

ANNUAL REPORT
OF THE
PUBLIC HEALTH COMMISSIONER
WITH THE GOVERNMENT OF INDIA
FOR 1938



With Appendices

PUBLISHED BY THE MANAGER OF PUBLICATIONS, DELHI
PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PRESS, NEW DELHI
1940

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ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1938

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Annual Report of the Public Health Commissioner with the Government of India for 1938

SECTION I

ON THE STATE OF PUBLIC HEALTH IN BRITISH INDIA AND SOME INDIAN STATES DURING 1938

Introduction

1. The annual report of the Public Health Commissioner has been published hitherto in two volumes, the first dealing with the health of the civil population and the second with the health of the Army in India. With effect from the year under review the report on the health of the Army will be issued by the Director of Medical Services in India and the Public Health Commissioner's report will, for the future, confine itself to a survey of the health conditions of the civil population.

The principal vital statistics of British India for the year 1938 are given below and corresponding figures for the previous year and for the quinquennium, 1933-37, are also given for the purpose of comparison.

	1938.	1937.*	Average of 1933-37.*
Mid-year estimated population	275,540,813	272,406,436	266,090,905
Density per square mile	361	358	350
Births {	9,398,011	9,388,457	9,298,989
	34.1	34.5	34.9
Deaths {	6,685,120	6,112,375	6,206,468
	24.3	22.4	23.3
Infantile death rate per 1,000 live- births.	167.1	161.7	167.9
Vital index	140.6	153.6	149.8

A comparison of the birth, death and infantile mortality rates indicates that no wide fluctuations of these rates have occurred during the period, 1933 to 1938. As regards the general death rate a slight rise of 1.9 *per mille* was recorded in 1938 as compared with the previous year, which is partly accounted for by the fact that a widespread epidemic of cholera swept over large tracts of Northern and Central India after the Hardwar pilgrim festival in April 1938. While the mortality from cholera rose from 99,054 in 1937 to 236,143 in 1938, the deaths from smallpox and plague decreased from 54,810 and 28,169 to 39,844 and 17,371 respectively. The combined effect of these three diseases was an increase of mortality to the extent of 111,325 over that of the previous year. It must however be remembered that, although the incidence of these diseases is correctly regarded as an index of the health and environmental conditions of a community, their joint contribution to the total mortality of the country is relatively small; for instance, during the decennium 1928-37, deaths from these three diseases constituted only 5.2 per cent.

*As Burma was separated from India on 1st April 1937, the figures are exclusive of Burma.

of the mortality from all causes. On the other hand during the same period the undefined groups, 'fevers', 'all other causes' and 'respiratory diseases' contributed 57.8 per cent, 26.0 per cent and 7.0 per cent respectively to the total number of deaths. These are large groups consisting of, in each case, a complex collection of diseases whose disentanglement is impossible under the existing defective methods of registration of vital statistics. Under the heads 'fevers' and 'respiratory diseases' appreciable proportions of the recorded deaths are undoubtedly due to malaria, tuberculosis and enteric fever, but no true picture of the relative incidence of these diseases is available. Such information is essential for the organisation of preventive work, and one of the most urgent tasks for health authorities in India is that of widening and speeding up their field of effort towards producing more accurate registration and compilation of vital statistics.

Table I (i) provides a comparison of the birth, death and infant mortality rates of British India with those of certain other countries. With the exception of Japan, the other countries of the Middle and Far East, for which figures are given, show no very marked superiority over India in respect of the general and infantile mortality rates.

TABLE I (i).

	Birth rate per 1,000 population.	Death rate per 1,000 population.	Infant mortality per 1,000 live births.	Maternal mortality per 1,000 live births.
British India	34.1	24.3	167	20*
England and Wales	15.2	11.7	52	3.1
Federated Malay States	39.7	19.1	147	8.6
Japan (For 1937)	30.6	17.0	106	2.5
Palestine	41.5	18.9	153	Not available
Egypt (For 1937)	Not available	27.2	165	Not available
Netherlands East Indies	30.9	20.2	Not available	4.0†

Population.

2. A comprehensive view of the growth of population in India and of birth and death rates since 1871 is given below in Table I (ii) :—

TABLE I (ii).

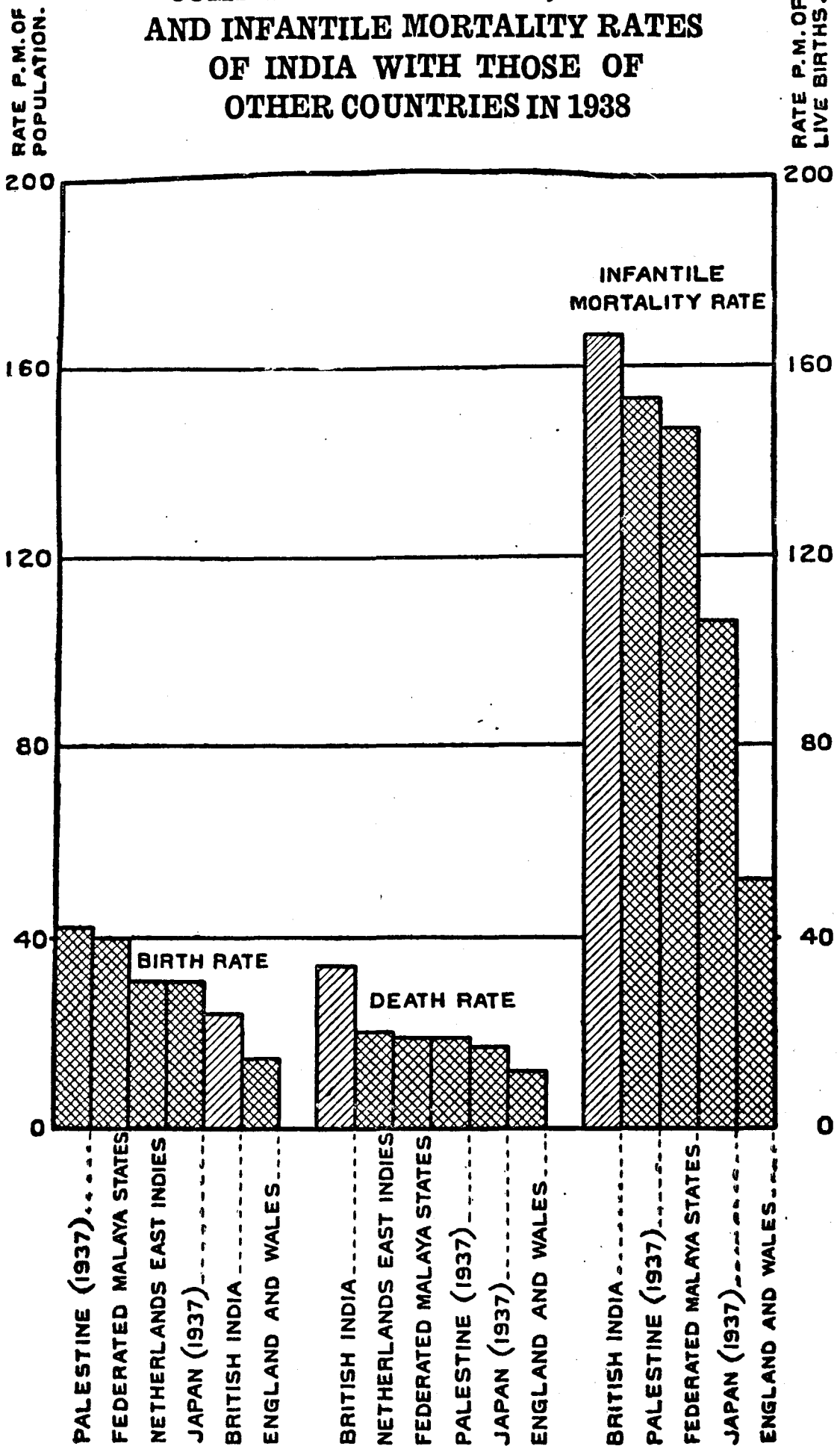
	Annual number of births.	Birth rate per mille.‡	Annual number of deaths.	Death rate per mille.‡	Annual excess of births over deaths.
1871—1880	Not available	Not available	3,540,202	19	Not available
1881—1890	4,565,687	23	5,058,578	26	492,891
1891—1900	7,174,694	33	6,662,417	31	512,277
1901—1910	8,591,136	37	7,657,513	33	933,623
1911—1920	8,810,018	37	8,142,364	34	667,654
1921—1930	8,345,364	33	6,347,063	25	1,995,301
1931	8,814,836	35	6,404,990	25	2,409,846
1932	8,718,620	34	5,596,246	22	3,122,374
1933	9,317,918	36	5,870,336	23	3,447,582
1934	8,923,169	34	6,606,697	25	2,316,472
1935	9,299,021	35	6,331,576	24	2,967,445
1936	9,566,379	36	6,111,358	23	3,455,021
1937	9,388,457	35	6,112,375	22	3,276,082
1938	9,398,011	34	6,685,120	24	2,712,891

*An estimate made by the Special Committee of the Central Advisory Board of Health on Maternity and Child Welfare Work in India (1938).

†Relates to Europeans.

‡ These rates are based on populations estimated for the middle of each period.

COMPARISON OF BIRTH, DEATH AND INFANTILE MORTALITY RATES OF INDIA WITH THOSE OF OTHER COUNTRIES IN 1938



NOTE-Infantile mortality rate for Netherlands East Indies is not available.

If we confine our attention to the figures relating to the present century on the assumption that defectiveness of registration of vital statistics would be relatively less in this period than before 1900, the first three decades of this century have witnessed uneven rates of growth as evidenced by the average annual excess of births over deaths. The lowest figure is for the decennium, 1911-1920, and this is due to the fact that the influenza epidemics of 1918 and 1919 caused abnormally high death rates in the population. The succeeding decade, 1921-30, recorded an average increase of nearly two millions every year while, for the eight years of the present decennium, the average figure was approximately three millions. It will thus be seen that, from 1921 onwards, there has been a steady increase in the population of the country.

The estimated mid-year populations of British India and of the provinces for 1938 are shown in Table I (iii). For the purpose of comparison the corresponding figures for 1937 are also given. The last two columns show the percentage rates of increase or decrease during 1938 and for the period that has elapsed after the census of 1931.

TABLE I (iii).

