to the duties of the midwife.

The place of the midwife in a scheme for maternal welfare needs careful consideration. One of the chief reasons in favour of the employment of midwives is that they do not come in contact with persons suffering from infectious diseases and, further, that they can devote all the necessary time to the care of women in childbirth. The midwife's position varies in different countries. In the United States of America, for example, she is not as a rule officially recognised. In the Netherlands, on the other hand, she is given a three years' training and conducts most of the cases of normal midwifery. In most countries her usefulness is not called in question.

Midwifery is an ancient profession and the midwife continues to exercise her calling with greater or less skill and under more or less strict supervision, especially in rural districts where doctors are comparatively scarce. The desirability of improving her training and of raising her status and remuneration is generally recognised.

The future of the midwife must, however, be considered in relation to the development of modern midwifery, and especially pre-natal care. As long as the actual delivery was the only event of importance, this might properly be left in normal cases entirely to the midwife without medical intervention, and the greater the technical skill of the midwife, the better for the patient. There was, in fact, room for an independent non-medical practitioner in this narrow speciality of medicine. But now that the importance of pre-natal care is recognised, together with the closer relation of obstetric treatment to general medicine, the position is altered. Pre-natal supervision can only be carried out adequately by a doctor because its scope is far beyond the training of any midwife or nurse, however competent, and, although the midwife can give most valuable assistance to the doctor, she can never safely replace him. Thus the midwife is likely gradually to lose her position of independence and isolation and become a member of the maternity service, co-operating on the one hand with the doctor to whom she is ultimately responsible, and on the other, with the visiting nurse who will assist her on the social side of her work, and will inherit from her the supervision of the new-born infant. This does not mean that the midwife need, or should, be superseded in her function of attendance at normal delivery — indeed, there are many reasons for hoping that this will be extended — but rather that she should be relieved of responsibility that should not fairly be placed upon her and, at the same time, given a better social and professional status than she usually enjoys at the present time. For this, it is necessary that her knowledge should be kept constantly abreast of all the requirements of modern hygiene, and that she should only be allowed to practise if she holds a Government diploma.

(d) THE EDUCATION OF THE GENERAL PUBLIC.

It is useless to provide facilities for pre-natal supervision and the modern treatment of women in childbirth if the mother herself refuses to take advantage of them and continues to employ the untrained "handywoman". Much of the morbidity associated with childbirth can be directly attributed to the ignorance or prejudice, or even to the mere inertia, of the mother, or sometimes to a sense of mistaken shyness or modesty which prevents her from consulting a doctor about her condition. One of the tasks, therefore, before any health organisation or centre is the creation of a more enlightened public opinion in matters of maternal welfare.

Individual teaching can best be given at the pre-natal centre or in the woman's own home by the doctor or visiting nurse, or the midwife attached to the centre. Communal instruction can be organised in connection with the health centre as part of general health propaganda. The centre often possesses a museum of popular hygiene; simple lectures and demonstrations can be given or educational cinema films can be shown. A travelling van equipped with pictures and models to illustrate lectures or discussions is a most valuable means of providing instruction in rural districts.

ABORTION AND CONTRACEPTION.

Both these subjects have aroused considerable interest of late years and, in many countries, the practice of both abortion and contraception has increased or at least

has become far more openly discussed. Exact information as to the prevalence of either is obviously difficult, if not impossible, to obtain.

From the standpoint of maternal welfare, apart from any moral or legal objections, *abortion* must be regarded as associated with considerable danger to health, mainly on account of the sepsis which not seldom accompanies it, and also because of the unhealthy condition of the pelvic organs which may be one of its sequelæ.

Salpingitis or pelvic infection may be set up which may lead to chronic invalidism and permanent sterility, and serious damage to the liver and kidneys may be produced by certain chemical abortifacients.

A threatened abortion often receives no proper medical attention, especially if the woman herself attempted to interrupt pregnancy, and the doctor is frequently not summoned unless acute septic infection intervenes. Cases of abortion are not usually welcome in the maternity hospital because of their potentially septic character, and increased hospital accommodation is urgently needed for these cases, so that the uterus may be properly emptied if the abortion is inevitable, and suitable after-treatment provided. Instruction should be given at the pre-natal clinic as to the dangers of abortion and the importance of seeking medical advice should it occur.

Apart from the practice of *contraception* for personal or economic reasons, it may be necessary to avoid pregnancy on account of the mother's own health, and in such cases it is preferable to prevent pregnancy occurring at all rather than to interrupt it. But it is not sufficient merely to tell a married woman suffering from tuberculosis or heart disease or nephritis that she should not again become pregnant. It is necessary to explain exactly what steps she and her husband should take to prevent this from happening. If the private doctor is not prepared to do this, the information can be given most appropriately at the health centre.

II. INFANT WELFARE

MEASURES TO PROMOTE THE REDUCTION OF INFANT MORTALITY (STILL-BIRTHS AND DEATHS OF INFANTS FROM BIRTH TO ONE YEAR OF AGE).

Dangers due to Obstetric and Developmental, to Alimentary and to Infective Conditions :

(a) The Reduction of Still-births and Early Infant Mortality :

Definition ;
Causes ;
Preventive Measures ;

(b) Infant Welfare (from One Week to One Year) :

Special Dangers and their Causes ;
Preventive Measures :
Nursing Allowances ;
Infant Welfare Centres ;
Homes for Mothers and Babies, or for Infants alone ;
Resident Nurseries ;
The Boarding-out of Infants ;
Crèches, Day Nurseries, Rooms for Nursing Mothers ;
Hospital Services ;
Prevention of Tuberculosis ;
Prevention of Syphilis ;
Slum Demolition ;
Milk ;
Health Visitors (Visiting Nurses) ;
Educational Propaganda.

Infant welfare is governed by certain general principles, though the precise measures taken to reduce infant mortality must be adapted to the existing customs, to the existing standard of public health, and to economic possibilities. In determining these principles, due account must be taken of the infant mortality rate in the district under consideration ; the importance of this index was shown very clearly by the enquiry into infant mortality carried out in different countries in Europe and South America under the auspices of the League of Nations Health Organisation. A detailed study of the causes of still-birth and infant mortality is contained in the reports drawn up as a result of this enquiry (documents C.H.820 and C.H.908(1)). The following account is based on the experience gained in the course of that enquiry, and is intended for those countries, or rather those regions, having infant mortality rates approximating to the rates found in the districts covered by the enquiry ; these rates vary from 50 to 200 per 1,000 (*i.e.*, 50 to 200 deaths under one year per 1,000 live births), and to these must be added still-births, varying from 23 to 64 per thousand live births.

DANGERS DUE TO OBSTETRIC AND DEVELOPMENTAL, TO ALIMENTARY AND TO INFECTIVE CONDITIONS.

Infancy must be protected against three main dangers : congenital and developmental defects, alimentary disturbances and infective disease. The first of these accounts for nearly all still-births and for deaths in the first seven days of life, and as deaths in these two groups are generally attributable to similar causes, they may usefully be considered together. The other two conditions chiefly affect older infants. " Infection " covers acute or chronic infections, whether local or general, specific or otherwise, and in this connection diseases of the respiratory passages are the most important. Lastly, alimentary disturbances cover deaths due to faulty methods of feeding, which may or may not be associated with disease of the digestive system.

The relative importance of these dangers in any district varies considerably according to whether the local infant death rate is low, moderate, high or very high.

Districts in which the mortality rate is under 50 per 1,000 are considered low-infant-mortality districts. Those in which the rate varies from 50 to 70 per 1,000 are regarded as moderate : those with a rate from 70 to 100 per 1,000 are considered high-mortality districts, while in districts where the rate exceeds 100 per 1,000 mortality is regarded as very high. In low-mortality districts, the risk of gastro-intestinal disease is largely negligible, the neo-natal death rate being practically the only matter for serious consideration, so that this is the problem which should be emphasised in these areas. Where infant mortality is moderate, the risk in the early days of life remains undiminished, but the danger of infective conditions begins to play a fairly important part, while mortality from digestive disturbance is also manifest to some extent. Where the mortality rate is high, gastro-intestinal disease is added to the risk from both other causes, and plays, indeed, the most important part. Lastly, in districts where the mortality is exceptionally high, all causes operate together, but in even higher degree. These considerations may be taken as affording a basis for general guidance. Thus, according to the infant mortality rate (and particularly the still-birth rate and neo-natal mortality) in a specified district, the relative importance of the different risks to infant life can be anticipated to some extent, and the direction in which efforts are chiefly required can be foreseen.

We have thought it advisable to consider still-birth and early infant mortality in a special section, since they are largely due to causes entirely different from those of infant mortality after the first week, and thus call for separate preventive measures.

(a) THE REDUCTION OF STILL-BIRTH AND EARLY INFANT MORTALITY.

Definition.

The term " still-birth " is applied to a foetus which has never breathed, in accordance with the definition adopted in 1925 by the Committee on still-births appointed by the Health Organisation of the League of Nations. Early infant mortality includes all deaths in the first seven days of life, and is particularly high during the first three days. Still-births and early infant mortality are due to similar causes and should be considered together.

For statistical purposes, it is suggested that the figures for still-births should be calculated not in relation to live births — which is irrational — but in relation to the birth of viable children. Still-births and infant mortality should be shown as a single rate; the rate would be determined by adding the figures for still-births and deaths under one year, and referring this total to the total figures for births following not less than twenty-eight weeks' pregnancy. The early infant mortality rate should be calculated — that is, the rate of mortality during the first week of life; and, lastly, the rates for still-births and early infant mortality should be added together. This mortality rate indicates the extent of the risk to which these two groups are subject.

Among children who die in the first week of life, a quarter are born at full term, and three-quarters are premature infants. Ten to twenty per cent of all premature births succumb during the first week. Later mortality among prematurely born infants, which is also of considerable extent and occurs chiefly in the first and second months, is due less to the congenital or development conditions than to alimentary and infective ailments.

The magnitude of the risk during the first week of life is shown by statistics drawn up in accordance with the principles we have just laid down. At Berlin, for example, there were, per hundred births :

	In 1922-1925	In 1926-1929
Still-births	4.0	3.9
Deaths in the first week.	3.5	3.3
	—	—
Total.	7.5	7.2
Deaths from one week to one year	7.2	4.8
	—	—
Total.	14.7	12.0

Early infant mortality is higher than the deaths caused by the alimentary and infective dangers combined. The improvement in sanitary conditions, which is expressed in a notable decrease in the general infant mortality, has had no influence on still-births and early infant mortality. Such figures indicate that it is a matter of urgency to undertake effective measures to reduce this early infant death rate, and that the methods employed will have to be altogether different from those commonly employed to reduce infant mortality as a whole.

Causes.

Prematurity plays an important part as a cause of death in this group, and it is therefore highly desirable to ascertain its incidence and principal causes. Unfortunately, no accurate figures are available on this subject. The causes of premature delivery may be divided into four main groups :

- (1) Chronic infections or intoxications of the mother (hyperemesis gravidarum, syphilis, poisons, etc.), eclampsia;

- (2) Constitutional weakness, anomalies in the position of the ovum, etc. ;
- (3) Acute diseases (influenza, etc.) ;
- (4) Accidental causes (traumatism, shock, illegal operations, etc.).

But the relative importance of each of these four factors is not known. In any case, it is certain that syphilis plays an important part, as does eclampsia, and that preventive measures are necessary mainly in respect of these two affections. It is also possible that repeated slight injuries which a pregnant woman may easily incur during her industrial or household work may frequently be the cause of premature delivery. Particularly among women working in factories, slight placental hæmorrhage has been known to occur as a result of trifling shocks, which are likely to lead in the long run to the premature expulsion of the fœtus.

The immediate cause of the death of prematurely born infants is not always merely weakness, due to their early arrival into the world, as many succumb when they should be perfectly viable. It is known that obstetrical injury leads in many cases to cerebral or meningeal hæmorrhage which is the actual cause of death.

In the early mortality of infants born at term, abnormal presentations and mechanical obstacles to delivery play the most important part.¹ Death is often due to cranial lesions or cerebral hæmorrhage. The more weakly the child, the greater is the danger of obstetrical injury. When the presentation of the child is normal, the difficulties of delivery may be due to :

- (1) Disproportion between the fœtal head and the pelvis ;
- (2) Lack of elasticity of the soft parts ;
- (3) Weakness of the contractions.

As regards the first two points, the age of a woman having her first child may be of considerable importance.

Lastly, compression of the cord, and asphyxia due to obstruction of the respiratory passages, either of which may cause the death of a new-born infant, are also to be classed among obstetrical injuries.

The relation of still-birth and early infant mortality to the social position of the mother deserve to be more closely studied (in connection, for example, with attempts at deliberate abortion). In particular, the influence of employment during the last months of pregnancy on the state of the child and on the delivery requires further investigation. It is held by some that a woman who works away from home is delivered earlier, and bears a weaker child than a woman who simply looks after her house; but accurate data in this connection are lacking.

Statistics show more frequent cases of premature delivery among unmarried than among married women.

Preventive Measures.

The means which may be used to reduce still-births and early infant mortality are concerned primarily with the safety of the mother, rather than of the child, and

¹ See also document C.H.826.

will be devised in accordance with the suggestions we have outlined in the chapter on the protection of maternity. By the prevention of toxæmia or of difficult labour and by ensuring to the woman good conditions for delivery, the life of both mother and infant can be saved. It is therefore unnecessary to recapitulate the guiding principles we have already laid down, which are applicable as they stand to the reduction of still-births and early infant mortality. It may be well, however, to emphasise here certain points which more particularly concern the welfare of the child.

The great frequency of birth injury in children, which leads, not only to deaths in the first days of life, but also to non-fatal lesions such as a lesser degree of cerebro-meningeal hæmorrhage, obstetrical paralysis, etc., raises the question whether present obstetrical technique always takes sufficient account of the welfare of the infant, or whether it would not be possible, while safeguarding the health of the mother, to adopt methods which would, to a greater extent, spare the child. It is for the obstetrician to decide whether the numerous manipulations practised nowadays, or whether, on the contrary, undue delay in taking action, may be the cause of maintaining a high incidence of traumatic lesions. In any case, midwives cannot too often be reminded to pay careful attention to the condition of the infant, and to call in the doctor whenever its life seems in danger.

The detection and early treatment of syphilis in women is of even more importance to the child than to the mother; great stress must therefore be laid upon the necessity of looking for this disease systematically at pre-natal consultations, of providing adequate curative treatment and of seeing that this treatment is continued, possibly also in the interval between pregnancies, by the medical officer in charge of the clinic for venereal diseases.