	Estimated population on 30th June 1937.	Estimated population on 30th June 1938.	Percentage increase or decrease.	Total percent- age increase from 1st March 1931 (last census) to the end of June 1938.
British India	272,406,436	275,540,813	1.15	8.65
N.-W. F. P.	2,523,589	2,539,059	0.61	7.65
Punjab	26,069,627	26,597,656	2.03	13.37
Delhi	699,157	715,419	2.33	12.44
U. P.	52,390,009	52,994,705	1.15	9.47
Bengal	52,195,805	52,583,541	0.74	5.38
Bombay	19,383,756	19,620,735	1.22	9.53
Sind	4,237,554	4,265,564	0.66	
Bihar	34,095,892	35,084,665	0.03	8.71
Orissa	7,209,846	7,251,906	0.58	
C. P.	16,604,896	16,748,481	0.86	
Madras	47,201,665	47,872,410	1.42	
Coorg	164,619	164,109	-0.31	0.48
Assam	8,438,246	8,506,974	0.81	7.32
Ajmer-Merwara	591,775	595,589	0.64	6.30

On 1st April 1936 the province of Orissa was formed from territories taken from the provinces of Madras, the Central Provinces and Bihar and Orissa while the province of Sind was created by its separation from Bombay Presidency. Detailed information regarding the vital statistics of the areas constituting the new provinces for the period prior to their formation is not available. These facts have necessitated, in certain cases, the presentation in the last column of this table, of combined rates of growth for areas much larger than those of individual provinces. To this extent, therefore, the picture of population growth in the provinces lacks precision. Even so, the figures show wide variation in the rates of growth. For instance, while Bengal

registered an increase of 5·38 per cent during the period of seven years and four months after the 1931 census, the Punjab had an increase of 13·37 per cent, closely followed by Delhi with its rate of 12·44 per cent. From the biological point of view it is justifiable to hold that the rate of growth of population over an extended period measures the balance of the favourable and adverse factors associated with the survival of a community. The difference between the rates of the provinces may therefore be indicative, at least in part, of the varying levels of health of the populations concerned.

Table I (iv) sets out the age and sex distributions of the estimated population for 1938. These figures have been calculated on the assumption that the age and sex distributions shown at the 1931 census hold good for 1938. The use of recorded births and deaths for working out these populations was ruled out because of their inaccuracy in respect of completeness of figures and, with regard to deaths, in respect of the registered ages at death.

TABLE I (iv).

	Males.	Females.	Total.
All ages	141,922,596	133,618,217	275,540,813
0—5 years	20,715,050	21,149,081	41,864,131
5—10 „	18,830,617	17,095,129	35,925,746
10—15 „	16,960,870	14,919,689	31,880,559
15—20 „	12,501,038	12,442,451	24,943,539
20—30 „	25,057,984	24,913,843	49,971,827
30—40 „	20,473,958	18,234,192	38,708,150
40—50 „	13,813,469	11,996,561	25,810,030
50—60 „	7,981,056	7,303,855	15,284,911
60 years and upwards	5,588,504	5,563,416	11,151,920

Live births.

3. The total number of live births registered in British India during 1938 was 9,398,011, an increase of 9,554 over the figure for 1937. The birth rates *per mille* of the estimated populations for 1937 and 1938 were 34·5 and 34·1 respectively. The rates for British India and the provinces are given below in Table I (v). Inaccuracy of registration is mainly responsible for the low rate of 18 *per mille* (Sind). In the first place birth rates well over 40 *per mille* have been recorded, as may be seen from this table, in the Punjab and Delhi. Secondly, careful investigations carried out in Madras Presidency have shown that the average rate for the province is in the neighbourhood of 42 *per mille*. It is therefore almost certain that defective registration is responsible for the low rate recorded in Sind. In this province, since its creation in 1936, the birth rates were 19, 18 and 18 *per mille* for the successive years 1936, 1937 and 1938. This question deserves therefore careful investigation by the health authorities of that province.

Urban and rural birth rates for British India and the provinces are given in Table C of Appendix I. The rates for British India were 39·5 and 33·5 *per mille* respectively for the two types of areas. In the provinces the urban

rate varied from 18·4 *per mille* in Bihar to 63·3 in Madras Presidency. For the rural areas, Sind recorded the lowest rate of 14·4 *per mille* and Delhi the highest, 54·8 *per mille*.

TABLE I (v).

	Births.			Rate <i>per mille</i>		No. of males born per 100 females in 1938.
	Male.	Female.	Total.	1938	1937	
British India	4,883,719	4,514,292	9,398,011	34·1	34·5	108
N.-W. F. P.	41,267	30,710	71,977	28	29	134
Punjab	615,125	550,712	1,165,837	44	42	112
Delhi	17,665	16,475	34,140	48	45	107
U. P.	945,068	836,050	1,781,118	34	33	113
Bihar	571,091	545,087	1,116,178	32	32	104
Orissa	122,328	116,469	238,797	33	34	105
Bengal	788,538	732,716	1,521,254	29	33	108
C. P.	340,412	321,373	661,785	40	38	106
Bombay	389,622	368,873	758,495	39	38	106
Sind	43,445	33,824	77,269	18	18	128
Madras	873,709	835,836	1,709,545	36	36	105
Coorg	1,981	1,804	3,785	23	24	110
Assam	122,346	114,834	237,180	28	29	107
Ajmer-Merwara	11,122	9,529	20,651	35	37	117

The abnormally high ratios of male to female births in certain provinces have already been commented upon in previous reports. The figures quoted by Newsholme for a number of European countries show a much smaller range of variation, the largest and smallest figures quoted by him being 106 and 103 males to 100 female children born. When countries like England and Italy, which are racially different, show only relatively small differences in the ratio, it is doubtful whether the much larger variations found in India can be explained in terms of racial difference alone. Further, the fact that some provinces, such as N.-W. F. P., the Punjab, U. P., Sind and Ajmer-Merwara, report high figures year after year seems to suggest that omission to register female births is more common in these provinces than in others.

A birth rate based on the female married population at the reproductive age period gives a clearer indication of the fertility of women in the country than the crude birth rates given in the previous tables. Information regarding marriage is available only from the census enumerations at 10-yearly intervals. On the assumption that the proportions of married women at the 1931 census for the respective provinces are applicable to 1938, the rates given below in Table I (vi) are based on female populations aged 15—40 years, which period covers the greater and the most fruitful part of a woman's reproductive life.

TABLE I (vi).

	Female population 15-40 years.	Total births.	Rate per mille based on total female population, 15-40 years.	Rate per mille based on married female population 15-40 years.
British India	55,590,486	9,398,011	169·1	201·5
N.-W. F. P.	483,371	71,977	148·9	185·0
Punjab	4,719,896	1,165,837	247·0	293·5
Delhi	134,960	34,140	253·0	287·0
U. P.	10,401,221	1,781,118	171·2	195·7
Bihar	7,140,798	1,116,178	156·3	181·2
Orissa	1,665,033	238,797	143·4	
Bengal	10,896,519	1,521,254	139·6	169·2
C. P.	3,432,124	661,785	192·8	217·6
Bombay	3,947,153	758,495	192·2	207·3
Sind	810,930	77,269	95·3	
Madras	10,115,657	1,709,545	169·0	213·4
Coorg	33,339	3,785	113·5	156·5
Assam	1,694,277	237,180	140·0	172·5
Ajmer-Merwara	115,208	20,651	179·2	202·9

The fact that births tend to occur more frequently at certain parts of the year than at others has long been recognised. The figures for births distributed according to the four quarters of the year are given below in table I (vii).

TABLE I (vii).

	1st quarter.	2nd quarter.	3rd quarter.	4th quarter.
British India	2,308,158	2,100,959	2,353,721	2,635,173
N.-W. F. P.	18,804	15,664	17,616	19,893
Punjab	281,969	230,412	314,469	338,987
Delhi	7,027	6,872	10,041	10,200
U. P.	425,620	366,064	485,910	503,524
Bihar	276,294	258,967	275,531	305,386
Orissa	57,598	66,482	57,030	57,687
Bengal	456,195	330,968	265,894	468,197
C. P.	157,257	154,153	173,872	176,503
Bombay	177,834	179,079	201,123	200,459
Sind	18,776	14,776	19,742	23,975
Madras	359,751	423,152	470,078	447,564
Coorg	831	989	1,093	872
Assam	65,631	49,213	46,845	75,491
Ajmer-Merwara	4,571	4,168	5,477	6,435

For British India as a whole births were most numerous in the fourth quarter. This holds good for all provinces except Bombay, Madras, Coorg and Orissa. In the first three the period of highest incidence of births is the third quarter while for Orissa it is the second quarter.

Deaths.

4. The total number of deaths registered in British India in 1938 was 6,685,120, an increase of 572,745 over that for the previous year. The death rates *per mille* of the population were 22·4 and 24·3 respectively during 1937 and 1938. The death rates for males and females in British India and the provinces are given in Table I (viii). In the Punjab, Delhi, Bengal, Bombay, Coorg, Assam and Ajmer-Merwara the death rate of females exceeded that of males while in the other provinces the reverse was the case. The combined rates for the two sexes show wide disparity among the provinces, the range of variation being from 11·3 *per mille* in Sind to 37·6 in the Central Provinces. The remarks regarding the birth rate in respect of Sind apply equally to the death rate and steps to improve the registration of vital statistics in this province appear to be urgently required. As regards the Central Provinces an examination of the provincial death rates since the beginning of the present decennium shows that the province has consistently recorded the highest rate among the provinces throughout this period, the figure ranging between 30·1 and 37·6. During the same period the death rate in British India varied between 22·4 and 26·9 so that the rates for the Central Provinces have been higher than those of India to the extent of about 34 to 40 per cent. It is clear that the situation demands the serious and urgent attention of the health authorities of the province.

TABLE I (viii).

	Deaths.			Death rate <i>per mille</i> .		
	Male.	Female.	Total.	Male.	Female.	Total.
British India .	3,490,496	3,194,624	6,685,120	24·6	23·9	24·3
N.-W. F. P. .	29,412	24,570	53,982	21·4	21·1	21·3
Punjab .	332,581	290,118	622,699	23·0	23·9	23·4
Delhi .	8,561	8,171	16,732	20·8	26·9	23·4
U. P. .	675,228	574,760	1,249,988	24·3	22·8	23·6
Bihar .	405,996	357,737	763,733	23·1	20·4	21·8
Orissa .	103,689	104,897	208,586	30·0	27·7	28·8
Bengal .	674,968	640,918	1,315,886	24·7	25·4	25·0
C. P. .	326,750	302,551	629,301	39·1	36·0	37·6
Bombay .	280,557	266,830	547,387	27·6	28·2	27·9
Sind .	27,225	20,860	48,085	11·4	11·1	11·3
Madras .	524,065	507,987	1,032,052	22·1	21·0	21·6
Coorg .	2,129	1,857	3,986	23·5	25·1	24·3
Assam .	91,611	86,156	177,767	20·5	21·4	20·9
Ajmer-Merwara	7,724	7,212	14,936	24·4	25·8	25·1

Rural and urban death rates for the provinces are given in Tables G and H of Appendix I. For British India the rural rate was 24·0 *per mille* and the urban rate 26·3 *per mille*.

The influence of age and sex on mortality is a recognised fact and the crude death rates already discussed are not satisfactory for interprovincial comparisons or comparison between different years for the same province because of the varying age and sex compositions of the populations concerned. To remove the influence of the age and sex factors standardised death rates (direct method) based on the total population of India at the 1931 census have

been calculated for the eight years of the present decennium and are given as Table P in Appendix I. It will be seen from this table that the result of standardisation has to show large figures for the death rate in the provinces of N.-W. F. P., Bengal and Coorg. This increase is most marked in Bengal. On the other hand, in the provinces of the Punjab, U. P., C. P., Bombay, Madras and Ajmer-Merwara, the standardised rate is lower than the crude death rate, the difference being most marked in the Punjab and C. P.