Lastly, premature delivery must be prevented by every possible means. At pre-natal consultations, care should be taken to discover and treat diseases of women liable to lead to premature birth. Heavy work in the factory and in the fields should be reduced as much as possible during the latter months of pregnancy, and pregnant women should avoid contact with persons suffering from acute infections.

It is desirable to organise arrangements for the safety of infants born prematurely. These should include active propaganda among doctors and midwives and nurses, warning them of the seriousness of this question and particularly of the importance of protecting the infant against chill and from the dangers of unskilled feeding and of infective conditions. The first attention to the baby will usually be given by the midwife and she must therefore be thoroughly trained in the management of premature infants immediately after birth. In many cases it will be difficult to rear the infant at home and it will then have to be taken to a suitable institution (maternity hospital or infants' hospital). It is important that conveyance should take place under good conditions. In maternity hospitals and homes for infants, special provision should be made for premature infants, so that they can be protected against infection and can be given human milk. In necessitous cases the cost of hospital treatment should be borne by the public welfare administration or by its social insurance institutions.

Apart from the special arrangements for premature infants no new organisation need be created for the prevention of still-births and reduction of early infant mortality. The principal agency is the pre-natal consultation centre with its medical and

educational activities. It is here that the causes of premature delivery and the defects likely to lead to difficult labour should be detected ; it is here too that mothers should be given information as to the care of their own health, should be made to understand the importance of sufficient rest during the months previous to delivery, and should, if necessary, be persuaded to undergo treatment for syphilis throughout pregnancy. If there is no pre-natal consultation, it is usually the midwife who must be ready to advise in the first place. She must therefore be taught the prophylaxis of premature birth and of obstetrical accidents, and should fully understand which cases are beyond her powers and thus require medical advice.

(b) INFANT WELFARE (FROM ONE WEEK TO ONE YEAR).

Special Dangers and their Causes.

It is of interest to note, when considering the different districts in which the League of Nations Health Organisation carried out its enquiry into infant mortality, that no single district was found to be adequately equipped against the three principal dangers — congenital, infective and alimentary. The alimentary risk is the easiest to overcome: a vigorous campaign in favour of breast feeding by the mother, attendance at infant welfare centres, control of the cow's milk offered for sale, and especially the correct quantitative adjustment of artificial feeding, should be sufficient to produce a considerable fall in infant mortality, despite the sometimes appalling conditions of housing, domestic hygiene and general sanitary environment.

The campaign against infective disease (chronic or acute) is a more difficult matter, since it depends not only on domestic and social reforms (such as the safeguarding of infants from all forms of infection, including diseases of the respiratory tracts, even when these occur in a mild form among adults), on the reorganisation of hospital services, as well as day nurseries and infants' homes, and on the better training of the professional staff, but also on a general improvement in the living conditions of the people.

We need not here go into the details of the medical and social causes of mortality in the first year, which have been fully stated in the reports concerning the enquiries into the causes and prevention of infant mortality undertaken in Europe and South America (documents C.H.820 and C.H.908/1).

Preventive Measures.

Nursing Allowances.

We do not propose to discuss further the methods of protecting the health of the mother and of preventing still-births and early infant mortality, which have been described in the first chapter of this report (namely, the social, legislative and health measures for the protection, assistance and supervision of pregnant and parturient women). Financial assistance to women in childbirth may be supplemented by assistance to women who feed their babies at the breast, a measure which has been recognised in a large number of countries as essential to promote breast feeding and thus avert the risk of alimentary disease. Naturally, the amount of such assistance

must be sufficient to secure its object, and must especially be adequate during the first three months.

Assistance for women in childbirth and nursing allowances are valueless unless accompanied by social welfare work and proper medical care. Any assistance for the mother must therefore be accompanied by medical supervision of the health of the child.

Assistance with a view to preventing desertion of the infant is intended to help women dependent on their own earnings who may be tempted, for economic reasons, to abandon their children to the public assistance authorities. Such help, which is granted in several countries, must be adequate for its purpose and should be conditional on a compulsory supervision of the woman by a properly organised social service. This condition should also apply to all social assistance of a similar kind, such as might be granted in case of illegitimacy.

These various economic measures should be supplemented by grants from the Government, local authorities and insurance funds¹, to promote infant welfare by preventing the separation of the child from the mother; thus, they should all further the cause of preventive medicine.

Infant Welfare Centres.

Consultation centres for healthy infants are the pivot of preventive medicine in early infancy. They have proved their worth in the campaign against infant mortality, particularly in preventing mortality due to digestive diseases.

These centres should be separate from the treatment clinics; they may be organised independently, or may form a part of those consultation centres — the maternal and infant welfare centres — where provision is made for the care of infants in addition to pre-natal care, and the care of older children. In other districts, infant welfare centres may be attached to health centres, where other forms of public health supervision or treatment are provided.

Infant welfare centres should be so organised as to avoid overlapping, and each centre should serve a specified district. They should be under the direction of a competent medical officer, who should have sufficient time at his disposal to examine each infant thoroughly, and should only be responsible for a limited number of patients. The system of making definite appointments is recommended whenever practicable. The centres should have a sufficient staff of visiting nurses to ensure regular attendance of the infant, and to secure the carrying out of medical, dietetic and hygienic instructions by visiting the homes at regular intervals; the organisation of these centres should be planned so as to provide as soon as possible for all infants in the district served; in order that those in need of vigilant and continuous supervision of their health may be discovered, and specially those whose lives are threatened on account of social conditions, such as illegitimacy, neglect, etc., or because the mother is obliged to go to work.

Infant welfare centres should be equipped for weighing and medical examination only; they should not offer treatment. To these centres may be attached free milk

¹ Here, too, a system of sickness insurance covering the members of the family is to be recommended, in view of its favourable effects on the health of children.

services for children who are artificially fed (pure milk, correct quantity, sterilised bottles). Canteens may also be attached to the centres to supply necessitous nursing mothers with proper food. These centres for healthy infants are a valuable means of popular education in mothercraft.

In certain rural districts, consultation centres for healthy infants can be organised and established in some small town which is easily accessible and much frequented on market days. They should be associated with a rural health centre and be equipped on the lines of the urban centres. It is essential that the infant welfare centre, wherever it is situated, should be under the direction of a medical man who has made a special study of the problems of the infant and little child, and is familiar with the dietetic principles applicable in infancy.

Homes for Infants and for Mothers and Babies or for Infants alone.

Institutional provision may be necessary for mothers who for social, economic and medical reasons are unable to remain at home with their infants, and these homes must be organised in accordance with modern principles of infant hygiene.

Resident Nurseries.

Some women are forced by economic or moral considerations to separate themselves from, or even, as happens in certain countries, to abandon, their infants. In such cases, it is preferable, at all events in the towns, to place the child temporarily, to begin with, in an infants' home. The stay in an institution should always be short, and should be terminated as soon as possible by finding a good foster-mother for the child.

Resident nurseries should be reserved as a general rule for : (1) premature and sickly children ; (2) children whose nurture requires careful supervision ; (3) healthy children whose mothers cannot keep them at home, and (4) lastly, orphans, foundlings, etc., until homes are found for them in the country. Proper accommodation and equipment, and careful medical supervision, preferably by the health administration itself, are essential.

The Boarding-out of Infants.

Everything should be done to prevent the indiscriminate boarding-out of infants, either by their relatives or, in the case of foundlings or orphans, by the public authorities. Premature putting-out to nurse, travelling in bad weather, and incompetence and carelessness on the part of the foster-parents, may lead to disastrous consequences, and, in any case, it may be difficult to arrange for supervision over such children. For this particular class of child, an organisation may well be established for placing them with families in the country, or in centres where they can be satisfactorily reared. For this purpose, private associations approved by the authorities, or the authorities themselves, may select suitable villages where the infants can be placed with foster-parents. The latter receive instructions from the doctors, and are under the supervision of visiting nurses. Every such district should

have a welfare centre for the regular examination and weighing of the infants, and for preparing standard feeds to be distributed to each foster-mother, as well as a small ward for sick infants and a feeding-room to which mothers may come to learn how to wean their children gradually and methodically. Very strict supervision should be exercised over each child which is boarded out.

Crèches, Day-Nurseries, Rooms for Nursing Mothers.

Women working away from their own homes who wish to keep their children with them, but cannot do so during the day, may use rooms set aside for breast feeding in the factories or workshops (in the case of infants at the breast), or may leave their children at crèches or day-nurseries. These nurseries must be properly equipped. every precaution must be taken to prevent epidemics, and the mother must not have too far to go to her work. Some factories have rooms for nursing mothers and nurseries (to which bottle-fed babies are also admitted) which are of great value, as their equipment and administration are under the strict supervision of the public health service.

Day nurseries, whether municipal or private, where children are left during the day, are more exposed to epidemics than feeding-rooms, as they admit older children (nine months to two years or older) who are more susceptible to acute infectious diseases. This necessitates strict medical supervision. In time of an epidemic, instead of closing down the premises and disinfecting them as is commonly done, it is better to isolate or refuse suspects, to test for the diphtheria bacillus (a very usual practice) and for the Bordet-Gengou whooping-cough bacillus (a less frequent practice), to employ anti-measles sero-prophylaxis, more particularly sero-attenuation (using the mother's blood, failing convalescent serum). But modern preventive health measures should not be employed simply at times of epidemics : it is essential, as a precautionary measure and in order that the children may offer greater resistance to infectious diseases, to ensure proper feeding and to safeguard against rickets, more particularly by the use of ultra-violet-ray apparatus, with attention to diet and suitable medicines. All such measures require of course very careful medical supervision and proper hygienic organisation (see also pages 62 to 70, Chapter III).

Hospital Services.

In the country, sick children often receive medical attention too late, and the doctor is not called in until the disease has gained a hold. This state of affairs may be remedied partly by means of popular education, partly by the activities of sickness insurance services which provide for dependants, and also by the efforts of medical practitioners and visiting nurses. The child can, as a rule, be nursed at home by its mother, but the necessary therapeutic equipment is not always available. This makes it essential for the hospitals to have adequate wards for infants. Babies can receive proper care and attention in hospital only if (1) there are entirely separate wards for young children, (2) there is some arrangement whereby both mother and child can be received together if necessary, (3) every available precaution is taken to prevent the spread of infectious diseases and — more important

still — the staff is properly trained from this point of view, and (4) mothers' milk is available.

Further, if medical practitioners could call upon the services of nurses who would follow their instructions in the care of the child at home, this should make it possible to avoid sending to hospital many children who do not require special treatment.

Prevention of Tuberculosis.

Infant mortality benefits to some extent from the general organisation for the prevention of tuberculosis, although, under one year of age, the death rate from tuberculosis is fairly low.

In certain countries, Calmette's vaccine (BCG) is systematically administered with excellent results. In the countries where it is used, a reduction has been observed, not only in the mortality from tuberculosis, but also in the infant mortality generally. Even in these circumstances, children born of parents suffering from active tuberculosis should always be isolated at birth (this may be the work of the welfare centres) and should be placed with families or in a satisfactory infants' home (preventorium) away from the infected house.

Prevention of Syphilis.

This is carried on in the pre-natal clinics and maternity homes and also in the children's consultation clinics, which will be dealt with later. It is most desirable that the pre-natal clinic should keep in touch with the organisations for the prevention of syphilis.¹

Slum Demolition.

The importance of slum demolition is by no means confined to the sphere of infant mortality, but nowhere is its urgency and its efficacy more apparent than in this particular field, urban and rural slums both playing the same fatal part. Cold, heat, darkness and the absence of ultra-violet rays have a disastrous effect on the infant's health.

From a constructive standpoint, it may be added that, in the towns, the erection of workers' tenements where the children are crowded together, thus increasing the risk of infection for the younger ones, is not as satisfactory as the establishment of garden cities, where infants can more easily be isolated — at least, to some extent.

Milk.

The quality of the cow's milk supplied for infants is an important factor in their health. Watering, skimming, and bacterial contamination present serious dangers. To avoid these, it is essential that the cows should be healthy, the byres well kept, the veterinary supervision efficient, the milking carried out with all possible care, the milk promptly chilled, bottled as quickly as possible, transported and kept under

¹ Measures should also be taken against gonococcal infection, which, though not important from the point of view of mortality, gives rise to cases of blindness.

proper conditions (suitable temperature), and sold within twenty-four hours; and that suitable arrangements should be made for bacteriological and chemical analysis before the milk is put on sale. The question of milk is being made the subject of a separate study undertaken by the Health Organisation.

It is obvious that not only the quality of the milk but also the methods of estimating the quantities given in artificial feeding play an important part in the prevention of gastro-intestinal disturbances.

Health Visitors (Visiting Nurses).

In reviewing the sanitary measures for combating infant mortality, one of the most important of these has been left to the end — namely, the provision of health visitors (visiting nurses) in all districts. Only by means of a competent health visitor can the various organisations, the protective legislation and the arrangements for financial assistance become fully effective. By visiting the home and investigating the individual circumstances, and by getting into direct contact with the parents, she is able to apply any general measure to individual cases. Her personal interest and the direct and immediate action which she is able to take are of value as permanent propaganda by practical example.

The work of visiting nurses is carried out both in the towns and in the country districts. Every district should have one health visitor or more who take the child under their supervision, as it were, before birth, on being informed of the mother's pregnancy. Rural visiting nurses have to contend with special difficulties — for example, the long distances between the patients' homes, the loss of time and the fatigue in getting about districts where the population is scattered — while difficulties of a different kind may arise from the characteristics of the country people and their instinctive mistrust of new methods. The duties of the health visitor include pre-natal supervision; she must persuade the expectant mother in many cases to avoid undue fatigue, or to consult a doctor or midwife; she must explain to her that she should entrust herself for her confinement only to a doctor and a qualified midwife, and not to a "handy woman"; she should emphasise the value of breast-feeding, and explain the dangers of putting the child out to nurse.

The relations between midwives and visiting nurses have been indicated in Chapter I, page 24.

One most important point which should be stressed is that visiting nurses should everywhere co-operate successfully with the medical profession. Doctors who fear interference in the professional relations with their patients may be assured that the visiting nurse will be of real help to them; that properly-trained nurses know where their own duties end and where the doctor's begin, and that they will advise the families to consult the doctor whenever necessary, and as early as possible.

The establishment of an adequate staff of health visitors is, of course, no easy matter, and the composition of such a body is of the first importance. Only women of intelligence, energetic women who realise the true meaning of their calling, can be relied upon to carry out this most delicate, and at the same time most exacting, social service. If good training schools are founded, if Government diplomas are

provided, and if visiting nurses are offered the living conditions to which they are entitled, a sufficient number of candidates may present themselves to allow of careful selection.

Educational Propaganda.