Death rates at different age periods for males and females in British India and the provinces are given in Table J of Appendix I. It will be seen from this table that, below 15 years and after 40 women are subject to a lower rate of mortality than men. Between 15 and 40 the death rate among women is higher. This is due to the fact that maternity levies a heavy toll on women in this country. The only exception is the province of Bihar, where throughout life the rates for women are lower than those for men. Table I (ix) gives death rates for the two sexes during the period 15-40.

TABLE I (ix).

	Deaths, 15-40 years.		Death rates, 15-40 years.	
	Males	Females	Males	Females
British India	592,574	670,646	10·2	12·1
N.-W. F. P.	6,025	5,861	11·0	12·1
Punjab	43,184	45,508	7·5	9·6
Delhi	1,283	1,831	6·4	13·6
U. P.	106,810	108,905	9·3	10·5
Bihar	84,391	75,822	12·1	10·6
Orissa	18,406	22,084	12·7	13·3
Bengal	140,727	175,158	12·3	16·1
C. P.	53,170	61,222	15·7	17·8
Bombay	36,971	44,402	8·6	11·2
Sind	5,821	5,520	5·5	6·8
Madras	74,420	96,879	7·9	9·6
Coorg	693	672	15·3	20·2
Assam	19,796	25,578	10·8	15·1
Ajmer-Merwara	877	1,194	6·6	10·4

Bihar has shown lower rates for women at this age period since its separation from Orissa in 1936. In a country like England, with its highly developed service for maternity, women enjoy a lower mortality than men even during the period between 15-40. There is no reason to consider that Bihar is well in advance of the other provinces in India in respect of maternity service. In fact a recent report on maternity and child welfare work in India by a committee of the Central Advisory Board of Health presents figures which show that Bihar is behind many other provinces in regard to this branch of health work. This question of a lower mortality rate for women in Bihar during 15-40 therefore requires early investigation.

In last year's report mention was made of a scheme of verification of the causes of death in Delhi Municipality by a staff of medical men who investigated every death. From the tabular statements given in the report of the Health Officer for 1938 the following figures are quoted :—

DELHI MUNICIPALITY.

	Registered deaths.	Verified deaths.
Malarial fever	4	266
Measles	222	222
Smallpox	81	81
Typhoid fever	410	410
Pneumonias (including broncho-pneumonia)	1,184	2,470
Phthisis	850	850
Puerperal fever	nil	83
Infantile diarrhoea	72	492
Premature birth	9	245

In regard to measles, smallpox, typhoid fever and phthisis the numbers of registered and verified deaths agree. The signs and symptoms of measles and smallpox are widely known to the people and this may explain the agreement in numbers for these diseases, in respect of the two sources of information. As regards typhoid fever and phthisis, the patient is ill, in either case, for fairly long periods and is likely to have sought and obtained medical aid for himself, so that the cause of death given at the time of its registration by the person reporting it, might have been based on medical diagnosis. In regard to the other causes given above, considerable differences exist between the numbers for the registered and the verified deaths. Taking the latter as a closer approximation to truth, it is clear that the rôle of many preventable causes of mortality, such as malaria, puerperal fever, infantile diarrhoea and premature birth, would have been lost sight of if no verifying agency were employed to check up the accuracy of the registered causes of death.

The importance of securing reliable information regarding the cause of death has been stressed repeatedly in these reports and in last year's report certain suggestions for effecting improvement were embodied in the paragraph dealing with the registration and compilation of vital statistics. While it is recognised that considerations of cost stand in the way of providing trained personnel for this work in the rural areas, the desirability of making some advance in respect of urban populations is so great that the example of Delhi Municipality has been quoted in the hope that similar attempts will be initiated in other places also.

Infantile Mortality.

5. Total deaths under one year in British India in 1938 numbered 1,570,196 giving a rate of 167.1 *per mille* of live births as against 161.7 for 1937. Such minor fluctuations from year to year require no explanation. The relative incidence of deaths among infants at different periods of the first year of life is shown in Table I (x). Corresponding figures for England and Wales are also given for the purpose of comparison.

TABLE I (x).

	Under one month.		One to six months.		Six to twelve months.		Total deaths under one year.	Death rates per 1,000 live births.	
	Number.	% of total.	Number.	% of total.	Number.	% of total.		1938.	1937.
England and Wales		53·7*		29·2†		17·1		52·7	57·6
British India	735,555	46·8	480,135	30·6	354,506	22·6	1,570,196	167·1	161·7
N.-W. F. P.	3,822	34·4	3,846	34·7	3,422	30·9	11,090	154·1	148·6
Punjab	78,528	40·4	56,865	29·2	59,115	30·4	194,508	166·8	163·0
Delhi	1,767	34·6	1,835	35·9	1,508	29·5	5,110	149·7	166·6
U. P.	102,171	38·6	96,618	36·5	65,900	24·9	264,689	148·6	142·3
Bihar	65,476	48·9	41,994	31·4	26,318	19·7	133,788	119·9	115·9
Orissa	25,122	47·4	18,183	34·3	9,633	18·3	52,988	221·9	214·7
Bengal	154,474	55·0	81,640	29·0	44,809	16·0	280,923	184·7	176·2
C. P.	75,780	48·1	46,901	29·8	34,953	22·2	157,634	238·2	218·6
Bombay	49,053	37·1	47,098	35·6	35,949	27·2	132,100	174·2	160·7
Sind	3,527	37·6	3,298	35·2	2,550	27·2	9,375	121·3	118·0
Madras	155,780	54·9	66,658	23·5	61,492	21·6	283,930	166·1	169·8
Coorg	363	57·0	147	23·1	127	19·9	637	168·3	221·7
Assam	18,554	47·5	13,485	34·5	7,018	18·0	39,057	164·7	160·0
Ajmer-Merwara	1,138	26·0	1,567	35·9	1,662	38·1	4,367	211·5	226·1

The death rate for children under one year in England is only 31·5 per cent of that of India. However, in respect of both countries, the proportionate mortality rates at corresponding periods of the first year of life do not show such a marked difference. England has been able to achieve a remarkable saving of infant lives in comparison with India. But the proportion of neonatal deaths to total infantile deaths in England is as high as, if not higher than, what takes place in India. The prenatal causes, which contribute largely to the mortality within the first month of life, are more difficult to control than those which operate adversely on the infant's health during the succeeding eleven months.

Provincial rates vary widely, from 119·9 *per mille* in Bihar to 238·2 in the Central Provinces. The low figure for Bihar is almost certainly due to defective registration. Infant mortality rates for rural and urban areas are given in Table N of Appendix I. For British India the rural rate is 164·2 *per mille* and the urban rate 190·6. It is difficult to determine how far the difference between these two rates is due to defective registration in rural areas or to adverse environmental conditions which town life produces.

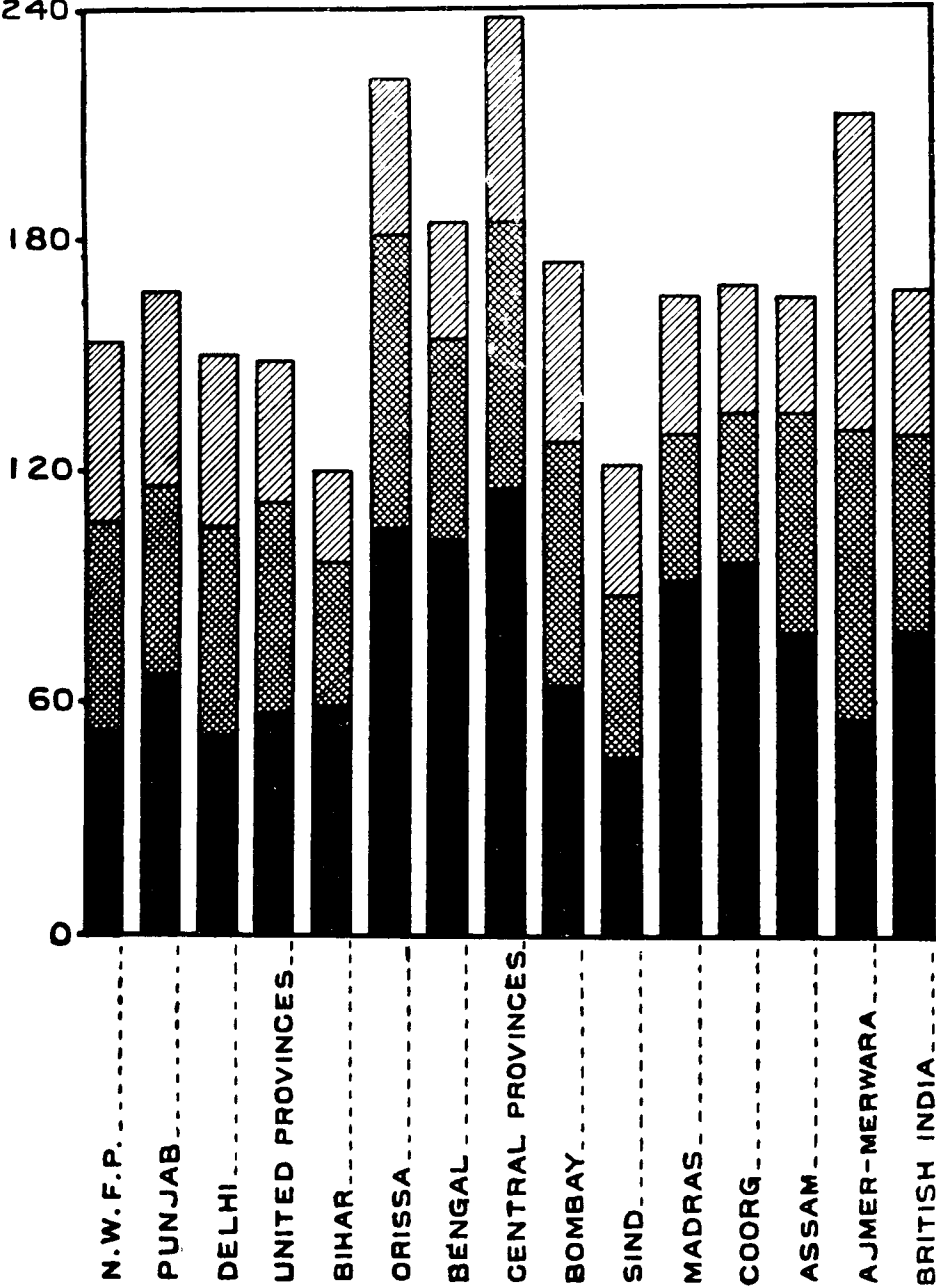
Table I (xi) gives infantile deaths under one week as a rate *per mille* of live births and as percentages of deaths under one month and of total infant deaths. The corresponding rates for England and Wales show that while, of the total infants born a much smaller percentage dies in the first week of life than in India, the deaths under one week constitute higher proportions of the infantile deaths within the first month as well as of those during the first year than they do in this country. This again emphasises the fact that the success achieved in the saving of infant lives has been more conspicuous by an improvement of the conditions of extra-uterine life for the child rather than of those relating to its prenatal existence.

* Under four weeks.

† Four weeks to six months.

INFANTILE MORTALITY RATE PER MILLE OF LIVE BIRTHS IN BRITISH INDIA DURING 1938

RATE P.M.
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INDEX.

- Under one month
- One to six months
- Six to twelve months

TABLE I (xi).

	Deaths under one week.	Rate per mille live births.	Percentage of	
			Deaths under one month.	Total infant deaths.
England & Wales		21·1	74·6*	40·1
British India	444,200	47·3	60·4	28·3
N.-W. F. P.	1,944	27·0	50·9	17·5
Punjab	43,245	37·1	55·1	22·2
Delhi	1,016	29·8	57·5	19·9
U. P.	64,885	36·4	63·5	24·5
Bihar	45,715	41·0	69·8	34·2
Orissa	14,186	59·4	56·5	26·8
Bengal	89,202	58·6	57·7	31·8
C. P.	41,383	53·8	54·6	26·3
Bombay	27,430	36·2	55·9	20·8
Sind	1,898	24·1	53·8	20·2
Madras	101,825	59·6	65·4	35·9
Coorg	213	56·3	58·7	33·4
Assam	10,596	44·7	57·1	27·1
Ajmer-Merwara	662	32·1	58·2	15·2

Infantile mortality rates for the two sexes based on the corresponding male and female births, are presented in Table I (xii). For British India the male rate is 175·8 *per mille* and the female rate 157·6. In all provinces, except Sind and Ajmer-Merwara, the male rate is higher than the female rate.

TABLE I (xii).

	Infant deaths.		Rates per mille of corresponding live births.	
	Males.	Females.	Males.	Females.
British India	858,619	711,577	175·8	157·6
N.-W. F. P.	6,366	4,724	154·3	153·8
Punjab	106,691	87,817	173·4	159·5
Delhi	2,751	2,359	155·7	143·2
U. P.	147,566	117,123	156·1	140·1
Bihar	74,073	59,715	129·7	109·6
Orissa	28,155	24,833	230·2	213·2
Bengal	152,159	128,764	193·0	175·7
C. P.	85,732	71,902	251·8	223·7
Bombay	71,532	60,568	183·6	164·2
Sind	5,191	4,184	119·5	123·7
Madras	154,697	129,233	177·1	154·6
Coorg	341	296	172·1	164·1
Assam	21,074	17,983	172·2	156·6
Ajmer-Merwara	2,291	2,076	206·0	217·9

The infant mortality rate is correctly regarded as an index of the status to which communal health has attained. Adverse environmental conditions, such as malnutrition and insanitary surroundings, more quickly sap the vitality of those who have recently emerged from the relatively stable environment of uterine life than of older children who have undergone their apprenticeship in the more varied and exacting life of the outer world. Further, apart from

* Deaths under four weeks.

good food and sanitary surroundings, infantile life demands sound mothercraft. A community can achieve conspicuous success in infant welfare work only through the education of its mothers. A high level of attainment in this branch of public health endeavour indicates a quickening of the civic conscience to the needs of the most helpless section of the community, as well as to the recognition of the potential value of the infants as the future citizens of the country. In India infant mortality remains high as compared with many other countries. However, even here, the rate has fallen from 195 in 1920 to 167 in 1938. Further, it has been shown in limited areas, where intensive work has been undertaken, that a considerable saving of infant life can be achieved in spite of the adverse home conditions among the poor people. Two instances may be quoted. In Calcutta, the Calcutta Maternity and Child Welfare Committee has four Red Cross Clinics and five other affiliated clinics under its charge and, in these institutions, a total of 2,093 infants came under care during 1938. The infant mortality rate for the areas attached to the clinics was 73·6 *per mille* in 1938 while the corresponding rate in Calcutta was 235. In Madras 14,589 babies came under the care of the welfare scheme of the Corporation and among them, the infantile mortality rate was 113·3 *per mille* as against a rate of 222·1 for the city as a whole. These infant welfare campaigns include the provision of milk as a supplement to the diet, wherever necessary, and systematic home visits for the education of the mothers. Even so, the adverse effects of overcrowded and insanitary home conditions and of inadequate response to educative efforts from the mothers owing to their lack of general education must have remained to counteract, to some extent, the beneficent work of the welfare staffs. These reductions in infantile mortality constitute therefore a gratifying record of success and they point to the possibility of similar achievement elsewhere, wherever properly organised infant welfare work can be brought into being.

In last year's report comment was made on the lack of information regarding the true causes of infantile mortality and the suggestion was made that child welfare centres under the charge of women doctors appeared to afford the best opportunities for collecting reliable figures for the different parts of the country. In the following table figures are quoted for the causes of death amongst the infants attending the Red Cross centres under the Calcutta Maternity and Child Welfare Committee, the centre attached to the All-India Institute of Hygiene and Public Health, Calcutta, and the centre of the Lady Reading Health School, Delhi. The total figures number only 288, but they give some indication of the more important causes associated with infantile mortality. It cannot be too strongly emphasised that one of the most important functions of child welfare organisations is the collection of correct vital statistics, which are so essential for throwing light on the problems of morbidity and mortality at that period of life. Inadequacy of women doctors will, for a long time, continue to impede the progress of such investigations on any extensive scale. However, it is desirable that all existing facilities should be mobilised towards this end. Welfare organisations under the direct charge of women doctors, with health visitors to assist them, can alone undertake the task satisfactorily. Health visitors, through their contact with the homes of the people, should be able to give valuable help in this direction but, without guidance from medical women trained in public health work, no conspicuous success can be attained. Child welfare work is at present largely confined to urban areas, while the necessity for information regarding rural areas is equally urgent. Health Units working in different provinces have women medical officers and health visitors on their staff and these units appear therefore to be suitable for the collection of this information.

TABLE I (xiii).

Causes of death.	Calcutta Red Cross Centres		All-India Institute of Hygiene Centre	Lady Reading Health School Centre, Under 12 months.
	Under one month.	One to twelve months.	Under twelve months.	
Trauma	2	..	..	..
Convulsions	2	1	..	..
Tetanus	11	..	..	..
Umbilical sepsis	1	..	1	3
Respiratory diseases	11	43	19(Pneumonia)	16
Gastro-intestinal diseases	6	31	14	25
Fevers	3	6	..	10
Smallpox . . . . .	..	5	3	..
Congenital Syphilis	4	1 Syphili- tic cir- rhosis of the liver.	1	2
Prematurity	6	..	1	3
Congenital debility	3	..	..	..
Neglect	5	..	5	..
Marasmus . . . . .	..	7	..	..
Dysentery . . . . .	..	6	..	..
Cholera . . . . .	..	1	..	..
Anaemia . . . . .	..	1	..	2
Sepsis . . . . .	..	1	..	..
Measles . . . . .	..	..	2	..
Tuberculosis . . . . .	..	..	2	..
Diphtheria . . . . .	..	..	1	..
Jaundice . . . . .	..	..	..	2
Unknown	7	..	6	6
Total	61	103	55	69

The figures for the Calcutta Red Cross clinics are given separately for neonatal mortality and for deaths between the first and twelfth months. For the other two institutions only combined figures are given. The figures for all the three centres emphasise the fact that most of these deaths were preventable. Eleven deaths due to tetanus and five due to umbilical sepsis are all the more to be deplored because they give definite evidence of the neglect of elementary aseptic precautions. Taking the three institutions together, respiratory and gastro-intestinal diseases accounted for 57 per cent of the total infant deaths. These diseases are mainly dependent on environmental factors for their production and it is significant that, when the mortality figures for the first month of life and for the succeeding eleven months are considered separately, the contributions of respiratory and intestinal diseases to the total mortality are 28 and 65 per cent respectively. On the other hand causes like prematurity and congenital debility take their toll before the first month of life is finished.

Mortality among Children.

6. Table I (xiv) sets out the mortality figures for children under 10 years of age. Corresponding percentages for England and Wales are also given for comparison.

TABLE I (xiv).

	Under one year.	% of total deaths.	1-5 years.	% of total deaths.	5-10 years.	% of total deaths.	Total under 10 years.	% of total deaths.
England and Wales . . . . .	...	6	...	2.1	...	1.1	...	10.0
British India	1,570,196	23.5	1,301,531	19.4	371,980	5.6	3,243,707	49.5
N.-W. F. P.	11,090	20.5	10,834	20.1	3,489	6.5	25,413	47.1
Punjab	194,508	31.2	131,131	21.1	30,818	4.9	356,457	57.2
Delhi	5,110	30.5	3,602	21.6	670	4.0	9,382	56.1
U. P.	264,689	21.2	291,776	23.3	61,106	4.9	617,571	49.4
Bihar	133,788	17.5	162,668	21.3	48,969	6.4	345,425	45.2
Orissa	52,988	25.4	35,228	16.9	9,980	4.8	98,196	47.1
Bengal	280,923	21.3	212,155	16.2	97,116	7.4	590,194	44.9
C. P.	157,634	25.1	129,200	20.5	34,905	5.5	321,739	51.2
Bombay	132,100	24.1	130,823	23.9	25,765	4.7	288,688	52.7
Sind	9,375	19.5	7,937	16.5	2,880	6.0	20,192	42.0
Madras	283,930	27.5	154,286	14.9	43,130	4.2	481,346	46.6
Coorg	637	16.0	464	11.6	167	4.2	1,268	31.8
Assam	39,057	22.0	27,651	15.5	12,431	7.0	79,139	44.5
Ajmer-Merwara	4,367	29.2	3,776	25.3	554	3.7	8,697	58.2

There can be no clearer indication of the huge waste of child life that takes place in India than that presented in the above table. While in England deaths among children under 10 years of age form only 10 per cent of the deaths at all ages, in India the proportion is nearly 49 per cent and of them about half occur among infants under one year. They point to the conclusion that child welfare work is perhaps the most pressing health problem in India today.

Information regarding the causes of mortality among children under five years of age is available with regard to those attending the three welfare centres mentioned already in connection with infantile mortality. The figures are shown below :—

TABLE I (xv).

Causes of death.	Red Cross Centres, Calcutta.	Centre attached to the All-India Institute of Hygiene and Public Health, Calcutta.	Centre attached to the Lady Reading Health School, Delhi.
Respiratory diseases	5	7 (one a case of tuberculosis).	15
Gastro-intestinal diseases	12	..	5
Typhoid	5	2	..
Fevers (not defined)	2	..	6
Cholera	6	2	..
Dysentery	1	4 (diarrhoea and dysentery)	..
Meningitis	1	..	..
Smallpox	3	7	2
Septic conditions	1	2	..
Enlarged liver	1	1	..
Marasmus	1	..	..
Anaemia	1	1	..
Measles . . . . .	..	3	4
Accident . . . . .	..	1	..
Jaundice . . . . .	..	..	2
Unknown . . . . .	..	1	5
Total	39	31	39

The figures are few. Their value mainly lies in the fact that the cause of death has been ascertained by a more efficient agency than that which exists for the greater part of the country. Respiratory and gastro-intestinal diseases are responsible for 44 deaths or for 40 per cent of the total deaths numbering 109. There were 12 deaths due to smallpox. No information is available as to the vaccinal condition of these children but, in view of the fact that they were all under five years of age, it is certain that vaccination, if efficiently carried out, should have given them protection.