This is most important. It was demonstrated in the course of our enquiry that, despite unsatisfactory economic and hygienic conditions, an educated population can obtain excellent results in rearing young children. Educational measures imply, first and foremost, the education and training of the public in general and of mothers in particular.

Certain principles, very simple and at the same time very important, should be inculcated, chief among these being :

(1) Importance of pre-natal medical care (including attention to the gravity and prophylaxis of hereditary syphilis), examination and treatment for albuminuria, the possibility of correcting faulty presentation by external manipulation ;

(2) Evil effects of over-fatigue and need for proper diet and hygiene during pregnancy ;

(3) Necessity for expert aid at confinement ;

(4) Special care for premature children, the high death rate among this class being due partly to ignorance ;

(5) Advantages of breast-feeding by the mother (too much insistence cannot be placed on this point, as the mother's milk is practically never injurious to her own child) ;

(6) Dangers of artificial feeding and means of preventing them (emphasis should be placed on the relative advantages of mixed feeding), precautions as regards weaning, choice of milk, proper quantities, regular feeding, technique of preparing bottles ;

(7) Prophylaxis of acute infectious diseases (whooping-cough, influenza, measles, broncho-pneumonia, infantile diarrhoea, etc.) and chronic infectious diseases (tuberculosis and syphilis) ; special measures should be taken to protect the child from any infection of the upper respiratory passages (rhino-pharyngitis and bronchitis of the influenza variety) from which the persons in its vicinity may be suffering ;

(8) Importance for infants of regular medical supervision (periodical examination and weighing) and dangers of empirical practices and various superstitions to which infants often fall victims ;

(9) Importance of calling in the doctor early, as what appears to be a slight indisposition may, in an infant, be the beginning of a serious disease.

Some of these principles already form the basis of the instruction in infant management which can usefully be given to girls at school, and should be further extended, particularly in secondary schools and in training colleges for both

sexes. School-teachers can play a very important part from this point of view, their advice, and the counsel they may be able to give to parents, being sometimes even more important than the lessons they give to the children. Our enquiry showed how anxious they were to be informed on matters of hygiene in general, and what valuable helpers they might be in the cause of preventive medicine.

As regards the mothers, most can be done by the health visitors, who are able by means of definite instruction and concrete examples to give useful practical teaching, especially among certain suspicious and mistrustful peoples who pay very little heed to pamphlets and posters and other means of propaganda which are, or appear to be, of official origin. It would be wrong, however, to imagine that the public are untouched by this kind of propaganda; the value of well-written booklets, illustrated pamphlets, posters, broadcast lectures, films and exhibitions has been proved, in the case more particularly of the prevention of tuberculosis, and the results should be no less satisfactory in the campaign against infant mortality — as experiments have already shown. In this particular sphere, however, more than in any other, due attention must be paid to local beliefs and prejudices, which vary in every country. This need for suitable adaptation was one of our reasons for stressing the diversity of the problems arising out of infant mortality and still-birth according to the districts and the local circumstances.

III. HEALTH OF THE PRE-SCHOOL CHILD

Statistics.

The Dangers and their Causes :

- Medical Causes ;
- Infectious Diseases ;
- Diseases of the Respiratory System ;
- Tuberculosis ;
- Accidents ;
- Gastro-intestinal Affections ;
- Other Diseases ;
- Morbidity ;
- Social Considerations.

Campaign against Disease :

- Nutrition ;
- The Care of Teeth ;
- General Hygiene (Light, Fresh Air, Cleanliness) ;
- Chronic Infections ;
- Physical Education ;
- Acute Infections :

- Diphtheria ;
- Scarlet Fever ;
- Measles ;
- Whooping-cough ;
- Other Acute Infections ;

Chronic Infections :

- Tuberculosis ;
- Syphilis ;
- Rheumatic Manifestations ;

- Physically Abnormal Children ;
- Mentally Abnormal Children.

Preventive Measures :

- Consultation Centres ;
- Institutions for Children :
 - Housing ;
 - Day Nurseries, Nursery Schools, Nursery Classes ;
- Residential Institutions ;
 - Institutions for Sick Children ;
 - Institutions for Abnormal Children.

Staff :

- The Nurse's Duties.

The pre-school-age group comprises children from the beginning of their second to the end of their sixth year, at which age school-attendance becomes compulsory in nearly all countries. Obviously, this group is far from being homogeneous ; in the matter of pathological reactions there are noticeable differences between children in their second and children in their fifth and sixth years. From this point of view, the pre-school age can be divided into two periods : the first comprising the second

and third years, during which the child's reactions are still in many ways similar to those of the infants; the second period comprising the fourth, fifth and sixth years, during which, in certain ways, these children already resemble schoolchildren. Nevertheless, it seemed to us to be of no value from the point of view of the welfare of pre-school children to make a definite division into two groups, seeing that the whole of this period is a transition from infancy to school age, and that the problems with which we are faced are more or less the same throughout the pre-school age.

The welfare of the child from its second year to its admission to school is not yet as a general rule organised to the same extent as that of the infant and of the school-child. Even in those countries which have done most towards improving the health of children as a whole, the pre-school age is still neglected, not so much because the importance of supervision at this age has escaped the attention of public health workers, but because of the difficulties, both theoretical and practical, which the protection of children of this age presents. The problems encountered in the campaign against morbidity and mortality during the pre-school age are very different from those to be solved in infant welfare. Many, indeed, have not yet been solved from the scientific point of view, for example, the prophylaxis of whooping-cough, poliomyelitis, etc. Again, it is more difficult in practice to remain in touch with children of this age than with those in their first year; and the great majority still escape the attention of the health officer.

To undertake the effective protection of children of pre-school age, the rate of morbidity and mortality for each year should first of all be established, with the help of reliable statistics, and the relative importance of the different causes of disease and death should be studied. The available statistics are largely inadequate and give no exact idea of the state of health during this period. The morbidity is only known in the case of the few infectious diseases which have to be notified, and even these notifications do not appear to be made in the same way in all countries. We are therefore compelled to use mortality statistics, which necessarily only give an imperfect idea of the condition of children's health.

STATISTICS.

Only in a few countries do statistics give the mortality rate for each year of age. In most countries the mortality rate is given for the period 1 to 4 years. But as there are considerable differences between the mortality rates of, for example, the second and the fifth year, it would be of value to have information as to the death rate for each year. Moreover, in all statistics, the sixth year is included in the mortality figure for the age-group 5 to 9 years. It would, however, be of interest to know the rate for this age-year, so as to be able to compare it with the rates for other years of the pre-school age and, in any case, to separate it from the rates for the school age, seeing that most children at this age have not yet entered school. The available statistical material is thus very limited and incomplete, and certain of our present conclusions may therefore have to be revised as soon as we are in possession of better statistical data.

As regards the total mortality figure for the pre-school age, it appears, from certain statistics for the age-group from 1 to 4 years and from the approximate calculations

we have been able to make for certain countries on the basis of the number of deaths given, that the rates vary between 0.4 and 3 per cent.

As a general rule countries which have a high infant mortality rate also have a heavy mortality during the pre-school age, so that there appears to exist a certain parallel between the mortality rates of the first year and the subsequent years.

But the total rate is of no special importance, since the number of deaths is spread very unevenly over the different age-years. The highest mortality rate is always reached in the second year and then gradually decreases, the diminution being rapid during the third and fourth years, after which it slackens. During the second year, mortality is about one-fifth of that during the first year, and, in the third year, about one-half or one-third of that of the second.

The relationship between the mortality rates of the first, second and third years of age is approximately constant in all countries, whatever their actual infant mortality rate. In other words, a heavy mortality in the first year always means a heavy mortality in the second and third years.

In proportion as a country reduces the mortality rate for its first year by hygienic measures, the mortality rate for succeeding years automatically falls, sometimes to an even greater degree than that of the first year. This fact can be explained in two ways. On the one hand, the hygienic measures taken with respect to infants which result in a reduction in their mortality rate, increase at the same time their power of resistance to infectious diseases which, as we shall see, are the principal causes of death in subsequent years. Moreover, it is probable that, by disseminating a knowledge of infant hygiene and mothercraft, older children also benefit, because their mothers continue after the first year to apply the methods of cleanliness and dietetics, etc., which they have learnt. These facts indicate that, in order to ensure good health in the pre-school age, it is essential to begin with a good organisation of infant welfare during the first year of life.

Despite the favourable progress noted in nearly all countries, mortality in the pre-school age is still, after mortality in the first year, the highest recorded up to the age of 45, or even 50. It is especially the youngest children who are the most endangered. In the second year alone, there are more deaths than in the three succeeding years combined, and the mortality rate for the ages between 12 to 18 months is nearly double that for the period between 18 to 24 months. *These data show that it is the youngest children who are in the greatest need of supervision and care.*

THE DANGERS AND THEIR CAUSES.

MEDICAL CAUSES.

The investigations undertaken in countries having a temperate climate with a view to ascertaining the causes of mortality in children of pre-school age lead to the general conclusion that *the greatest number of deaths is due to infectious and contagious diseases; then come in order of importance: affections of the respiratory organs, tuberculosis, accidents, gastro-intestinal troubles, and, finally, to a lesser extent, all other diseases.* The infectious diseases which are important causes of mortality in

countries in the temperate zone are diphtheria, scarlet fever, measles and whooping-cough. In other climatic and social conditions, the relative importance of each of these diseases may vary, and smallpox, dysentery, malaria, etc., may also play an important part.

Statistics are not always very explicit or sufficiently exact as regards the causes of death. Thus, we find that a considerable number of deaths due to broncho-pneumonia secondary to measles or whooping-cough is entered under the heading "pneumonia, or broncho-pneumonia", instead of being classed under "measles" or "whooping-cough", so that the mortality due to infectious diseases is really higher than appears from the statistics. Similarly, cases of tuberculous meningitis sometimes appear under the heading "meningitis", instead of being recorded under "tuberculosis". It is highly desirable that, in future, causes of death should be recorded more accurately and uniformly in all countries.

Even though these five conditions — namely, infectious diseases, affections of the respiratory organs, tuberculosis, accidents, and gastro-intestinal troubles — have been recognised in all countries as the principal causes of mortality during the pre-school age, their relative importance varies from one country to another, and even in the same area from one year to another. Obviously, in serious epidemics, deaths from infectious diseases increase; on the other hand, when there are no epidemics, diseases of the respiratory organs and tuberculosis are likely to predominate. It has been observed that, with improvements in hygiene, deaths due to infectious diseases and tuberculosis diminish more rapidly than those due to respiratory diseases. Among infectious diseases, diphtheria and scarlet fever have been reduced far more in certain countries during the past twenty years than measles and whooping-cough.

In comparing the statistics of different countries, we are struck by the great difference in the incidence of tuberculosis. This is so considerable that the question arises whether there is not a divergence in the methods of notifying and registering these deaths.

INFECTIOUS DISEASES.

The importance of the four infectious diseases — diphtheria, scarlet fever, measles and whooping-cough — as causes of death is shown by the fact that, in many statistical returns, more than a quarter of the number of deaths is attributable to them. In large towns their share is often even greater. For certain age-years, the mortality from these diseases, indeed, has accounted for as much as one-half the general mortality, but these figures vary considerably from one year to another.

The case fatality of these diseases varies according to age; generally speaking, it is high in proportion as the child is younger. Thus, even if it is impossible to reduce the incidence, efforts should be made to ensure that the children are carefully protected against these diseases at any rate until they are older and their resistance is greater.

The relative importance of these four diseases as a cause of mortality varies. At present it is thought that in Europe whooping-cough and measles are the most fatal during the pre-school age, but there have been times when the number of deaths from diphtheria was the highest.

DISEASES OF THE RESPIRATORY SYSTEM.

The mortality from diseases of the respiratory system, which in most countries comes next in importance to that from infectious diseases, comprises deaths from simple pneumonia, broncho-pneumonia, capillary bronchitis, pleurisy, empyema, etc., but excludes diseases of tubercular origin. It is probable that cases of broncho-pneumonia following measles or whooping-cough, or of pleurisy after scarlet fever are sometimes included under this heading and help to swell this group at the expense of the preceding one.

This group is far from presenting the same homogeneity as that of infectious diseases. From the medical point of view, it is certain that very diverse cases are included in it, and information as to the state of health previous to the disease — that is to say, as to the physical condition which preceded the final pneumonia — would be of great value. Among such conditions are to be found debility as a result of malnutrition or chronic digestive troubles, large numbers of cases of rickets, cases of syphilis, tubercular adenitis, etc. So far no study has been undertaken to ascertain the importance of these predisposing factors. However, as a means of reducing this mortality, attention should be paid first of all to the general physical condition and to the prevention of those states of physical depression which predispose to the development of pulmonary infections. The child who succumbs to broncho-pneumonia often really dies from the effects of pre-existing rickets or malnutrition; thus, in these cases, it is not an anti-pneumococcic prophylaxis which is required, but measures to prevent the onset of rickets or other source of physical weakness.

The mortality from diseases of the respiratory system generally reaches its maximum in the first year; it is still high in the second year, falls considerably in the third, and after that becomes comparatively negligible.

TUBERCULOSIS.

As regards mortality from tuberculosis, notifications of this disease are not made everywhere on a uniform basis. It is well known that, during the first and second years of childhood, the diagnosis of tuberculosis is often difficult and cases of pulmonary tuberculosis, for example, are sometimes mistaken for broncho-pneumonia, or general tuberculosis is thought to be some minor infection. On the other hand, it sometimes happens that the doctor, for humanitarian reasons, avoids using the word "tuberculosis" and writes on the death certificate a more general diagnosis, such as "pulmonary infections", so that the death is then classed under another heading. For these reasons, the statistics of mortality from tuberculosis during the pre-school age appear to us to contain obvious errors, and need to be corrected in different countries to enable us to ascertain whether the wide divergence they show reflects the actual facts.

There is no doubt that, in all countries, tuberculosis is one of the most important causes of mortality during the pre-school age; in certain rural districts where, generally speaking, tuberculosis among young children is more frequent than in towns, it even exceeds all other causes of death.

ACCIDENTS.

It is somewhat surprising to find that, in many countries, after infectious diseases, respiratory diseases and tuberculosis, accidents cause the greatest number of deaths during the pre-school age. From 7 to 10 per cent of all cases of death between one and fifteen years of age are due to this cause. The number of accidents increases rapidly during the second year, reaches its maximum at from three to five years, and then declines gradually. Whereas the mortality rates for all other causes tend to diminish with the progress of hygiene, the number of accidents remains approximately stationary, so that this cause of mortality assumes increasing importance.

GASTRO-INTESTINAL AFFECTIONS.