Still births.

7. The figures for still births in British India and the different provinces are given below :—

TABLE I (xvi).

	Male.	Female.	Total.	Rate <i>per mille</i> live births.	Male still births per 100 female still births.
British India	111,456	89,092	200,548	21·3	125
N.-W. F. P.	127	71	198	2·8	179
Punjab	5,186	3,411	8,597	7·4	152
Delhi	277	234	511	15·0	118
U. P.	7,426	5,674	13,100	7·4	131
Bihar	16,582	13,183	29,765	26·7	126
Orissa	6,174	5,230	11,404	47·8	118
Bengal	39,663	32,662	72,325	47·5	121
C. P.	9,229	7,251	16,480	24·9	127
Bombay	6,982	5,597	12,579	16·6	125
Sind	617	454	1,071	13·9	136
Madras	13,888	11,209	25,097	14·7	124
Coorg	25	32	57	15·1	78
Assam	5,202	4,031	9,233	38·9	129
Ajmer-Merwara	58	73	131	6·3	79

The still birth rates for the provinces show wide variation, from 2·8 *per mille* in N.-W. F. P. to 47·8 *per mille* in Orissa. Even in the Western countries with their well-developed services for the registration of vital statistics, still birth registration is far from complete. As was pointed out last year, the information collected at the child welfare centre attached to the Hygiene Institute, Calcutta, in respect of 1,615 pregnancies gave a still birth rate of 51·7 *per mille* of live births and the low figures given in the above table are undoubtedly due to defective registration. The last column gives the ratio of the two sexes in respect of still birth. No explanation can be offered for the high ratios recorded for most provinces.

Registration and Compilation of Vital Statistics.

8. This subject was extensively discussed in the reports for 1936 and 1937. A brief reference to it is, however, being made here only to draw attention to a few glaring cases of defective registration selected from different

provincial public health reports and to emphasise the fact that continual vigilance on the part of the health authorities in the country can alone make for a progressive improvement of the situation.

TABLE I (xvii).

Province.	Name of town.	Population.	Birth rate per mille.	Death rate per mille.
N.-W. F. P.	Abbottabad	11,573	24.5	7.7
U. P.	Behat	4,238	1.4	1.3
	Mainpuri	15,342	7.7	6.1
	Juhi	20,092	9.6	2.1
	Basti	22,528	9.5	8.9
Bihar	Dinapur	12,347	6.9	3.7
	Katihar	9,014	9.8	3.8
	Sahibganj	8,530	7.4	2.6
	Deoghar	8,117	2.4	3.7
	Dumka	5,317	6.6	3.1
	Madhupur	4,997	7.6	4.8
	Giridih	11,122	7.1	3.7
	Jamshedpur	51,137	7.0	5.9
Orissa	Cuttack	36,357	13.3	10.8
Bengal	Suri	10,908	9.3	10.2
	Bansberia	14,211	8.9	14.1
	Jaynagar Majilpur	9,755	5.7	8.0
	Khulna	19,120	7.8	14.4
	Gauripur	6,319	2.4	3.2
	Comilla	31,365	7.5	7.7
C. P.	Jubbulpore Cantonment	20,065	6.3	7.3
Bombay	Urban	9,762	10.0	8.4

Some efforts are being made to detect and bring on record unregistered births and deaths but the work of detection is not being pursued with sufficient vigour in many parts of the country. As may be seen from the figures given below, in respect of both rural and urban areas, Madras Presidency has contributed by far the largest share of detections of births and of deaths. Similar evidence was also produced in the 1936 and 1937 reports. It is therefore clear that the matter demands serious attention from other provincial health authorities also.

Unregistered births and deaths detected during 1938.

Figures for all provinces.

	Urban areas.		Rural areas.	
	Births.	Deaths.	Births.	Deaths.
With health officers	17,711	9,888	65,755	19,816
Without health officers	10,171	4,309	12,239	3,222

The percentage contributions made by Madras Presidency to the above figures for British India were :—

	Urban areas.		Rural areas.	
	Births.	Deaths.	Births.	Deaths.
With health officers	59	74	59	58
Without health officers	83	75	..*	..*

Rainfall.†

9. Taking the year as a whole, the rainfall over the country was 24 per cent or more in excess in the East United Provinces, Berar, the Bombay

* In this province all the rural areas have been provided with health officers.

† Prepared from a memorandum on rainfall and other weather conditions by the Director General of Observatories, India.

Deccan and North Hyderabad, and 21 per cent or more in defect in the Punjab, Sind and Rajputana. Over the rest of the country, it was within 20 per cent of the normal.

The cold weather period, January-February, was characterised by excessive rainfall in Hyderabad and East and South Madras. Rainfall was also abundant in most parts of Northern India and parts of Central India and the Central Provinces mainly in association with western disturbances. In Gujarat and the surrounding divisions and in the Madras Deccan, rainfall was much less than usual. Averaged over the plains of India, the rainfall of the season was in excess by 9 per cent.

The rainfall during the hot weather period, March to May, was deficient over the region from Baluchistan and the North-West Frontier Province to the West United Provinces and East Central India, and abundant over most of the remaining divisions. Over the plains of the country as a whole, there was an excess of 10 per cent.

The southwest monsoon period, June to September, was marked by spells of heavy rains which resulted in floods in the Brahmaputra valley in July and in the United Provinces in August. The total rainfall of the period was above the average in the East United Provinces, Bihar, the Central Provinces, the Deccan, Mysore and East Madras. There was, however, less rain than usual in Northwest India, particularly in and near the triangle-Delhi, Lahore and Ajmer. Averaged over the plains of India, the season's rainfall was in excess by 6 per cent.

During the retreating southwest monsoon period, October to December, the season's rainfall was generally scanty except over the region from Gujarat and the Konkan to East Central India and the East Central Provinces and in Orissa and Assam. Averaged over the plains of India, the rainfall was in defect by 19 per cent during the period.

Table I (xviii) gives the figures for actual rainfall in inches as compared with the normals in the various provinces in each of the four periods mentioned above.

TABLE I (xviii).

	January to February.		March to May.		June to September.		October to December.		Total.	
	Actual.	Normal.	Actual.	Normal.	Actual.	Normal.	Actual.	Normal.	Actual.	Normal.
Mean of India*	1.2	1.1	4.3	3.9	33.9	32.1	3.5	4.3	42.9	41.4
N.-W. F. P.	2.4	2.5	3.1	4.2	7.0	8.0	0.7	1.2	13.2	15.9
Punjab	2.5	1.9	0.6	2.0	10.9	15.3	0.3	0.8	14.3	20.0
U. P.	1.9	1.5	0.8	1.4	37.6	33.5	1.0	1.8	41.3	38.2
Bihar	1.6	1.4	4.1	3.4	46.1	41.9	1.4	3.0	53.2	49.7
Orissa	1.1	1.5	6.5	5.7	38.8	43.6	7.9	6.8	54.3	57.6
Bengal	1.4	1.3	18.6	12.6	57.6	54.9	5.1	6.0	82.7	74.8
C. P.	1.1	1.3	1.7	1.7	48.1	40.5	4.5	2.8	55.4	46.3
Bombay	0.0	0.2	2.5	1.5	41.8	39.3	5.5	3.4	49.8	44.4
Sind	0.1	0.3	0.1	0.5	3.2	5.2	0.1	0.3	3.5	6.3
Madras	2.4	1.2	6.7	6.0	31.0	28.5	8.1	16.2	48.2	51.9
Assam	1.7	2.2	23.6	25.1	70.3	66.1	8.5	6.9	104.1	100.3
Rajputana	0.2	0.6	0.2	0.9	15.5	19.1	0.3	0.8	16.2	21.4
Central India	0.8	0.8	0.9	0.9	35.1	33.1	2.4	1.6	39.2	36.4
Hyderabad	1.0	0.5	2.5	2.0	34.7	25.9	2.3	3.7	40.5	32.1
Mysore	0.2	0.3	4.0	5.3	25.6	22.4	1.7	8.2	31.5	36.2

*Excluding Burma.

Agricultural Conditions.

10. Table I (*xix*) gives the cultivated and uncultivated acreage in British India and different provinces during the years 1937-38 and 1938-39.

TABLE I (*xix*).

		Cultivated.		Uncultivated.	
		Net area actually sown.	Current fallows.	Culturable waste other than fallows.	Not available for cultivation.
British India	{ 1938-39	209,377,838	48,325,002	94,180,437	91,807,971
	{ 1937-38	213,512,956	45,684,723	91,968,759	92,224,730
N.-W. F. P.	{ 1938-39	2,070,207	607,739	2,866,660	2,679,231
	{ 1937-38	2,109,029	576,056	2,851,700	2,687,052
Punjab	{ 1938-39	25,151,597	5,790,871	14,275,353*	12,983,323
	{ 1937-38	27,317,578	3,695,782	14,164,936	13,021,910
Delhi	{ 1938-39	172,314	50,829	62,604	82,709
	{ 1937-38	213,444	11,161	65,305	78,502
U. P.	{ 1938-39	36,081,950	2,795,085	9,964,452	9,928,409
	{ 1937-38	36,171,073	2,637,755	9,988,955	9,887,964
Bihar	{ 1938-39	17,978,400	6,791,000	6,800,775	6,148,185
	{ 1937-38	19,323,400	6,970,527	5,123,622	6,294,248
Orissa	{ 1938-39	6,507,729	1,646,240	3,138,765*	6,211,434
	{ 1937-38	6,447,555	1,736,964	3,571,049	6,211,433
Bengal	{ 1938-39	24,730,100	5,015,347	6,638,732*	9,300,924
	{ 1937-38	24,728,100	4,926,500	5,753,822	9,433,039
C. P. & Berar	{ 1938-39	24,369,333	3,950,319	14,017,848*	4,881,011
	{ 1937-38	24,537,804	3,805,214	13,992,370	4,899,410
Bombay	{ 1938-39	28,779,649	4,994,829	913,021*	5,712,230
	{ 1937-38	28,715,213	5,059,224	888,388	5,722,961
Sind	{ 1938-39	5,108,271	5,005,638	5,505,834	13,798,854
	{ 1937-38	5,140,479	4,873,248	5,899,512	13,548,576
Madras	{ 1938-39	31,383,337	9,860,540	10,862,821	14,497,180
	{ 1937-38	32,031,679	9,451,438	10,537,675	14,603,510
Coorg	{ 1938-39	144,696	164,667	11,690	359,474
	{ 1937-38	144,673	164,667	11,690	359,474
Assam	{ 1938-39	6,618,912	1,412,955	18,774,650	4,577,400
	{ 1937-38	6,295,796	1,601,597	18,856,570	4,577,400
Ajmer-Merwara.	{ 1938-39	281,343	238,943	347,232	647,607
	{ 1937-38	337,133	174,590	263,165	899,251

*Culturable area included.