The fact that gastro-intestinal affections in temperate climates occupy only the fifth place among causes of mortality during the pre-school age is the best proof of the change which has taken place in the child's physical state by the end of the first year, and indicates how different are the measures required for the protection of children of pre-school age and of infants. During the second year of life deaths from gastro-intestinal troubles are still not uncommon; but from the third year onwards, the forms of gastro-enteritis which we are still accustomed to meet with in infants claim practically no more victims. At this age, it is rather intestinal infections, such as dysentery and dysenteric colitis, which come to the fore. From the second year onwards, appendicitis also makes its appearance and is a fairly frequent cause of death during the pre-school age. It seems likely that the progress made in the hygiene of nutrition during the first period of infancy has greatly contributed to the decrease in gastro-intestinal affections as causes of mortality in the later period.

OTHER DISEASES.

Finally, the last group, in which are classed all other diseases and which comprises about one-tenth of all deaths during the pre-school age, presents a heterogeneous mixture of acute and chronic diseases, congenital malformations, tumours, constitutional troubles, etc. It includes infective diseases such as cerebro-spinal meningitis, poliomyelitis, typhoid fever, malaria, etc. It also includes syphilis; it may have appeared surprising that this disease was not mentioned earlier, but, in actual fact, its importance as a direct cause of death during the pre-school age is negligible. Acute articular rheumatism also comes into this group, generally under the heading of "diseases of the heart". In view of its importance in certain countries, notably in England and North America, where it assumes the dimensions of a real social scourge, it deserves, in our opinion, a special study, less from the point of view of mortality than from that of morbidity; for very often it is at the pre-school age that the first attacks occur which later develop into definite heart disease. A rational prophylaxis therefore should logically begin at this age.

Certain statistics also include rickets as a cause of death; but the figures which appear under this heading do not enable us to draw any conclusion as to the frequency of this affection, since rickety subjects generally die of broncho-pneumonia or other

infections and are consequently classed under other headings. A special study of the morbidity of rickets would be of the greatest interest.

This group of "other diseases" is, with that of accidents, the least influenced by the progress of hygiene. In most countries it has been stationary for years, so that it increases in relative importance in proportion as the others diminish. It also varies little with age, since it is composed of diseases the frequency of which diminishes with increasing years, like spasmophilia, and those the frequency of which increases progressively, such as acute rheumatism and chorea.

But the study of mortality gives only an incomplete idea of the state of health of a population. At the age with which we are concerned some very widespread diseases — such as chickenpox, mumps, etc. — practically never cause death and, as a consequence, do not appear in statistics of mortality, though they are of importance to the state of health and development of children and may have economic and social reactions. In the case of children living at home they may often be regarded as a mere incident, but, when they break out in a community of children, they may become a fairly serious source of trouble which has to be reckoned with.

MORBIDITY.

We are still very badly informed as to morbidity during the pre-school age. Apart from the limited amount of information provided by notifications of infectious diseases, we know nothing about the incidence of disease. It would, however, be of great value to have full information on this subject, for it is certain that even simple colds, sore-throats, etc., if they recur often, have a deleterious influence on the general condition and development of those who contract them. Even these slight indispositions should therefore be combated if the work of the hygienist is to be thorough.

In particular, morbidity from tuberculosis should be more accurately ascertained, because nothing can be learned of it from mortality statistics. It is known that infection by the Koch bacillus most frequently takes place during the pre-school age, particularly in children of the working classes. Among such infected children, one group will scarcely give any sign of infection, and without Pirquet's reaction it would be impossible to trace the infection at all. A second group will show a few transitory general symptoms, while a radiological examination will reveal signs of a lesion of the hylus. This is the most important group from the point of view of the protection of children, for these are the children who should be followed up and treated in order to prevent the spread of the disease. Finally, there are patients with obvious tubercular lesions, cases whose diagnosis is easy and who require prolonged and extensive treatment, though sometimes the infection is already too far advanced for them to be restored to health.

SOCIAL CONSIDERATIONS.

The social factors which dispose to infection during the pre-school age are primarily slum dwellings, which through lack of light and air and cleanliness reduce the power of resistance of the child's organism; and, secondly, close contact with

other children, whether in day nurseries or in the streets, which considerably multiplies the chances of contracting disease. Children who can walk live in very different social conditions from infants; they are no longer isolated, but look for playmates and thus come in touch with the outside world. There they are bound to encounter infective organisms and, if their immunity has been lowered through bad hygiene, favourable conditions for the development of disease are present. Thus, the supervision of all groups of children, and especially the improvement of their housing conditions, must be included in the programme for the protection of children of pre-school age.

CAMPAIGN AGAINST DISEASE.

To reduce the frequency and fatality of infectious diseases, which represent the principal cause of morbidity during the pre-school age, we have at our disposal three kinds of preventive measures. The object of the first is to improve the general condition of children, thereby increasing their natural immunity; the measures taken comprise a good dietary and open-air life, exposure to sunshine and artificial sources of ultra-violet rays, physical exercises, bodily cleanliness, the elimination of foci of infection, dental or pharyngeal, etc. The second includes measures which aim at reducing the risks of infection; they deal with methods of avoiding contagion by diseased or germ-carrying subjects in the home, in kindergartens and in residential institutions. The third group consists of methods of specific prophylaxis — that is to say, vaccination and inoculation. We shall discuss these various measures and endeavour particularly to arrive at an estimate of their value and of the way in which they can best be introduced into practice.

We have seen that the children who are most seriously threatened are the youngest — that is to say, those in their second and third year; thus it is on them that attention should especially be concentrated. They should be visited at home and examined at the consultation centre more frequently than those in the second half of the pre-school age.

In connection with the campaign against infectious diseases, some particularly difficult questions arise in institutions which are wholly or partly residential, where numbers of children of the same age are brought together. In places of this kind, the chances of contagion are infinitely more numerous than in the home, and are the more to be feared as the children have sometimes little power of resistance. Certain precautionary measures should always be taken to prevent infectious diseases from gaining access to such institutions; other action is necessary when, despite everything, a case occurs and the disease has to be prevented from spreading. Matters are further complicated by the fact that the measures to be taken differ according to the disease, and that it is impossible to suggest one general line of conduct.

As regards prevention by vaccination, it is not enough to make satisfactory arrangements; the method used must be made known to and accepted by the families concerned, it must be readily available for all, and steps must be taken to ensure that it is applied in good time. This involves a good deal of propaganda and organisation. Methods of passive immunisation by injections of animal or convalescents' serum only come under consideration in times of epidemics, and then principally

in institutions wholly or partly residential. The collection of stocks of convalescents' serum is also a matter requiring propaganda and organisation.

In addition to infectious diseases, there exists a series of complaints which, while not causing death, are of importance on account of the reduction in the social value of the individual which they involve; these are congenital and acquired defects, both physical and moral. We shall have to deal particularly with their ascertainment and treatment, since it is usually during the pre-school age that they become evident and are susceptible to improvement, either by medical treatment or by specialised education. It is the duty of doctors and nurses to draw parents' attention to these abnormalities right at the outset, and to impress upon public opinion the necessity of establishing institutions for the bringing up and training of such unfortunate children.

Other objects to strive for are — the prevention of rickets so as to avoid deformities or disease, the discovery of constitutional diatheses in order to correct them by appropriate measures of hygiene, and proper feeding so as to produce a hardy race. Further, efforts should be made to provide for the care of deaf-mutes, blind and crippled children in special institutions, and for the ascertainment of the mentally abnormal so as to subject them in good time to medico-pedagogical treatment. The results of this work will admittedly be expressed in terms not of a reduction of mortality, but of an improvement in the state of health and social utility of the cases treated.

NUTRITION.

It is not for us to discuss here the principles of nutrition during the pre-school age with which all doctors are familiar. At the age of one year, milk ceases to be the principal item of food and is replaced by a varied diet. In order that this diet may ensure normal growth, it must be satisfactory in quality and adequate in quantity. In particular, it must contain the different vitamins and proteins necessary to growth. From the beginning of the second year, the digestive organs of the normal child are sufficiently well developed to stand this mixed diet, provided it is presented in a form which is easily assimilated. It is therefore not so much digestion which needs watching at this age, as nutrition. In prescribing diets, the doctor must bear in mind principally the necessity of the preventing of diseases due to malnutrition — such as anæmia, scurvy, rickets, etc. — which, as everyone knows, pave the way for infections.

At the consultation centre, diet should be discussed with the mother. The doctor should give precise directions as to the number, composition and preparation of meals, especially taking into account the protein and vitaminic needs of young organisms. He will have to take a firm stand against bad habits in regard to food and the wrong ideas many people have as to the value of certain foods. He should emphasise particularly the danger of taking alcohol in any form whatever at this age. The collaboration of a trained dietician or of a nurse who has specialised in this subject, together with practical demonstrations in a kitchen adjoining the consulting room, would be of great value. The doctor's directions should be reinforced by explanations given by the nurse at the child's home. Thus, by introducing a suitable dietary, it will be easy to combat and prevent ailments of a general nature such as anorexia, constipation, anæmia, eczema, etc., and to raise the child's capacity

to resist disease. It is permissible for the doctor at these consultations to prescribe certain tonics or anti-rachitic preparations which should be regarded as preventive rather than curative measures.

In the case of children obviously under-nourished or unsuitably nourished, extra food should be given gratis either in the form of entire meals served daily at a public kitchen or in connection with day nursery classes, or by means of food coupons.

In day nurseries and residential institutions, the diet should be carefully controlled and constantly inspected by the doctor in charge, both as regards quantity and quality.

THE CARE OF TEETH.

The teeth of children should be regularly inspected both at the consultation centre and in day nurseries and nursery classes. The importance of the care which should be given to temporary teeth is still far from being understood by the majority of parents; there are even now doctors and dentists who are unaware of the baneful effects decayed teeth and dental suppuration may have on the general state of children's health. Active propaganda is required to induce parents to take their children regularly to the dentist, and to make them understand that temporary teeth should be treated as soon as the least sign of decay appears, and not only the permanent teeth. Many cases of anorexia, malnutrition and infection may be speedily improved by simple attention to the teeth. As soon as the first teeth appear, daily brushing of the teeth morning and evening is to be recommended as a means of securing dental hygiene.

A dental department should be associated with every consultation centre for children of pre-school age, as well as with the large institutions which take these children. A quarantine station, such as the *Kinderübernahmestelle* in Vienna, is the kind of place where children who are to be admitted to residential institutions or boarded out in the country may with advantage have their teeth examined and, if necessary, treated. Pending the establishment of these special dental departments, the service of the school dental clinics already in existence in many large towns might be made available also for children of pre-school age.

GENERAL HYGIENE (LIGHT, FRESH AIR, CLEANLINESS).

A child's capacity to resist disease is influenced by certain physical agents even more than by diet, such, for example, as *sunlight (natural and artificial), the usual temperature it lives in, the purity of the air, etc., as well as by exercise, and by bodily cleanliness*. The necessity of ensuring that the child obtains the requisite number of hours of rest and sleep must be insisted upon. The doctor and the nurse should educate parents and children in such matters by placing great emphasis on the importance of these measures of general hygiene which are neglected even by many educated parents. It is those very infectious diseases which do the most damage during the pre-school age which are fostered by a lack of sunlight. The best means of preventing them consists in allowing children to live as far as possible in the sunshine and open air.

Open-air life is a difficult problem in large towns; public gardens and places where children can play are too few, and are often badly equipped for children's games. A demand should be put forward that, in town planning, more thought should be given to the needs of the children, and playgrounds laid out near the populous quarters and away from the traffic.

During the fine warm weather, parents are recommended to take their children out of doors as much as possible and to clothe them lightly. Nursery schools and day-nurseries should set a good example by letting the children play outside whenever the weather permits. Country homes, similar to the holiday camps for school children, should be established for children of pre-school age, so that, for a few weeks in each year, those in need could be taken away from the narrow streets and unhealthy dwellings of the towns. The ordinary sun bath, taken either at home, if its situation makes this possible, or in a place specially equipped, should become a regular habit; during the pre-school age, it is an excellent prophylactic measure.

In bad weather, when cold, rain and fog compel children to remain indoors, treatment by artificial sunlight may to some extent replace sun baths. This artificial heliotherapy must be systematically organised so that all young children, whether infants or children of pre-school age, may profit by it. The treatment centres should preferably be attached to consultation centres, where their work would be controlled by the doctor. Residential institutions, day-nurseries and even nursery schools should, when necessary, be equipped with ultra-violet lamps to be used as required.

As regards sources of artificial sunlight, carbon arc lamps or quartz mercury-vapour lamps may be employed. Modern installations are often equipped with several lamps grouped round a playroom where the children are collected. Two short exposures weekly are sufficient to remedy any lack of sunlight, but they should be continued regularly from October to April.

Bodily cleanliness is likewise an important requirement for good health. The doctor and especially the nurse should insist on the necessity of bathing children regularly. A daily bath or a shower is as desirable for children of pre-school age as it is for infants. Children in day-nurseries are bathed each morning on arrival. Nursery schools should be equipped with shower baths where children can make a complete toilet every day.

The examination of the skin and scalp for parasites should be carried out by the nurse. Children attacked by phthyriasis and itch should be treated at the same time as other members of the family.

CHRONIC INFECTIONS.

If the child's power of resistance to disease is to be maintained, it must not be weakened by chronic infection. Enlarged tonsils and adenoids, apart from the physical and intellectual backwardness which they entail, frequently give rise to an exceptional susceptibility to all kinds of diseases; the same applies to dental suppurations, the ill-effects of which on the state of health have already been mentioned. Consequently, the doctor should systematically inspect the child's naso-pharynx, so as to be able to discover in time any chronic infection or obstruction of the respiratory passages which requires attention. It is often observed that a child,

after it has had its adenoids or tonsils removed, seems completely transformed, but it should not be concluded from this that such operations can usefully be performed on all children. The doctor must use his discretion in every case.

PHYSICAL EDUCATION.

Finally, the question of physical education should be of special interest to all doctors and nurses responsible for the rearing of children of pre-school age. It is at this period of life that suitable exercise is absolutely essential to ensure the harmonious development of the body. The physical exercise which children of this age can properly undertake consists principally in games, walking, running, round dances and movement of the limbs and the trunk; they should be chosen so as to strengthen under-developed groups of muscles and to increase the breathing capacity. Regular lessons in physical education should be included in the programme of the nursery school. In addition, special courses should be organised for under-developed children selected by the doctor. The doctor should indicate broadly the type of exercises to be carried out, but the technical direction of the course should be entrusted to specially trained nurses or gymnastic teachers.

ACUTE INFECTIONS.