NOTE—The figures are subject to revision.

Table I (xx) gives the areas in acres under food crops in British India and the provinces during 1938-39 :—

TABLE I (xx).

	Area under food grains.	Area under other food crops.	Total area under food crops.
	Acres.	Acres.	Acres.
British India.	186,273,641	9,914,820	196,188,461
N.-W. F. P.	2,026,086	139,303	2,165,389
Punjab	19,200,843	890,320	20,091,163
Delhi	133,546	8,036	141,582
U. P.	38,802,762	2,558,786	41,361,548
Bihar	19,654,900	1,452,500	21,107,400
Orissa	6,185,672	250,128	6,435,800
Bengal	23,985,200	1,587,800	25,573,000
C. P. and Berar	20,396,324	310,796	20,707,120
Bombay	20,278,881	511,447	20,790,328
Sind	4,239,051	62,938	4,301,989
Madras	25,435,445	1,603,683	27,039,128
Coorg	101,307	19,673	120,980
Assam	5,610,638	499,746*	6,110,384
Ajmer-Merwara	222,986	19,664	242,650

NOTE—The figures are provisional.

A comparison of the figures given in Tables I (xix) and I (xx) with similar figures for the previous year shows that, for British India as a whole, there has been a fall both in the net area actually sown, taking all forms of cultivation into consideration, and the total area under food crops. As regards the net area sown, all provinces except Orissa, Bengal, Bombay and Coorg have shared in the decrease. With respect to the cultivation of food crops, the United Provinces, Orissa, the Central Provinces, Bombay, Madras, Coorg and Assam recorded small increases during 1938-39 as against the previous year.

For detailed information regarding agricultural conditions the provincial season and crop report should be consulted.

Famine Relief.

11. During 1938-39, famine conditions prevailed in the following areas :—

Punjab.—Special and general remissions of land revenue, water rates and taccavi loans to the extent of about Rs. 53 lakhs were given to alleviate the economic distress caused by drought, famine and hailstorms in several districts of the province, including Hissar, Rohtak, Gurgaon and Karnal. In the latter part of the year Hissar was declared a famine district.

*Excludes acreage under miscellaneous food crops, as it is not separately available.

Concession rates for the carriage of fodder into Hissar and certain other districts were also granted, resulting in a further expenditure of Rs. 2·3 lakhs.

United Provinces.—The kharif crop was damaged by floods in some places and by insufficient rains in others. Relief was given in the form of remission of land revenue to the extent of Rs. 10·54 lakhs and the grant of taccavi loans amounted to Rs. 33 lakhs.

Bengal.—The early onset of the monsoon in 1938 caused floods in fifteen districts of the province, including Murshidabad, Faridpur, Pabna, Jessore, Khulna, Dacca, Rajshahi, Rangpur and Malda. Considerable damage to standing crops and destruction of property took place in the affected areas. The total population that suffered distress numbered about eight millions. The measures taken to relieve distress included the grant of gratuitous relief to the extent of Rs. 3·8 lakhs. About Rs. 4 lakhs were spent on test works.

Madras.—Rainfall was scanty and untimely in Bellary, Anantapur and Kurnool districts. There was failure of crops as well as scarcity of fodder. Test works and relief works had to be opened to relieve the general unemployment. Arrangements were also made to supply fodder from Government depots. Free grazing was allowed in Panchayat forests. East Godavari, West Godavari and Kistna districts suffered damage from a cyclone in November 1938. The provincial Government supplied building materials and gave money grants to the poor for reconstructing the houses destroyed by the cyclone.

Assam.—Floods in the Assam Valley and the Surma Valley seriously damaged the crops in many districts. In addition to suspension and remission of land revenue and grant of taccavi loans, Rs. 1·6 lakhs were spent on gratuitous relief.

Ajmer-Merwara.—Most crops on dry kharif area were affected by the failure of rains and general scarcity of fodder prevailed. A large number of cattle migrated to better pastures in the neighbouring States. Concession rates for the carriage of fodder were introduced to relieve the situation. Ordinary forest coupes were thrown open to grazing. Relief works were also opened wherever distress was felt.

Indian States.

12. The vital statistics for a number of Indian States are given below in Table I (*xxi*). Even a cursory examination of these figures shows that in several States registration of births and deaths is markedly defective. Birth and death rates in the neighbourhood of 15 and figures well below this number occur in a number of instances and they definitely point to defective registration.

Arrangements have recently been made for the supply of weekly and monthly vital statistics from Indian States to the office of the Public Health Commissioner, in order that their incorporation in the returns issued from his office may give the statistics an all-India character. When this system has worked for a year it will be possible to include in the annual report of the Public Health Commissioner a brief review of health conditions in the States as revealed by the vital statistics supplied from them. In the meantime no comment is being offered on the table given below, which has at least the advantage of presenting in convenient form the available information in respect of a large number of States.

TABLE I (xxi).

State.	Estimated population on 30th June 1938.	Births.	Birth rate per mille.	Deaths.	Death rate per mille.	Deaths under one year.	Infantile mortality per 1,000 births.
Jammu and Kashmir	3,885,112	99,796	25·7	82,777	21·3	13,841	138·7
PUNJAB STATES.							
Patiala	1,717,759	72,472	42·2	39,183	22·8	8,056	111·2
Nabha	305,350	8,177	26·8	5,350	17·5	253	30·9
Kapurthala . . .	340,576	10,350	30·4	4,767	14·0	994	96·0
Bahawalpur . . .	1,133,787	23,720	20·9	11,832	10·4	*	*
Jind	336,769	15,897	47·2	8,865	26·3	2,311	145·4
Sirmoor	154,523	2,787	18·0	2,626	17·0	454	162·9
Faridkot	174,411	8,827	50·6	4,838	27·7	1,383	156·7
Malerkotla . . .	85,089	2,515	29·6	1,017	12·0	196	77·9
Chamba	150,537	1,919	12·7	1,822	12·1	8	4·2
Kalsia	61,667	2,645	42·9	1,510	24·5	384	145·2
Pataudi	19,445	988	50·8	464	23·9	155	156·9
Dujana	29,961	1,162	38·8	765	25·5	227	195·4
Nalagarh	52,325	842	16·1	558	10·7	118	140·1
Mandi	223,906	7,553	33·7	5,335	23·8	1,101	145·8
Suket	61,400	1,507	24·5	1,274	20·7	*	*
Bilaspur	103,187	3,719	36·0	2,979	28·9	603	162·1
U. P. STATES.							
Tehri (Garhwal) .	581,304	11,385	19·6	8,146	14·0	2,070	181·8
Benares	412,014	11,317	27·5	6,148	14·9	1,474	130·2
Rampur	473,213	9,169	19·4	7,601	16·1	*	*
MADRAS STATES.							
Travancore	5,895,242	117,145	19·9	53,243	9·0	9,174	78·3
Cochin	1,370,705	19,395	14·1	11,830	8·6	1,323	68·2
Pudukottah	381,539	6,799	17·8	5,712	15·0	666	98·0
Banganapalle . . .	41,138	1,263	30·7	694	16·9	70	55·4
Sandur	14,991	531	35·4	302	20·1	83	156·3
RAJPUTANA STATES.							
Jalpur	2,846,620	24,074	8·5	16,686	5·9	3,601	149·6
Alwar	785,391	28,215	35·9	15,599	19·9	*	*
Kishangarh	91,618	2,223	24·3	1,311	14·3	455	204·7
Tonk	338,964	6,408	18·9	6,080	17·9	395	61·6
Shahpura	58,706	1,608	27·4	1,058	18·0	306	190·3
Lawa	3,179	46	14·5	52	16·4	*	*
Jaisalmaire	82,562	757	9·2	687	8·3	*	*
Banswara	250,582	1,733	6·9	2,750	11·0	16	9·2
Partabgarh	83,454	1,902	22·8	2,005	24·0	106	55·7
Dungarpur	256,342	645	2·5	2,880	11·2	133	206·2
Kushalgarh	40,257	115	2·9	239	5·9	27	234·8
Bharatpur	480,002	15,510	32·3	9,155	19·1	1,717	110·7
Dholpur	273,173	4,468	16·4	2,605	9·5	*	*
Karauli	145,512	2,145	14·7	1,643	11·3	126	58·7
Kotah	726,680	26,654	36·7	21,422	29·5	5,216	195·7
Bundi	238,465	4,730	19·8	2,273	9·5	513	108·5
Jhalawar	116,477	950	8·2	949	8·1	176	185·3
BARODA AND GUJARAT STATES							
Balasinor	58,758	2,125	36·2	1,422	24·2	456	214·6
Bansda	55,172	1,020	18·5	805	14·6	156	152·9
Baria	175,665	1,729	9·8	1,604	9·1	*	*
Baroda	2,675,100	95,254	35·6	62,924	23·5	13,828	145·2
Cambay	99,531	3,464	34·8	2,569	25·8	678	195·7
Chhota Udepur . . .	158,529	3,861	24·4	1,909	12·0	364	94·3
Dharampur	124,395	3,026	24·3	1,862	15·0	*	*
Jawhar	62,834	2,302	36·6	1,739	27·7	92	40·0
Lunawada	103,984	1,424	13·7	1,661	16·0	240	168·5
Rajpipla	233,702	7,810	33·4	5,873	25·1	1,242	159·0
Sachin	23,669	822	34·7	533	22·5	96	116·8
Sant	92,742	1,805	19·5	1,206	13·0	141	78·1