In the campaign against infection proper, a distinction should be made between the methods of "prevention" to be used when there is no immediate danger of contagion, and the protective measures to be taken when a case of contagious disease occurs in a family or group of children. The former methods consist principally of vaccinations, and the latter of isolation, disinfection and inoculation with serum. These prophylactic measures are naturally different for each disease and vary in their application according to whether the children are at home or in a day-nursery or a residential institution. We propose to examine in turn those which are of value in combating infectious diseases which are of greatest importance during the pre-school age, and we shall discuss how they may be applied in the various contingencies which may arise.

Diphtheria.

The problem of immunisation against diphtheria has now been satisfactorily solved. In formol toxoid (anatoxin) we now possess a completely harmless vaccine which gives immunity in 98 per cent of cases when injected three times. In employing this vaccine, the directions given by the Committee of Experts on Immunisation against Diphtheria (London, June 1931) should be followed.

The best age for anti-diphtheritic vaccination is the beginning of the second year, but, if the child has not been vaccinated at this age, it can be vaccinated at any other period later in life. It is unnecessary to submit subjects to Schick's test beforehand. There is practically no contra-indication to this vaccination.

The method recommended is subcutaneous injection. Where it is impossible to employ the subcutaneous method, the nasal passages may be used. The vaccination should comprise three injections. It is recommended that the intervals between

the injections should be three weeks between the first and second, and at least two weeks between the second and third.

The immunity conferred by formol toxoid (anatoxin) becomes established fairly quickly. Three injections are sufficient to confer practically certain immunity on all vaccinated subjects in six weeks or two months at the latest. This immunity, moreover, appears to be lasting, and there is no necessity to repeat the vaccination during childhood.

It is desirable for all children to be submitted to anti-diphtheritic vaccination between the ages of one and two. If this is not made obligatory, an active propaganda should be organised to induce the maximum possible number of persons to take advantage of the facilities offered. It would be useful to arrange for free vaccination to be given once a year by all local authorities. Doctors, especially, should recommend the method and use it both in family practice and in institutions where many children are in close contact with one another. Henceforth, it should be carried out systematically in all communities of children. It should be easy to make it a compulsory condition of admittance to day-nurseries, nursery schools, holiday camps, preventoria, etc.

During an epidemic, when unvaccinated persons have to be protected urgently, prophylaxis by the formol toxoid (anatoxin) method is not sufficient, on account of its relative slowness of immunisation. It is then possible to resort to preventive inoculation with serum. After applying Schick's test, receptive subjects should be inoculated with anti-diphtheria serum, preferably in the form of purified serum. The serum injection may be followed by a formol toxoid (anatoxin) vaccination. There would not appear to be any fear of sensitisation, from the vaccination during the first few days.

Where groups of children are concerned, in cases where complete and competent bacteriological control can be secured, it would be as well, at the same time, to search for carriers of virulent germs with a view to isolation and treatment.

Scarlet Fever.

The methods of prophylaxis against scarlet fever have not yet been brought to perfection in the same way as those against diphtheria; neither anti-scarlet-fever vaccine nor anti-scarlet-fever serum has proved sufficiently efficacious to be recommended for general use. The results obtained from vaccination with Dick's toxin are obviously encouraging and experiments might well be continued on a large scale.

The anti-scarlet-fever serum prepared by the Dick or the Dochez processes has an undoubted therapeutic value in serious cases; on the other hand, its prophylactic value is still disputed.

Favourable preventive results have also been obtained with convalescents' serum:

Dick's reaction may be of value in tracing susceptible subjects, with a view to their immunisation. Its practical utility is the same as that of Schick's test for diphtheria. However, Dick's reaction appears to be less reliable and often more difficult to interpret than Schick's test.

The examination of the throat for streptococci may have a certain value in tracing germ carriers. At the present time we have no means of determining the period of infectiousness in scarlet fever convalescents.

Measles.

Actually the only effective, practical and harmless method of combating measles is by sero-prophylaxis. The technique has been perfected by Deckwitz in Germany and Debré in France. We shall follow the directions given by Debré for its application to large groups of children and families.

For collective application, sero-prophylaxis needs to be well organised. Special laboratories attached to children's hospitals and hospitals for infectious diseases should be set up to collect the blood and to prepare, preserve and distribute the serum. Serum should be taken primarily from adults and children of over ten years of age. They should be definitely convalescent from measles without complications and in good general health. Particular care should be taken to see that they are free from syphilis, tuberculosis and malaria. The best time to take the blood is between the seventh and twelfth days following defervescence. The sero-diagnostic test for syphilis should be applied to each batch of serum; moreover, as a further precaution, this may be heated on two successive days to a temperature of 56°C. or an antiseptic may be added. Each tube should be proved sterile, and then several sera (from three to five) mixed together. If kept in a refrigerator, the serum will maintain its activity for at least two years.

The prophylaxis of measles may be achieved either by sero-prevention or by sero-attenuation. The serum should be injected as soon as possible, if absolute prevention is desired; or, on the sixth, seventh, or, if necessary, even the eighth day of incubation, if sero-attenuation is the aim. The doses should be one cubic centimetre for each age-year, with a minimum of three cubic centimetres up to three years, and, from fifteen years onwards, a maximum of from fifteen to twenty cubic centimetres according to the weight of the patient.

With a slightly different technique, sero-prophylaxis can also be carried out by the family doctor without the help of a laboratory; but in that case it is based on the use of sera or the whole blood of adults or older children who have been attacked by measles a long time before; generally the parents' blood should be used. In order to obtain the same result as with convalescents' serum, the doses previously mentioned should be quadrupled if using serum, and again doubled if injecting whole blood.

The sero-prophylaxis of measles is at present still restricted by the difficulty of obtaining sufficient quantities of convalescents' serum; in order to overcome this handicap, the anti-measles serological centres should be well organised and donors of serum should be remunerated if necessary. Experiments at present being undertaken have been successful in obtaining a considerable increase in the proportion of antibodies in the blood of former measles patients by injecting the blood of actual measles patients; it is possible that, by this process, we may eventually succeed in procuring large quantities of highly active anti-measles serum.

The indications for anti-measles sero-prophylaxis are many. All children exposed to contact with measles in places where many children are brought together

should have the benefit of it. As soon as a case of measles occurs in a day-nursery, a residential institution or hospital ward, all other children there should immediately be inoculated with convalescents' serum. Among private patients, sero-prophylaxis should be restricted to children under two years old, as above this age measles is generally harmless in towns. Measles may become serious, however, in delicate, rickety or tubercular children, in those suffering from diphtheria or whooping-cough, or convalescent from an affection of the respiratory organs. In all these cases, it would be of advantage to avoid or mitigate measles, or to secure a mild attack, by a preventive injection of convalescents' serum.

Whooping-Cough.

Of all the infectious diseases of pre-school age, whooping-cough is the one against which we are most helpless. Its prevention by means of convalescents' serum has yielded, under Debré, some good results, but it has been impracticable to adopt this method generally.

Anti-whooping-cough vaccination has been attempted in various countries. The vaccine generally used is prepared with pure cultures of Bordet-Gengou bacilli; sometimes mixed vaccines have been used, comprising in addition to the Bordet-Gengou bacillus, staphylococci, pneumococci and Pfeiffer's bacillus. Opinion is divided as to the efficacy of these vaccines. It is certain that they are incapable of conferring any long-period immunity; even when given right at the beginning of the period of incubation, they do not always prevent the disease from developing. It seems that their action is curative rather than preventive. It would be as well therefore to use them as soon as possible when a child is infected, but vaccination should never supplant other protective measures, such as the isolation of patients and suspects.

The discovery of the whooping-cough bacillus has enabled a study to be made of the infectiousness of this disease, and the measures to be taken to avoid infection can be accurately defined. In some countries, the presence of the bacillus has been of assistance in enabling the disease to be detected in its earliest stages and thus in protecting numbers of children. It has been possible, through identifying the bacillus, to show that patients are particularly infectious during the catarrhal stage, and that the organisms decrease in number rapidly during the stage of coughing and disappear entirely after the fifth week of coughing. It is, therefore, especially desirable to isolate patients at the catarrhal stage. In communities of children every child who coughs in a suspicious manner should be isolated. It is advisable, in theory, to admit such children to hospital to prevent them from spreading the infection to others. For this purpose, however, it would be necessary to have available special whooping-cough departments sufficiently extensive to receive, not only definite cases, but also suspect cases for prophylactic treatment and for social reasons.

The prophylaxis of whooping-cough deserves greater attention from doctors than it has hitherto received, for it is an affection which is important during the pre-school age both from the point of view of mortality and morbidity, and of which the frequency has diminished very little in the past ten years.

Other Acute Infections.

Among other infectious diseases of importance during the pre-school age should be mentioned, first of all, *influenza*. This ill-defined complaint is in part responsible for the mortality from pneumonia and broncho-pneumonia. At present we have no specific means of prophylaxis against influenza. Only general health measures which strengthen the resistance of the child to disease and diminish the risk of infection are likely to have much influence upon the morbidity and mortality due to this disease. Naso-pharyngeal vaccination and disinfection have proved of little value as preventives.

Smallpox,¹ thanks to Jenner's vaccination, no longer counts among causes of death during the pre-school age, but it should not be assumed that this danger has necessarily been warded off once and for all and that vaccination can now be neglected. The mild epidemics which sometimes occur in countries where vaccination is not strictly enforced prove that the risk of infection is always knocking at the door. Systematic vaccination for smallpox during the first year should therefore be maintained. Cases of post-vaccinal encephalitis, always of rare occurrence, are practically unknown if vaccination is performed in the first two years of life.

In certain areas, or at certain periods, it may be advisable to protect children against *typhoid fever*, dysentery and malaria. In this case, in addition to general health measures, which present no particular features in the pre-school age, the methods of specified prophylaxis employed for adults (vaccination, immunisation) may be utilised from the second year onwards.

CHRONIC INFECTIONS.

Tuberculosis.

The campaign against tuberculosis in the pre-school age is so closely bound up with the measures taken for the control of tuberculosis in general that it would be absurd to think of setting up a special organisation for the pre-school child. Prophylactic measures for the child of from one to six are, in fact, based on the same principles as those for the infant and the schoolchild, and, even if there are certain differences as to the details of application, that is no reason for departing from a centralised administration which has obvious advantages from many points of view.

Anti-tuberculous measures in the pre-school age should include : (1) the prompt detection of children who have active disease or merely latent infection ; (2) the removal of a child from contact with tubercular patients whether in the family or elsewhere, and (3) a strengthening of the power of resistance of children who are infected or threatened with the disease. As regards the detection of infected subjects, a systematic tuberculin test once a year of all children aged from one to five attending consultation centres and day-nurseries has proved such a valuable method that it would perhaps be desirable to make its adoption more general. Children with a positive skin reaction should be X-rayed, and an investigation made at their homes will show whether there is a source of contagion in the family and whether these children ought to be removed. These children should be watched over with particular care and should be the first to receive the benefit of organisations designed to

¹ See also document C.H.739.

strengthen bodily health and resistance to disease, such as preventoria, open-air schools, holiday camps, etc. The possibility of infection from the milk of tuberculous cows must be taken into consideration in certain areas, and such risk should be combated by a proper control of the milk.

Close co-operation between the consultation centre for children of pre-school age and the tuberculosis dispensary is therefore essential. This co-operation may be effected in two ways. On the one hand, the doctor and the nurse of the children's consultation centre should report to the dispensary all cases recognised as definitely or potentially tuberculous, with a request that the necessary investigations should be made to trace the source of infection, and that, if required, measures should be taken to avoid further spread of infection. On the other hand the dispensary medical officer should send the children of tuberculous parents to the pre-school consultation centre for general examination and an opinion as regards treatment. Children should only be sent to open-air sanatoria or special institutions after a joint report from the two centres.

In order that the campaign against tuberculosis among children of pre-school age may be carried out effectively, the centre responsible for examination must be in touch with suitable institutions for the reception of different classes of children. Healthy children of more than three years of age, who are at home in danger of infection may properly be entrusted to an institution or a voluntary organisation which, like the Grancher organisation in France, arranges to board them out with healthy families in the country and to supervise them systematically afterwards. Those children who have not reached the age of three may be sent to resident nurseries. Children showing slight enlargement of the glands, etc., should be sent each year, for a few weeks or months, to an open-air school or a convalescent home. These institutions may be situated in the neighbourhood of towns, in an open space or near a forest; in some of them, children are only admitted during the day-time and return to their parents at night. For more serious cases, with definite pulmonary or osseous disease, sanatoria are required situated in suitable climatic conditions, either by the sea or in the mountains. Cases of active pulmonary tuberculosis should always be treated separately from the others. Certain countries already possess all types of these institutions for children of school age. It is most desirable, however, that children aged from one to five years should also be able to share these advantages, and they should be placed either in special departments attached to already existing open-air homes or sanatoria, or in new institutions specially established.

Syphilis.

The campaign against syphilis is not as important in connection with the welfare of the child of pre-school age as it is for the protection of the pregnant woman and the infant. As a general rule, syphilis will be discovered at the maternity and infant consultation centre during the first months of life. After the first year, therefore, all that is necessary is to continue the treatment already begun and to ascertain, by clinical and serological examination, whether a final cure has been achieved. Certain attenuated forms of syphilis, however, only appear during the pre-school age, manifesting themselves by defects of nutrition, by endocrine disturbances or physical and mental backwardness. With affections of this kind, the doctor at the

consultation centre should always carefully enquire whether there is any syphilis in the family and, if necessary, submit the child to a special examination.

Investigation for syphilis should be systematically carried out, in institutions where abnormal children are cared for (blind, deaf-mute, crippled, backward or feeble-minded). Here a serological examination on the admission of each case should be the usual rule.

Rheumatic Manifestations.

The problem of the prevention of acute rheumatism which, despite its name, is usually an essentially chronic disease, is of particular interest in certain countries, notably in England and North America. A good many patients who die between the ages of ten and fifteen from cardiac lesions of rheumatic origin have had their first attack — often unrecognised — during the pre-school period; this, therefore, is the period of life when an endeavour should be made to apply prophylactic measures. At present, we have no effective means of preventive treatment, either serum or vaccine, but certain measures of general hygiene seem to diminish the risks of contracting the disease, and to prevent, to a certain extent, persons who have had one attack from incurring a second. Where possible, rheumatic children should be removed from the neighbourhood where they have acquired the infection to good hygienic conditions, preferably to a special sanatorium situated in a mild and sunny climate. Thus, in areas where articular rheumatism is very widespread, hospital schools should be established for these patients, where a cure designed to strengthen their health could be arranged for similar to that applied to tuberculous cases. These schools should also undertake the education of patients, and the training of cases suffering from heart disease for suitable occupations.

The removal of enlarged adenoids and tonsils may be recommended as a means of preventing the onset of rheumatic lesions or a recurrence of the complaint.