*Figures not available

TABLE I (xxi)—*contd.*

State.	Estimated population on 30th June 1938.	Births.	Birth rate per mille.	Deaths.	Death rate per mille.	Deaths under one year.	Infantile mortality per 1,000 births.
BARODA AND GUJARAT STATES—<i>contd.</i>							
Azar	3,586	157	43·8	108	30·1	47	299·4
Bhadeswa	12,133	350	28·8	267	22·0	26	74·3
Chhaliar	3,148	35	11·1	28	8·9	15	428·6
Gad Boriad	13,998	249	17·8	238	17·0	39	156·6
Jambughoda	12,742	415	32·6	252	19·8	45	108·4
Kadana	19,166	461	24·1	315	16·4	46	99·8
Mandwa	6,606	141	21·3	126	19·1	36	255·3
Palasni	3,117	98	31·4	52	16·7	12	122·4
Sihora	5,016	126	25·1	95	18·9	18	142·9
Sanor	2,045	90	44·0	48	23·5	18	200·0
Surgana	15,487	304	19·6	194	12·5	35	115·1
Uchad	3,707	102	27·5	78	21·0	22	215·7
Umeta	7,208	229	31·8	181	25·1	29	126·6
Vajitra	5,739	173	30·1	175	30·5	48	277·5
Pandu Mewas	22,813	522	22·9	402	17·6	74	141·8
EASTERN STATES AGENCY.							
Athgarh	55,868	1,573	28·2	1,499	26·8	413	262·6
Athmallik	67,587	3,011	44·5	2,120	31·4	75	24·9
Bamra	163,022	6,481	39·8	4,753	29·2	1,668	257·4
Baramba	52,599	1,995	37·9	1,427	27·1	490	245·6
Baudh	143,197	4,877	34·1	3,586	25·0	776	159·1
Bonal	88,993	3,297	37·0	2,536	28·5	795	241·1
Daspalla	49,921	1,863	37·3	1,624	32·5	501	268·9
Dhenkanal	321,462	9,667	30·1	7,155	22·3	2,644	273·5
Gangpur	391,434	14,346	36·6	9,322	23·8	2,436	169·8
Hindol	56,435	1,918	34·0	1,289	22·8	585	305·0
Keonjhar	520,090	18,796	36·1	14,257	27·4	3,255	173·2
Khandpara	87,932	3,429	39·0	2,743	31·2	878	256·1
Kharswan	47,343	1,222	25·8	799	16·9	155	110·5
Narsinghpur	46,657	1,864	40·0	1,938	41·5	377	202·3
NayaGarh	156,750	5,781	36·9	5,040	32·2	2,053	355·1
Nilgiri	71,065	1,871	26·3	1,938	27·3	406	217·0
Pal-Lahara	31,047	1,345	43·3	879	28·3	290	215·6
Bairakhol	39,003	1,299	33·3	1,109	28·4	385	296·4
Rampur	52,423	1,465	27·9	1,222	23·3	324	221·2
Seraikela	164,300	3,121	19·0	2,234	13·6	409	131·0
Sonepur	246,111	7,194	29·2	4,036	16·4	1,664	231·3
Tigiria	28,701	837	29·2	710	24·7	221	264·0
Cooch Behar	590,002	12,803	21·7	11,553	19·6	1,629	127·2
Bastar	569,146	16,140	28·4	12,091	21·2	2,747	170·2
Changbhakar	24,422	477	19·5	415	17·0	8	16·8
Chhuikhadan	35,738	1,191	33·3	893	25·0	337	283·0
Jashpur	222,694	8,011	36·0	4,307	19·3	*	*
Kalahandi	585,447	22,770	38·9	18,715	32·0	3,699	162·5
Kanker	144,326	5,442	37·7	2,785	19·3	662	121·6
Kawardha	80,916	3,030	37·4	2,258	27·9	508	167·7
Khairagarh	181,886	6,021	33·1	3,977	21·9	830	137·9
Korea	99,445	2,421	24·3	1,839	18·5	530	218·9
Nandgaon	206,455	7,711	37·3	5,596	27·1	2,230	289·2
Patna	619,904	25,083	40·5	15,089	24·3	4,842	193·0
Raigarh	303,925	8,898	29·3	6,007	19·8	1,328	149·2
Sakti	53,553	1,953	36·5	1,168	21·8	427	218·6

* Figures not available.

TABLE I (xxi)—concl'd.

State.	Estimated population on 30th June 1938.	Births.	Birth rate per mille.	Deaths.	Death rate per mille.	Deaths under one year.	Infantile mortality per 1,000 births.
EASTERN STATES AGENCY—cont'd.							
Sarangarh . . .	137,175	3,959	28·9	2,779	20·3	728	183·9
Surguja . . .	555,547	11,405	20·5	7,755	14·0	*	
Udaipur . . .	117,252	3,737	31·9	2,347	20·0	658	176·1
Mayurbhanj . . .	988,896	30,163	30·5	21,998	22·2	4,121	136·6
Talchar . . .	83,408	546	6·5	366	4·4	80	146·5
KOLHAPUR AND DECCAN STATES.							
Akalkot . . .	100,936	3,755	37·2	2,531	25·1	223	59·4
Bhor . . .	149,708	5,882	39·3	4,232	28·3	1,164	197·9
Jamkhandi . . .	123,881	4,464	36·0	2,695	21·8	627	140·5
Kurundwad (Senior)	48,193	2,028	42·1	1,140	23·7	279	137·6
Kurundwad (Junior)	43,470	1,819	41·8	1,291	29·7	290	159·4
Miraj (Senior) . . .	102,289	2,633	25·7	3,039	29·7	395	150·0
Miraj (Junior) . . .	45,130	1,592	35·3	1,124	24·9	238	149·5
Phaltan . . .	64,862	2,517	38·8	1,898	29·3	431	171·2
Ramdrug . . .	36,559	1,636	44·7	1,159	31·7	222	135·7
Savanur . . .	22,879	935	40·9	508	22·2	90	96·3
Kolhapur . . .	999,313	36,755	36·8	24,352	24·4	*	*
Mudhol . . .	64,805	2,252	34·8	1,244	19·2	228	101·2
Sangli . . .	285,683	11,454	40·1	7,298	25·5	1,798	157·0
Sawantwadi . . .	248,299	7,809	31·4	4,790	19·3	698	89·4
Aundh . . .	85,270	3,570	41·9	2,165	25·4	659	184·6
CENTRAL INDIA AGENCY.							
Indore . . .	1,440,997	36,033	25·0	36,619	25·4	9,952	276·2
Bhopal . . .	757,462	22,724	30·0	29,202	38·6	6,043	265·9
Narsingarh . . .	123,003	1,738	14·1	1,376	11·2	386	222·1
Rajgarh . . .	149,690	2,244	15·0	1,693	11·3	*	*
Kurwai . . .	23,711	379	16·0	394	16·6	112	295·5
Makrai . . .	17,514	617	35·2	848	48·4	160	259·3
Khilchipur . . .	49,646	699	14·1	643	13·0	160	228·9
Mohammadgarh . . .	2,665	52	19·5	58	21·8	16	307·7
Ratlam . . .	123,330	2,089	16·9	1,966	15·9	384	183·8
Dewas Senior Branch	7,956	1,197	150·5	1,171	147·2	*	*
Piploda . . .	9,524	189	19·8	223	23·4	65	343·9
Panth Piploda . . .	4,648	114	24·5	86	18·5	20	175·4
Jobat . . .	21,516	237	11·0	189	8·8	*	*
Sailana . . .	41,307	504	12·2	619	15·0	66	131·0
Barwani . . .	156,481	2,295	14·7	2,358	15·1	*	*
Nimkhera . . .	6,975	89	12·8	138	19·8	*	*
Bakhatgarh . . .	8,767	217	24·8	304	34·7	*	*
Ratanmal . . .	2,469	52	21·1	63	25·5	16	307·7
Bharudpura . . .	3,223	34	10·5	18	5·6	3	88·2
Kathiwara . . .	6,756	140	20·7	101	14·9	29	207·1
Mathwar . . .	3,044	150	49·3	76	25·0	23	153·3
Hyderabad . . .	15,876,693	170,432	10·7	158,971	10·0	*	*
Mysore . . .	6,981,469	150,410	21·5	102,228	14·6	16,082	106·9

* Figures not available.

SECTION II. HISTORY OF THE CHIEF DISEASES.

Introduction.

13. The methods of registration and compilation of vital statistics in British India have been fully discussed in the annual reports for 1936 and 1937. It has been shown that, under existing conditions, it is possible to record the causes of death, apart from such epidemic diseases as cholera, smallpox and plague, only in certain broad groups such as "fevers", "respiratory diseases" and "all other causes". Bearing this in mind the two diagrams facing this page may be examined. One diagram gives the mean number of deaths during the ten years, 1929—38, classified under these causes of mortality and the other presents similar information in respect of 1938. The undifferentiated groups entitled "fevers" and "respiratory diseases" are by far the most important from the point of view of the health of the community and, as has been repeatedly stressed by the Public Health Commissioner in his previous annual reports, progress in preventive work on scientific lines depends largely on patient investigation by the health authorities in order to separate out the diseases that constitute these groups.

Cholera.

14. The geographical distribution of cholera in Asia during 1930—38 is shown in the map facing this page. The areas affected by cholera in the different countries during 1937 and 1938 are shown separately and, in respect of previous years, the localities affected have the respective dates shown against them. It will be seen that, in 1938, cholera was prevalent in certain parts of Japan, Korea, China, Indo-China, Burma, India and Afghanistan. Of these countries India had the highest incidence. All excepting Korea and Afghanistan had cholera outbreaks in 1937 also. Malaya too had the infection during this year.

A striking feature is the general absence of infection during the whole period, 1930—38, in the Netherlands Indies. The insular position of these territories and the strict measures taken by the health authorities are responsible for successfully keeping out cholera. A comparison between the cholera situation in British India and in the Netherlands Indies was made in a monograph* entitled "The Eradication of Cholera and the Campaign against Smallpox in Netherlands Indies" from which the following is an extract:—

"The population of British India in 1921 was 318,942,000 and of Java and Madoera 34,984,171 in 1920. We find from the table by summation that during the years 1923—34, the number of deaths from cholera in British India was 2,490,409 and for Java and Madoera only 17, of which 16 were in the year 1927 and one in 1928. It seems evident that the great improvement in the Netherlands Indies, as regards cholera, must be set down to the introduction of pipe water-supplies, reorganization of the public health service, large scale vaccination, insistence on certificates of vaccination for immigrants and pilgrims, and strict quarantine regulations."

It is clear that India has to make considerable progress before attaining such conspicuous success in the campaign against cholera.

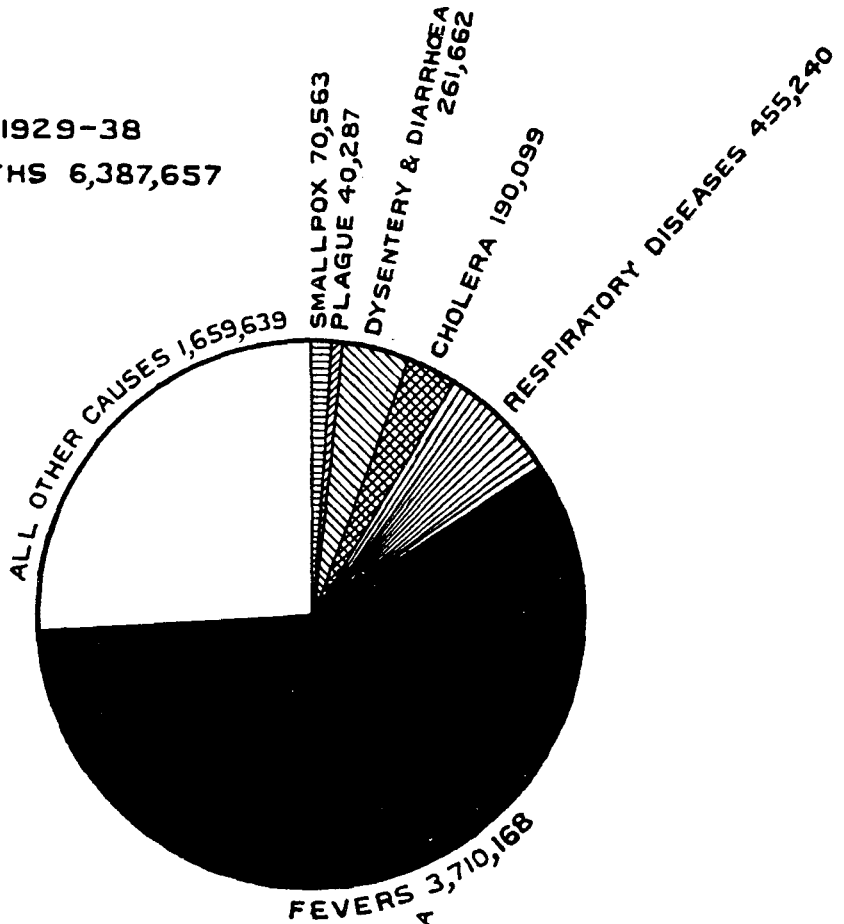
In table II (i) are presented the average annual numbers of deaths for each of the quinquennia between 1877 and 1936 as well as the deaths during the individual years of the present decennium.