It appears indispensable that all measures for the prevention of acute and chronic infectious diseases, including notification, vaccination and serum-prophylaxis, should be directed by a Department for Infectious Diseases, attached to the Central Public Health Service, which should co-ordinate the work of all the regional branches engaged in this field, and collaborate with the Child Health Department as far as infectious diseases of young children are concerned.

PHYSICALLY ABNORMAL CHILDREN.

The pre-school age is a period during which numerous congenital or constitutional defects, inherited pathological peculiarities and troubles affecting growth become apparent and require treatment. Consequently, the doctor in charge of the consultation centre should keep a careful look-out for such abnormalities so as to be able to take any necessary steps in good time, and advise parents as to the education and, if necessary, the residential treatment of abnormal children.

First of all, there are disturbances affecting growth which may be of endocrine, nutritional, infective or other origin; they should be easily discovered by means of regular measurements. Each child should have his anthropometric chart recording all measurements taken since birth. Abnormal children should be referred to a consultation centre or sent to a hospital for further examination and treatment.

It would also be useful to detect at this age different types of constitutional defect, including the nervous or "lymphatic" child. By advice on diet or hygiene, it should often be easy to improve the condition of these children. Occasionally it will be found necessary to remove them from the family circle and place them for a time in convalescent homes, open air institutions or holiday camps.

This is also the age at which the special education of crippled children should begin. Their number is relatively high.

Cases with deformities of the limbs should be submitted as soon as possible to orthopædic treatment followed by special education so as to obtain the maximum use from crippled limbs. This treatment can only be given in properly equipped special institutions. Since children may be obliged to remain for months and even years, their education must be cared for and suitable teaching provided. These institutions may be situated in the neighbourhood of large towns, but should have plenty of space and sunshine. They should have orthopædic consultation centres associated with them, fitted with the necessary mechanical equipment for the benefit of crippled children who live with their families; they should also provide suitable remedial treatment for the sequelæ of poliomyelitis.

Children presenting visual abnormalities or ocular lesions should be referred by the doctor of the consultation centre to an oculist or an ophthalmological clinic. Refraction troubles frequently become apparent in nursery schools; consequently the staff should watch for them and report suspected cases to the doctor. Blind children may be sent after their second year to a special school for the blind, where they will be educated and trained by suitable methods.

The deaf-mute child likewise has a claim to the special attention of the medical officers. It is wrong to suppose that deaf-mutes should not be put in charge of specialised teachers until about the age of seven or eight. Actually these children are ready for medico-pedagogical treatment from their third year. At this age, pedagogical receptivity is high; consequently, it is desirable to take advantage of this favourable condition as early as possible, in order to impart fairly rapidly the first elements of the vocabulary of lip-reading and speech.

The education of deaf-mutes is nowadays carried out to a large extent in residential institutions; but where circumstances permit, a child should enjoy the advantage of remaining in his natural surroundings and attending the nursery school or the special school each day. He will thus be enabled to play with children who can hear and to profit by the continual instruction in the family circle. Many deaf-mute children retain traces of their hearing power; an endeavour should be made to develop this methodically, since, if they can manage to differentiate between voice sounds and to mark intonations, they will speak much better.

In addition to institutions for deaf-mutes, it would be of advantage to have special nursery schools for young children who, though not completely deaf, are hard of hearing, and have difficulty in following the ordinary courses. Finally, a special school should be provided for children who are both deaf-mute and blind.

The examination of the hearing and the detection of diseases of the ear should be carried out by a specialist collaborating with the doctor in charge of the consultation centre, or appointed to visit the day-nurseries and nursery schools. He should also be responsible for the supervision of children who are sent to schools for deaf-mutes.

MENTALLY ABNORMAL CHILDREN.

In the promotion of infant welfare, mental hygiene is a necessary complement to the prevention of physical disease, and an integral part of the duties of the physician entrusted with the supervision of children. The latter must therefore fit himself for this task by an extensive study of child psychology and child psychiatry. He should not allow himself to be supplanted in this field by the teacher who is beginning to take a great interest in the abnormalities of childhood, and who, at the present time, shows some tendency to take over this branch of educational hygiene. The study of abnormal childhood should undoubtedly be regarded as a branch of infantile pathology, just as psychiatry has always been a branch of medicine. The discovery and careful examination of the abnormal child, both physical and mental, is the business of the physician; the education, manual and vocational training are the business of the school-teacher. Close co-operation between doctor and teacher should clearly be the rule, and will be of material advantage at every stage of the work.

The number of children in need of special medico-pedagogic treatment is comparatively large. Duty and humanity alike should lead the State to take an interest in such children, and to educate them as far as possible to become useful members of society.

This work involves : (1) the ascertainment of abnormal children ; (2) their classification ; (3) education in special schools, either day or residential ; (4) the provision of an environment most likely to develop and utilise existing capacities. The work should begin in the pre-school age, the case being diagnosed at the centre by the physician who has had charge of the child from birth. A few simple tests will enable him to form an approximate idea of the degree of backwardness. Once a child is recognised as mentally deficient, he should be sent to a mental health centre where a complete examination of the mental state should be made by a specialist. A visit to the child's home should then be made by the health visitor ; the specialist, after consultation with the teacher in charge of backward children, should then refer the child to whatever school or institution seems to be most appropriate to the case.

Feeble-minded children need specially adopted methods of education ; during the pre-school age in a specialised nursery class, and during school age in a special school. In these institutions, the backward children of a whole town or of one or more districts should be brought together. The curriculum should comprise special educational methods, with a minimum of intellectual work and a maximum number of hours devoted to manual work and physical education and welfare. Children educated in day-schools continue to live with their families : but idiots and imbeciles should be placed in residential institutions, which are preferable to day-schools inasmuch as they remove the child from his family surroundings and enable him to be given medical, educational, moral and social care of a more specialised nature. It is better not to wait until school age is reached before placing such children in residential institutions, but, when practicable, to remove them from their families in the third or fourth year.

As regards high-grade defectives, excellent results have been obtained in recent years by placing children in families in the country, or in colonies run on family lines. Decroly is of opinion that " in order to educate the abnormal child for his future life,

he should be placed in surroundings which will stimulate and encourage those qualities which will enable him to adapt himself to the future circumstances of his adult life". He considers that, so far as physical surroundings are concerned, the ideal conditions are to be found in an agricultural estate, while the ideal social atmosphere is provided by a normal family in a rural district. In his view, institutional treatment can never hope to obtain results comparable to those secured by boarding-out with families, and, for these reasons, Decroly considers that institutions should only be regarded as a "threshold" to the farm colony, and a means of temporary training for cases which are too difficult or too dangerous for adoption by families.

PREVENTIVE MEASURES.

Effective supervision of children of pre-school age can only be secured by keeping in touch with them through regular physical examination, by closely following their development, by a knowledge of their home surroundings and by power to influence or modify the home conditions when necessary. As with infants, the best means of keeping in touch with children living at home are, first, the centre and, secondly, regular visits to the home, to which reference has been made in previous chapters. In places where considerable numbers of children are brought together — *i.e.*, in institutions such as residential nurseries, orphanages, etc., and in institutions of a non-residential character, such as day-nurseries, nursery schools, kindergartens, etc. — special supervision is necessary.

CONSULTATION CENTRES.

The object of these centres is the supervision of children living at home or boarded out, the giving of advice to mothers, the detection of abnormalities and of diseases, the reference to the appropriate institutions of those in need of special treatment, and the employment of every available method of preventive treatment.

Centres for the pre-school child are organised and managed on the same lines as infant welfare centres. They are under the charge of a specially qualified doctor with one or more visiting nurses to assist him. For reasons of health, pre-school centres are better separated from infant welfare centres; in any case, consultations should take place on different days or hours, in order to avoid that risk of infection for infants which is always to be feared in crowded waiting-rooms, where children with colds are continually moving about. In actual practice, however, this policy of separation has nearly always failed. Mothers with several children will usually bring only the youngest child, and will not come for advice about their older children. The abandonment of separate centres for the pre-school child, which is so much deplored, is very largely due to the lack of time at the disposal of the mothers, and to the difficulties and expense of transport; visits to the centre should therefore be made as easy as possible for the mothers, particularly in order to enable them to arrange for the examination of the pre-school child at the same time as the infant. It is not practicable to provide centres exclusively for children over one year old, except where the area served is limited, as for example where all the families under supervision dwell in the same block of buildings or within a very small district, where mothers can attend without losing much time.

It is difficult to make most mothers understand the usefulness of regular examination for children of more than one year of age. They are quite ready to ask advice as to the management of an infant, but, once the child can walk, they are apt to think that special care is no longer necessary. In this matter, propaganda and education are much needed. We should aim at the examination of every child of two years old at least once in four or six weeks; later on, the intervals can be longer.

We do not recommend the grant of a bonus to encourage visits to centres, but it might be possible in certain cases to refund travelling expenses to poor mothers who come from some distance, as both the cost and difficulty of travelling are greater with children from two to five years of age than with an infant. The relief and allowances which certain families receive from the State or the municipality might with advantage be made payable at the centre, in order to oblige mothers to bring the children there. In a few exceptional cases, gifts in kind might perhaps be given, but the aim should always be to assist and advise and not to reward.

Consultation centres for the pre-school child and infant welfare centres in the same district are parts of a single organisation, and, whether consultations are held simultaneously for both classes of children, or at different times, they should be in charge of the same medical officer and the same nurses. It is of considerable advantage for the doctor to see children from birth, and to follow their development as long as possible, as he is thus able to become much better acquainted with their constitution and history than if he had only seen them after the first year. It might even be of advantage to entrust him with the school medical supervision of his district in order that the welfare measures for all the children should be in the same hands. This system of centralisation may be difficult to achieve in large towns, but it might well be introduced in smaller towns and in the country, where it could be applied without difficulty. The task of the doctor who is responsible for the welfare of all children clearly becomes very arduous. He will not be able to undertake any considerable private practice in addition to his work as medical officer; he should therefore receive a salary sufficient to enable him to devote himself entirely to his task.

The aim of centres for the pre-school child is the study of the development of the young child and the prevention of disease. The doctor should therefore watch over the state of health of each child: he should endeavour by all possible means to detect any abnormality or chronic disease, and to follow the child's physical and mental development. He should also advise the parents on questions of diet, personal and general hygiene, and the prevention of infectious disease. In certain circumstances, he will be in a position to apply preventive measures, such as ultra-violet-ray treatment, vaccination, etc., but, as a general rule he should abstain from treatment and should send children found to be ill or abnormal to the family doctor or to the hospital.

The equipment of the centres need not be elaborate, but should include, in connection with the waiting-room and the consulting-room, two or three isolation cubicles for infectious cases such as measles in the catarrhal stage, or children with chicken-pox rash or diphtheritic sore-throat. On arrival, the children should be examined by the nurse for any sign of infectious disease, and all suspects should be isolated until the arrival of the medical officer. Some modern clinics have been provided with cubicles where the mother and her children are isolated by means of

glass partitions : but isolation is more difficult to secure with children of this age than in the case of infants, and it is found that, in spite of theoretically perfect arrangements, infection may still be spread at the time of the consultation. In order to reduce this risk to the minimum, care should be taken to avoid too great a number of children being together at the same time. For this reason, consultations should be held at frequent intervals ; an average of about thirty examinations during a session of two to three hours should enable the medical officer to make a thorough investigation and to form some idea of the mentality of the mother and the temperament of the child. Consultations by appointment are to be recommended in order to avoid overcrowding.

If possible, the centre should have attached to it an artificial sunlight clinic, where, on the prescription of the physician, light baths could be given to children at certain hours.

Case-records should be kept for children, as for infants. Each child should have his individual record, which should be a continuation of that of his first year, and in which illnesses and vaccinations should be noted at regular intervals. This individual record should follow the child if he leaves the district, and should be forwarded to the school medical officer at the end of the pre-school period.

It is often found necessary to supplement the general examination made at the consultation centre by a special otological, ophthalmological, radiological or other examination. For radiological examinations and for everything connected with the prevention of tuberculosis, a close co-operation should be maintained with the tuberculosis dispensary, which should be communicated with when a case of tuberculosis is discovered in a family. The tuberculosis dispensary should be responsible for any enquiries of a medico-social nature and for any further steps required to secure the isolation of the infective patient or the boarding-out of the children.

The centre should keep in close touch with school dental clinics and with local dentists, to encourage them to take more interest than they do at present in children between the ages of two and six. It might even be of advantage to set up special dental clinics, attached to the centres, for children between those ages.

The mental condition of the child requires as close supervision as his physical health. The physician should therefore have some knowledge of child psychology and psychiatry, and should be able, with the help of suitable tests, to ascertain the state of the child's intellectual development. He should endeavour to detect as early as possible any abnormal cases, which should be passed on to the mental health centres for classification.

Lastly, one of the most important tasks of the centre for the pre-school child is the organisation of preventive vaccination. The doctor attached to the centre, being in constant touch with the families, is better able than a strange vaccination officer to carry out the necessary propaganda and to decide which children should be vaccinated. The medical profession is not everywhere in favour of arrangements for vaccination at welfare centres, but the advantages of such centralisation are obvious and, if the relation between the private practitioner and his patient is duly respected, it will probably be generally recognised that vaccination may properly be regarded as part of the preventive work of the centre.

We have mentioned the various forms of vaccination now available for general application; their number is still very limited, but it is probable that, in the next few years, considerable progress involving new technique will be made in this field. The physician should therefore keep himself acquainted with the developments of this branch of preventive medicine and be ready to employ new methods when their usefulness has been proved.

The concentration of vaccination during certain periods of the year has considerable advantages. In order to avoid too great overcrowding at the centre during such periods, it would be advisable to arrange for vaccination to be performed apart from the usual consultation hours.

Medical work carried on at a centre is incomplete without house-to-house visits by the health visitor. Experience has shown that, without following-up by a visiting nurse, attendance at a centre is of little value and is soon given up; regular visits to the homes are essential to the success of child welfare work. We shall deal later with the duties of visiting nurses.

INSTITUTIONS FOR CHILDREN.

A child of pre-school age has a natural desire for active movement, and for this he requires ample space. Normal growth depends on the amount of sun and open air which are available, and all buildings and institutions for children of this age should be adapted to these requirements. As a little child is clumsy and is unaware of danger, everything likely to cause accidents should be avoided in internal equipment.

Housing.

The ideal dwelling for a child of pre-school age is a one-family cottage surrounded by a small garden. There he has the sun, air and space which are needed. The hygienic and moral benefits of this type of accommodation cannot be too strongly urged. Unfortunately, for reasons of economy, in all large cities, tenement houses are now being built in which the interests of children are not adequately safeguarded. At least there should be playgrounds near these great buildings. In the flats themselves wide bay-windows and balconies exposed to the sun should allow children to be placed in the sun all the year round. The children's room should always be the airiest in the apartment.

Care should be taken that the doors of the building do not open on to busy streets where the children would run the risk of accidents.

Day-Nurseries, Nursery Schools, Nursery Classes.

The need for accommodation for children away from home during the day is a problem which arises more frequently now than in the past. As the number of women who go out to work increases, there is a corresponding need for providing institutions to look after children during working-hours. These institutions require special organisation from the point of view of health because of the great danger of infection involved in bringing together large numbers of children, particularly since they spend the night under the most varied conditions. Day-nurseries or the nursery school may become an excellent means of health education and training for both

mothers and children, and provided they are well conducted, they exercise a wholesome influence on the physical and moral development of the children in their care. But, if badly equipped and staffed, they may also become centres of dangerous infection and be instrumental in spreading epidemic disease.

Socially these institutions prevent the complete separation of mother and child when, for any reason, the mother cannot look after her child at home. If, instead of being boarded out, the child returns home every evening and every Sunday, the mother grows fond of it and will be increasingly reluctant to be separated from it. Moreover, the child will be under the beneficial influence of ordinary family life, which is important.

The simplest form of day-nursery is one in which a woman takes into her house one or more children during the day-time, looks after them and feeds them until the mother takes them away. Usually a small payment is made which allows the woman to cover her expenses and even to make a profit. One advantage of this system is that the risk of infection is less than in large institutions, because of the small number of children brought together. Its great drawback, however, is that it is usually not subject to any medical supervision, so that the hygienic conditions under which the children live may leave a great deal to be desired, and the children may run the risk of personal infection, for instance by a woman suffering from tuberculosis. Any person regularly entrusted with the care of one or more children, even if only for a few hours, should be compelled to apply for a permit to take them which should not be granted until she has been medically examined and her house inspected, as is usually done when infants are boarded out.

Day-nurseries are bound to bring together a number of children from different environments and thus afford numerous opportunities for the spread of infection. Experience has shown that these institutions, particularly if they do not fulfil every hygienic condition, may be a constant source of infection and even of epidemics. In some places, people have even gone to the length of demanding the abolition of day-nurseries because of their high morbidity and mortality rate. Others regard them as a necessary evil, and suggest that they should be used as little as possible. We, on the other hand, believe that they should be increased in number where required, but that their efficiency should be improved. Provided certain conditions are observed, the risk of infection can be easily controlled and the incidence considerably reduced.

In most large cities, the accommodation available in day-nurseries is totally inadequate for the needs. Under these conditions, the existing day-nurseries naturally tend to admit more children than they should, and overcrowding is conducive to the spreading of epidemics. The number of places available in day-nurseries and nursery schools should be sufficient to meet all reasonable needs. The proportion of young children requiring accommodation is difficult to estimate, for it varies a great deal according to the occupations and economic position of the local population. But, although it is not possible to suggest an exact figure, it may be said that, at the present time, the number of places available is entirely inadequate almost everywhere.

One of the first conditions for improving the health in day-nurseries is accordingly to limit the number of children admitted. Large day-nurseries having fifty, eighty or even a hundred children in one building may be a great potential danger.

Decentralisation should be aimed at as much as practicable. The ideal would be to have numerous small nurseries, accommodating some fifteen or twenty children, situated in all parts of the town near working-class districts.

If, for reasons of economy, large day-nurseries are unavoidable, they should at least be subdivided, so that there should not be more than fifteen or twenty children in each group. These subdivisions should be, as far as possible, independent of each other; they should have their own admission room, bathroom, W.C.s, playroom, dormitory, and fenced-in garden. Only the kitchen, laundry, administration and isolation accommodation may be common to them all.

The accommodation in a model day-nursery should include an admission room, bathroom, playroom, dormitory, W.C.s, isolation cubicles, a room for the doctor which may be used at the same time as a room for ultra-violet-ray treatment, an office and, when necessary, rooms for staff, a kitchen and a laundry. There must also be a playground or verandah and a garden. Twelve cubic metres are usually allowed for each child. The admission room should be equipped with numbered lockers in which the children's clothes may be placed. All the furniture and equipment should be adapted to the age of the children.

The staff should consist of a medical officer, a matron, nurses or kindergarten teachers, kitchen maids and laundry maids. The staff must be large enough to cope with the work. It is suggested that one nurse or kindergarten teacher should be allowed for six infants, or for twelve children of pre-school age.

The proper selection of nurses is of great importance. In addition to suitable training and good health, they must also have special professional aptitude and be of a cheerful disposition. Some knowledge of infectious diseases and child psychology is indispensable.

The doctor should have a special knowledge of young children. His work should not merely consist in making occasional visits or coming when he is called: he should see the children at regular intervals, examine new admissions every day and have a special record card for each child which should be kept up to date and later placed in the individual file kept at the health centre. He should be notified immediately of children who are feverish or show signs of infectious disease. It is his duty to arrange for their removal to a hospital or to send them home as the case may be.

The doctor is responsible for a well-balanced and rational dietary, and for the observance of those hygienic measures which are necessary to build up the resistance of the children to disease and prevent sickness (for example, play in the open air, cleanliness, protection against cold and heat, etc.). As a general rule, the children should have three meals in the day-nurseries: breakfast after coming to school, a solid meal about noon and a lighter meal in the afternoon before going home. The composition of these meals naturally varies with local customs. A fairly long rest and sleep after the mid-day meal should be compulsory.

Play in the open air is the best method of avoiding infection when large numbers of children are brought together. The children should therefore spend a large part of the day both in summer and winter either in the garden or playground. During the wet and cold season, artificial sun-baths may well supplement the effect of life out of doors when necessary. Every nursery should have an ultra-violet-ray apparatus and each child should be exposed to artificial sunlight for the time prescribed

by the doctor. Physical education adapted to the children's age will help still further to improve their physique. A daily bath and cleaning the teeth morning and evening will not only have an excellent influence on health, but will instil in them a love of cleanliness. From the point of view of general hygiene, the day-nursery and the nursery school are educational media for both children and parents. It may be hoped that, by accustoming the children to being always clean, eating plain but healthy food and living in the open air, family habits will be influenced.

Admission to the nursery should be subject to certain medical and social conditions. The mother may be required first to bring her child to the child welfare centre of the district for a thorough medical examination. Children found suffering from infectious diseases, notably tuberculosis, syphilis or gonorrhœa, should not be admitted. The nurse should then investigate the family circumstances, particularly its economic position, the nature of the home, and the existence of infectious diseases in the child's environment. The purpose of this enquiry is to ascertain whether the child's admission is necessary. A child should, as a rule, only be admitted when it has been shown that the mother cannot look after her child herself, or that the child's health or moral welfare would benefit from being taken out of the home surroundings. It may be convenient for the right of admission to be given, not by the staff of the nursery, but by a municipal officer or by the doctor attached to the district welfare centre. Mothers should not be allowed to place their children in the crèche merely as a matter of convenience or out of laziness. These institutions, especially if already overcrowded, should be reserved for the children of women who go out to work or who, for other reasons, are unable to look after their children properly at home.

Before being admitted to the nursery, every child who has reached the age of one year should be vaccinated against smallpox. Vaccination against diphtheria is desirable at the end of the second year. The doctor attached to the crèche should ascertain exactly what vaccinations each child has received, and the infectious diseases from which he has already suffered, particularly measles, whooping-cough and chicken-pox, so that, in case of an epidemic, he knows those who are already immune. This information will influence him in allotting the children to the various sections of the institution. This may be done according to different principles. Generally speaking, the children are classified according to their age, which has advantages for games and training, but is not justified on hygienic grounds. On the other hand, a proposal was recently made to group together children of different ages in order to create conditions that more closely resemble the home and to lessen somewhat the risk of infection. For instance, by placing children for whom a certain infectious disease is particularly dangerous exclusively with children who have already had this disease, the probability of infection may be substantially reduced. In institutions where teaching is a secondary consideration, it is therefore better to divide the children according to their health rather than according to their age. Later on, we shall discuss in detail the steps to be taken in a day-nursery should an epidemic occur. At present, we merely urge the necessity for the doctor to know beforehand which children are liable to catch this or that disease and those who are immune. In this way, he may very often avoid having to close the crèche.

Most of the health measures we have just recommended for day-nurseries are also applicable to nursery schools or *écoles maternelles*, but some of them need not be

so rigorously adhered to, as the two latter institutions only admit children who are at least three years old.

Generally speaking, a child only spends about three hours in the morning and three hours in the afternoon at a nursery school or kindergarten. Meals are taken at home with the exception of a light meal in the morning and afternoon. At the *école maternelle*, the children are given small tasks — drawing, singing, learning to read and count. In the kindergartens and nursery schools, the time is spent somewhat differently. The children are taught by the Froebel or Montessori methods, the aim of which is to cultivate the senses and develop the intelligence by games. These institutions are open to all children aged from three to five. Staircases should be avoided as much as possible or built with very low steps; the furniture should be adapted to the children's height and preferably include separate tables for each child; large playrooms and gardens well exposed to the sun should be situated near the classrooms. The school should have plunge-baths or showers. These schools usually consist of three classes — one for children aged three, one for children aged four and one for children aged five. The teachers who are in charge of these schools should not only receive training in special teaching methods, but should also have some knowledge of preventive nursing, particularly with regard to infectious diseases, and child psychology. The nursery schools, like the day-nurseries, should have their official doctor, who is responsible for the supervision of the children, the staff and the sanitation of the building. He should be assisted by a nurse.

In addition to institutions of this kind for normal children, provision may also be made by day-nurseries and kindergartens for certain categories of abnormal children, particularly for the blind, deaf-and-dumb, backward and crippled children. Such institutions would look after these children until they could be admitted to special schools or institutions and, while still leaving them with their families, might already begin their special education.

Residential Institutions.

As in the case of infants, the rearing of a number of children of pre-school age in residential institutions presents serious difficulties. At this age, the chief danger is the risk of infectious disease. The high death rate found in many of these institutions has not only been caused by the numerous possibilities of infection which are present when large numbers of children are brought together, either through germ-carriers or newly-admitted children, but also, it would seem, by the lack of resistance of children living under abnormal conditions and frequently exposed to what has been called "hospitalism". Preventive measures are therefore necessary to avoid infection through individuals actually suffering from a disease, and also the resistance of the children must be built up by a good all-round care for their health and, where necessary, by preventive vaccinations. The same measures should be applied in all institutions, whether for normal children (orphans, destitute children, convalescents) or for abnormal children (blind, deaf-and-dumb, crippled, backward children).

The question that first arises is whether morally and hygienically it is desirable to bring up children who, for various reasons, cannot live with their families, in special institutions, or whether it would not be better to board them out with

families in the country. For children who are physically and psychically abnormal, the question is usually easy of solution, for there is no doubt that they are often a "nuisance" at home and that both they and their families benefit by their being brought up away from everyday life. But the question does arise in the case of normal children. In this matter, opinions are divided. An institution where children are brought up together is easier to organise and control, but boarding-out with families under suitable conditions gives better results from the point of view of health and morals. Orphanages and homes for assisted children are more and more becoming institutions where children are only kept until such time as they can be boarded out. Nevertheless, residential institutions will always be necessary, even if the principle of boarding-out children in receipt of public relief is adopted. As the formalities to be fulfilled in boarding-out children are always apt to be lengthy and the number of places available in families at any particular moment likely to be inadequate to meet requirements, an institution to accommodate homeless children, at least temporarily, is indispensable. The hygienic organisation and medical supervision of these residential homes is particularly necessary in order that they should not become a source of infectious diseases spread by the children who leave them.

There are numerous reasons why provision may have to be made for children away from their own homes, and the organisation of residential institutions, therefore, should vary according to the goal in view and the length of time the children are likely to remain there. A day-nursery or a home for abnormal children must obviously be adapted to other needs than a "preventorium" or a holiday-camp, but the main lines of prophylaxis are the same in all special institutions. Children suffering from infectious diseases must not be brought in contact with healthy children, and the power of all children to resist disease must be strengthened in every way.

Regular medical supervision is indispensable in order to detect the presence of infectious diseases at an early stage. Newly-admitted children and any that are found to be feverish or show some suspicious symptom should be examined by the doctor every day. New arrivals should remain isolated in special premises (quarantine) for three weeks before being allowed to mix with the others. During this period, the child should be subjected to a thorough physical and mental examination, and special care should be taken to discover the presence of infectious disease. For each new arrival, a swab of the throat should be taken and a serum test made for syphilis, a skin reaction for tuberculosis and a Schick test should be carried out. In the case of girls it is necessary to find out whether there is any discharge from the vagina; in certain districts an examination for typhoid and paratyphoid bacilli in the stools is also necessary. Any child, either a new arrival or a permanent boarder, who is found to be ill should always be removed immediately to hospital. Only slight and non-contagious cases should be treated in the sick room, consisting preferably of a group of isolation-cubicles, which should be provided in every institution of this kind.

The proper observation of children during the period of quarantine requires a considerable amount of time and trouble, and the centralisation of this service for all institutions in one town has been suggested. The *Kinderübernahmestelle* in Vienna is a model of this kind. All children to be admitted into one of the institutions in

the town, and even those who are to be boarded out with families, first spend three weeks here and then, without any other precautionary measure, are admitted to the institution to which they are allotted. This centralisation, in addition to its great advantages from the health point of view, greatly facilitates the supervision of children who are separated from their families. As they all pass through the *Kinderübernahmestelle*, a complete card-index system can easily be established, making it possible to ascertain at any moment the place where each child is to be found and his social and medical history.

In order to increase the children's resistance to infection, the doctor attached to the institution should see that the rules of general hygiene for children of that age are observed, particularly in regard to diet, length of time spent in the open air and sun, bodily cleanliness, hours of sleep, etc. A crèche for children of pre-school age should be planned quite differently from one for infants. In addition to dormitories, it should have spacious play-rooms and dining-rooms. Usually, the mid-day rest should take place in one of these rooms on folding couches; the premises should therefore be sufficiently large and well ventilated. Extensive play-grounds, part of which should be exposed to the sun and part planted with trees, together with large sheltered terraces, are desirable in all these institutions. There should be an ultra-violet-ray lamp for heliotherapy during the cold weather.

Frequently, day-nurseries for children of pre-school age are attached to nurseries for infants; where this is the case, the two departments should be separated.

In the children's second year, the chief duties of the staff no longer consist only in attending to the children's bodily needs, but also in occupying them with games, cultivating their senses and their intelligence, and teaching them to speak and use their limbs. This task demands different training and aptitude from those of a nurse. Certain institutions, therefore, have arranged for the physical needs to be attended to by nurses, while the training was entrusted to kindergarten teachers. But this method led to difficulties amongst the staff, and nowadays persons who have been trained both as nurses and kindergarten teachers are preferably placed in charge of such institutions. Aptitude for these two kinds of work is easily found amongst women, for every mother is both her child's nurse and teacher. As far as the community life of children is concerned, the best plan is to adhere to the conditions of family life as much as possible.

Institutions for Sick Children.

Most institutions for sick children admit patients both of pre-school age and school age. Infants should, however, always be isolated from the rest. Nevertheless, in preventoria, open-air schools, etc., the children might, for practical reasons, be divided into groups according to age, in order that those who need more sleep or walk badly or have been placed on a special diet, etc., could be looked after together. Children who cannot walk in their second year are better placed in infants' wards than with older children.

Institutions for ailing children may be classified into two categories: those admitting sick children, and those admitting children who are convalescent or who are in danger of contracting a disease. The first category includes general hospitals, hospitals for infectious diseases and sanatoria, the second convalescent homes.

preventoria, holiday camps and open-air schools. Strict rules should govern the admission of children to either of these two classes of institutions. A child who is seriously ill must not be placed with children who are convalescent or are merely threatened with a disease, nor should a convalescent child be left amongst sick children. For instance, whenever a child becomes ill in an open-air school, he should be immediately removed to a hospital, while children recovering in hospital should be sent to a convalescent home as soon as their health permits.

As far as general hospitals and hospitals for infectious diseases are concerned, it would be of interest to ascertain the number of beds necessary for any given population, but for the time being this is impossible, as we have no adequate knowledge of morbidity, and the tendency of parents to send their sick children to hospital varies a great deal from place to place. One town may need a small number of beds, because only the poorer people have their children treated in the hospital, whereas another town will require a large number of beds because all classes of the population are accustomed to bringing their children to the hospital. With a system of social insurance, when the health insurance funds bear the costs of hospital treatment for children, the number of admissions often increases appreciably. At the present time we think that propaganda for the hospital treatment of infectious diseases is most urgently needed. Cases of diphtheria, scarlet fever and whooping-cough among small children might, with advantage, be treated in hospital to a greater extent than hitherto. But this would require adequately equipped institutions so that a child would not run the risk of contracting other diseases during its stay in hospital.

Sanatoria situated on the sea-coast or at high altitudes are necessary for children suffering from tuberculosis of the bones, of the glands, or of the lungs.

Institutions for convalescent children and children threatened with disease might well be increased everywhere. They are an excellent means of combating disease in large towns. Some of these institutions may be established in the neighbourhood of large towns. Thus, open-air schools situated in open spaces, and in the suburbs, even when children only stay there during the day-time, have already yielded good results. Other institutions may be in the heart of the country, either in the mountains, near the sea, or in the neighbourhood of thermal springs, so that all these various factors may be utilised to repair the particular weakness of a child's constitution.

Institutions for Abnormal Children.

Institutions for abnormal children consist of special schools where the children spend a few hours every day, and institutions where they remain the whole time, during the pre-school and school age. Boarding-out with families in the country, as is done with certain classes of mentally deficient children, may also be resorted to. Residential institutions should preferably be situated in the country, whilst day-schools are only possible in towns.

These institutions admit four classes of children : crippled, blind, deaf-and-dumb and backward children. Every country should also provide a small institution to admit children who are both deaf-and-dumb and blind. The number of places necessary for each category should be roughly calculated from the statistical returns.

STAFF.

The welfare of children of pre-school age, both in their own homes and in institutions, should be directed by a children's specialist, assisted by nurses. In each district, the same medical officer should, when practicable, be in charge of the infant welfare centre and the centre for children of pre-school age. He should also be entrusted with the supervision of school medical inspection. For special ear, nose, throat, eye and X-ray examinations, he should be in a position to call upon specialists who would see cases either at regular monthly or fortnightly consultations, or occasionally as required. The doctor attached to the health centre of the district should be in constant touch with the tuberculosis dispensary where the whole campaign against tuberculosis is centralised. Generally speaking, a children's specialist should be in charge of institutions for healthy and convalescent children, while other specialists (orthopædist, oculist, otologist, and psychiatrist) should be responsible for institutions for crippled, blind, deaf-and-dumb and backward children, which the general children's specialist would only attend as a consultant.

THE NURSES' DUTIES.

The part played by the nurse in the care of children of pre-school age is an all-important one. Medical supervision is not effective either in institutions or at a health centre unless it is supplemented by the work of the visiting nurse. The same nurse should supervise the infants and children of pre-school age in the district. If she has given good advice for the baby, she will have won the family's confidence and can easily follow the child's growth until it goes to school, and even beyond. In addition, being familiar with the child's development from birth, she will be better able to give advice than if she had not taken charge of it until it was one year of age. From almost every point of view, it is desirable to extend the health visitors' activities by assigning them duties in connection with the campaign against tuberculosis and the ante-natal supervision of pregnant women, even when the latter are also being looked after by midwives. The public will always tend to have more confidence in a general nurse than in a highly-specialised nurse. Nevertheless, nurses may also be attached to the health centres for certain special duties to assist the visiting nurses, who would refer to them the cases requiring specialised advice or treatment. They should accompany the health visitor to the homes when necessary.

For a nurse to do her work properly, and in order to make it possible for her to visit the homes at sufficiently frequent intervals, her district must not be too large. In the second year, children should be visited, say, once a month; in the third year every two months, and, later, every three months. In the course of her visits, the nurse should have time enough to talk with the children, in order to get to know their mentality. She should therefore not have more than 10 to 12 visits daily to make.

She should devote particular attention to the children's surroundings and home, their diet, cleanliness, physical and mental development and their teeth. She should ascertain when the children began to walk and talk. She should, above all, exercise an educational influence. During her visits, she should instruct mothers how to feed, dress and put children to sleep, and urge the necessity of giving them

plenty of fresh air and sunshine. As she will have been present at the medical consultation, she will know the directions given by the doctor and should see that they are carried out. She should inform the doctor about the home circumstances, the economic position of the family and their mental attitude, pointing out particularly any faults in hygiene she may have observed. Above all she should do her best to educate personal and public opinion in the value of the various preventive measures recommended, particularly vaccination. She should see that the children are brought regularly to the welfare centre. She should take the children to the various specialists, and should keep the medical officer of the health centre informed of the treatment that is being carried out. When necessary, she should supervise the boarding-out of children and, for this purpose, she should be in constant touch with the social services and with institutions which provide for destitute children, convalescent children, and physically and mentally abnormal children.

Should a contagious disease occur in a family, she should inform the district health officer and should take meanwhile the necessary preventive measures to avoid the spread of the disease. If the child cannot be admitted to a hospital, she should see that it is sufficiently isolated. She should carry out the doctor's instructions as to separation or immunisation of contacts and should explain to the parents what precautions they should take.

She should also pay particular attention to housing conditions, and should accordingly be in touch with the authority responsible for cheap housing and do what she can to secure sanitary and sunny houses for large families.

The visiting nurse should also be responsible for keeping up to date and classifying individual records. She should enquire into the history of each new case, and make out the social record which is subsequently completed by the anthropometric and medical notes filled in by the doctor. The records should be kept at the welfare centre as long as the children remain in the district. They should be sent after any children leaving the district or those who, because of their age or for some other reason, attend another centre. The nurse should undertake the despatch of record cards, of which a note should be kept.

GENERAL

- I. Training of the Staff (Doctor, Midwife, Health Visitor).
 - II. Organisation and Co-ordination of Work.
-

I. TRAINING OF STAFF.

The adequacy and success of the work of maternal and infant welfare in any country depends first and foremost on the efficiency of the responsible staff (doctors, midwives, nurses). The teaching authorities who control the various branches of the medical curriculum should therefore, it is suggested, give particular consideration to this question in order that more attention than at present may be devoted to instruction in hygiene and in preventive medicine.

The Doctor. — A thorough knowledge of obstetrics is an essential part of the training of every medical student. Any doctor, however inexperienced, may be called upon to attend a woman in labour, and a recently qualified practitioner may at any time be asked to perform an urgent and difficult obstetric operation which may be entirely beyond his capability unless he has acquired an adequate practical knowledge of modern obstetrics, and is aware of what is being done through the Public Health Administration to co-operate with the private doctor or midwife. Unfortunately this is not always realised at the medical school, where attention given to instruction in medicine and surgery may be altogether out of proportion to the limited time allotted to obstetrics. Yet the safety of the mother and the life of the child depend primarily upon the skill and judgment of the individual doctor, and, unless and until he is properly trained by competent teachers, he will be obliged to gain most of his obstetric experience after qualification, and only at the expense of the health of his patients.

In training the medical student, clinical experience is of greater importance than attendance at theoretical lectures, and every student should be given ample opportunity of actually assisting in the delivery of a specified number (20 to 30, for instance) of cases himself, as well as of observing for a prescribed period (two months, for instance) as resident student the whole of the practice of a maternity hospital. Further, it is not sufficient for the student to follow the in-patient work of the hospital; he should also be required to attend the pre-natal clinic and to make himself thoroughly familiar with the examination of patients at all stages of pregnancy, both normal and abnormal. Here he will be able to observe the treatment advised for various complications of pregnancy and will in fact be taught "preventive obstetrics".

It is also most desirable that the student should be carefully instructed in the care of the new-born infant, and especially of the premature and weakly baby. He

should learn the difficulties which are often associated with the commencement of lactation and how these may be overcome. Such matters are too often left to the midwife or nurse, who may herself be ill-informed or prejudiced.

Until the doctor is fully acquainted with the care of the infant, as well as of the mother, and able to supervise the work of the midwife, the present high neo-natal death rate is not likely to be substantially reduced. Although the obstetrician is often ready to relinquish the new-born infant to the care of his pediatric colleague, the doctor in private practice cannot draw fine distinctions of this sort, and should be taught to bestow as careful attention upon the baby as he does upon the mother.

The training of doctors in pediatrics is also an important matter. Great progress has been made in teaching future practitioners pediatrics and the management of normal infancy and childhood. The knowledge of medical students would still, however, seem to be inadequate. Attendance at infant welfare centres should be made a compulsory part of their education.

This problem is bound up with two fundamental questions, the first being the importance of preventive medicine in the training of the future practitioner — not so much a matter of specific teaching as a general policy — and the second, the need for post-graduate teaching and refresher courses for medical practitioners. Both pediatrics and preventive medicine as applied to infant welfare, together with social hygiene, have made such strides in the last few years that the knowledge acquired by general practitioners might very usefully be brought up to date.

The Midwife.

As is indeed already the case in most countries, the training of midwives should be under the direct control of the Government — *i.e.*, the Ministry of Health. The training should not only include instruction in the main elements of practical obstetrics in relation to the technique of confinement, etc., but also methodical instruction in pre-natal care, and the supervision by the midwife of the health and hygiene of pregnant women. The training should also include some knowledge of what is being done to reduce maternal mortality and morbidity, of the work of the public health service in the protection of maternity, and the necessity for the close co-operation of the midwife with the visiting nurse and the other health officers with whom she may come in contact. She should also be given the fullest instruction as regards lactation and the care of new-born infants, particular emphasis being laid on the special treatment required for premature and weakly babies and those who cannot be breast-fed. As in rural areas the local midwife may be the only person available to carry out the work of the visiting nurse, she should have a thorough theoretical and practical knowledge of weaning, and a general knowledge of the management of infants and young children. Such instruction should be similar to that given to visiting nurses, thus avoiding any inconsistency in the advice given to the mother.

Because of the midwife's exceptional responsibilities — she is the only professional person directly entrusted with the health of the mother and child who does not belong to the medical profession — her work should preferably be under proper guidance and supervision. Health officers and departments responsible for the supervision of midwives and the issue of their diplomas should be empowered to

frame provisions delimiting the sphere of action of midwives and determining what they are to do under certain conditions or in cases of emergency. Midwives should also be required to keep individual records of a uniform type for all cases they attend.

The Health Visitor.

Much of the success of the campaign against infant mortality depends on the efficiency of the visiting nurse. We have seen that a nurse who can undertake all public health nursing duties in a district is to be preferred. She should therefore have received a good general training at a school awarding Government diplomas. During her training, she will acquire some knowledge of medicine, surgery and special branches of medicine; she should spend a considerable time in children's hospitals or wards (infants, children of pre-school age and school age, infectious diseases); should work in lying-in hospitals or wards; should be attached to the out-patients department; should do some social service, and should have experience of work in dispensaries. On the conclusion of this general training, she should have a period of training in practical infant and child welfare, practical work in this respect being more important than theoretical lectures. Some kindergarten training and a knowledge of child psychology is desirable.

II. ORGANISATION AND CO-ORDINATION.

There are two possible forms of good health organisation. In one, the Government administers the local health services (centralised system) and, in the other, it merely exercises a supervisory and co-ordinating function, the local authorities being responsible for their own health administration (system of decentralisation).

Every central health authority under either of these two systems should have a special department for maternity and child welfare, including that of young infants, children of school age and of adolescents. This department should be under the charge of a whole-time specialist medical officer with a knowledge of public health.

Through a chief health visitor, who would have a special experience of maternity and infant welfare, this department might co-ordinate the work of all visiting nurses attached to the various institutions, particularly those responsible for more than one branch of health visiting.

A chief midwife might advantageously be attached to the department of maternal and infant welfare of the central health organisation. She would be under the head of the department, and would be responsible for advising and supervising the midwives attached to the local centres (or, if possible, all the midwives in the district).

According to the morbidity rate in each urban or rural area, every possible step — such as we have described in detail in the preceding chapters — should be taken to provide for medical assistance and maternal and infant welfare to meet the needs of the population.

The department should co-operate with medical practitioners, and co-ordinate all public and private work relating to maternal and infant welfare, including social insurance. The "committees of co-operation" set up in certain countries are an efficient means of co-ordination. The department should also keep in close touch

with the various social services and statistical departments, and with the service for the prevention of acute and chronic infectious diseases (including tuberculosis and syphilis), with a view to ensuring the prophylactic treatment of those diseases particularly dangerous to the health of mother and child.

The organisation of maternal and infant hygiene must always be considered in conjunction with the other branches of modern hygiene of which it forms an integral part. Every plan for the organisation of a health service, either central or regional, must, from the outset, take into account the necessity for close co-operation between its various branches. Thus only can the best results from the point of view of public health be obtained.

Financial questions, buildings, equipment, the question of the necessary number of hospital and visiting nurses, the allotment of their work, their relations to the medical profession, should be the subject of special enquiries linked up with the other activities of the proposed health organisation, and utilising as wisely as possible the human and material resources already available.