* Page 859, Tropical Diseases Bulletin, November 1936.

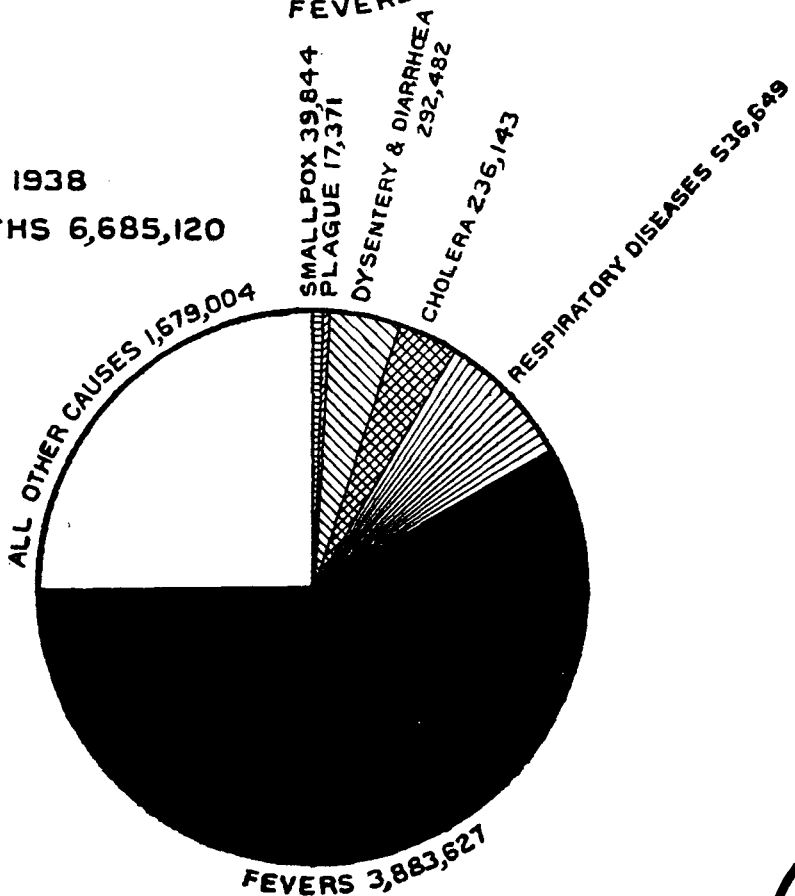
BRITISH INDIA

COMPARATIVE DIAGRAMS OF DEATHS BY CAUSES

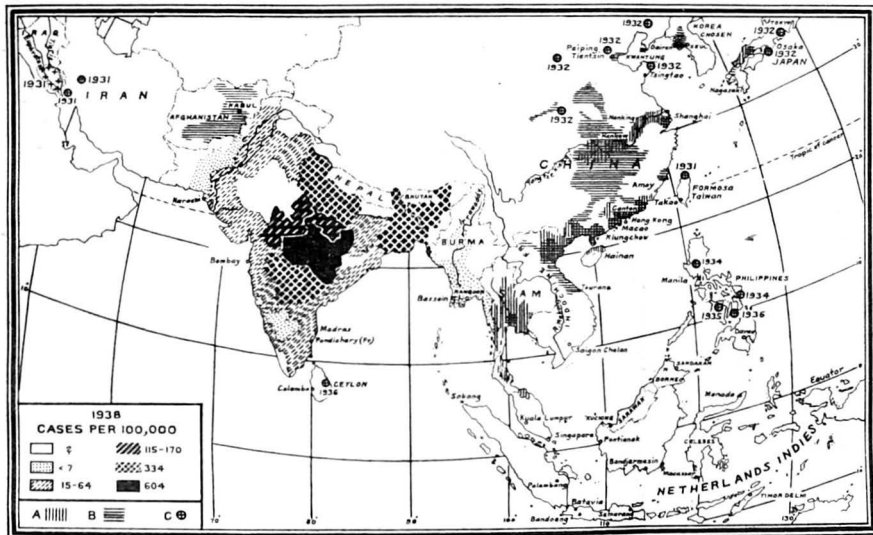
MEAN 1929-38
TOTAL DEATHS 6,387,657



YEAR 1938
TOTAL DEATHS 6,685,120



GEOGRAPHICAL DISTRIBUTION OF CHOLERA IN ASIA 1930-1938



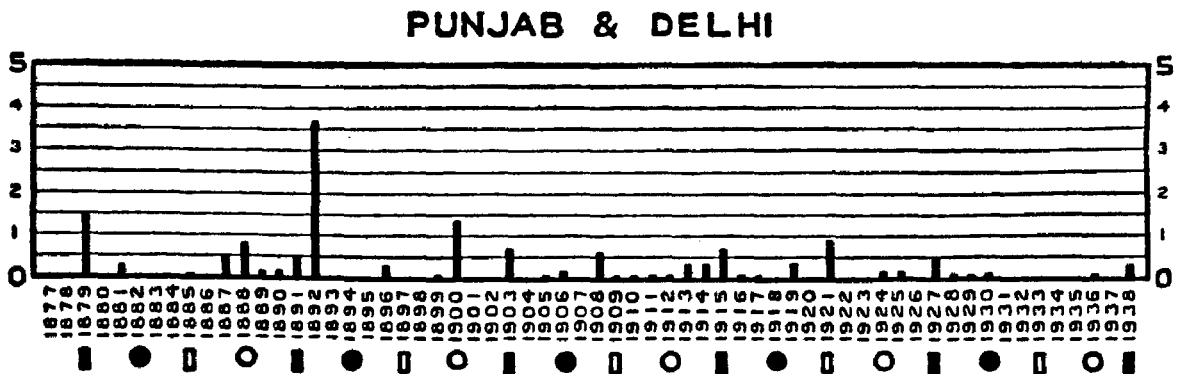
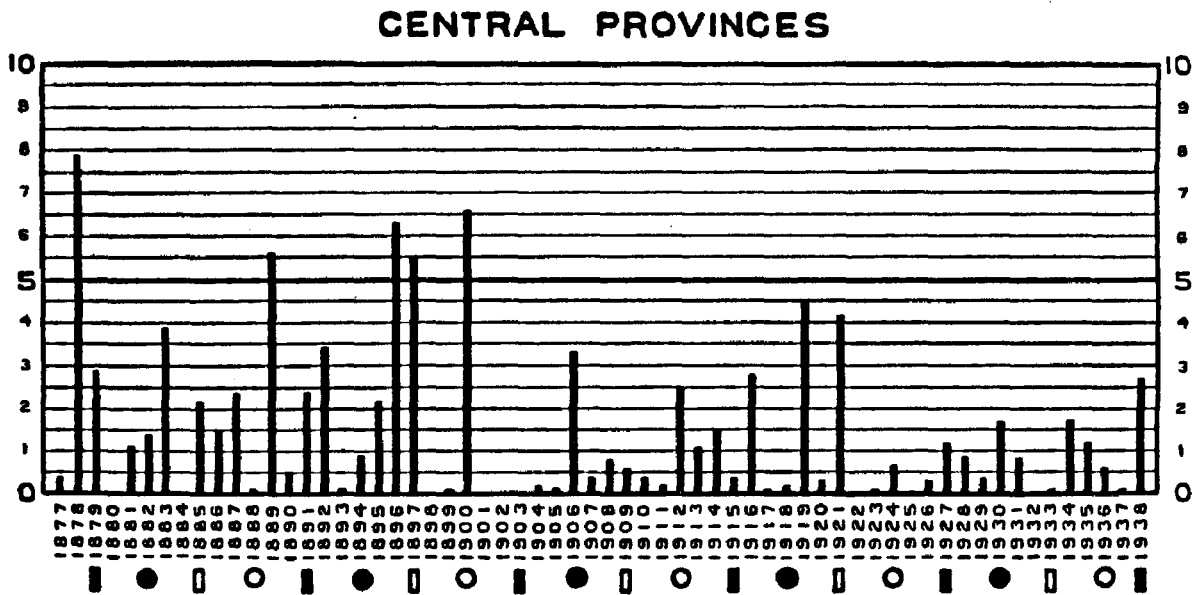
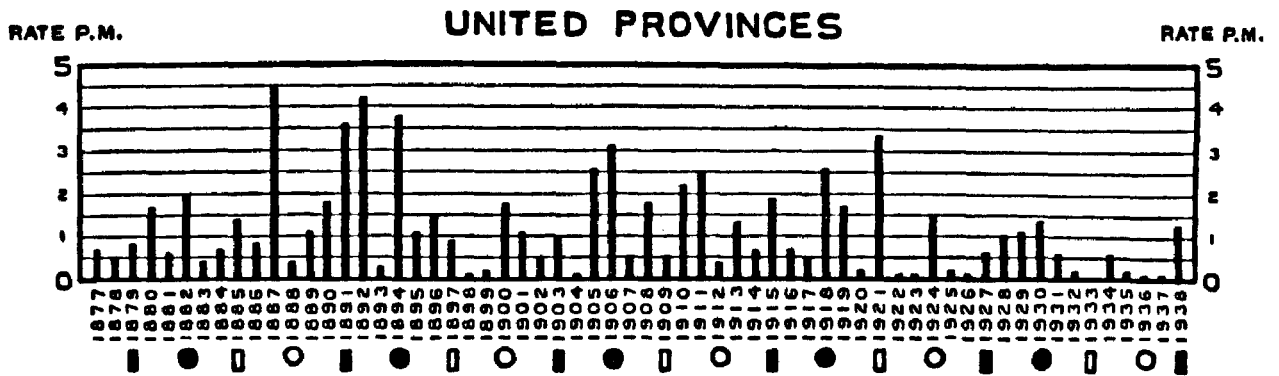
A. Disease reported in 1937.

B. Disease reported in 1938.

C. The dates shown on the map for the various territories correspond to those of the latest occurrence of the disease.

NOTE:- Reproduced from the League of Nation's Weekly Epidemiological Record for August 31st, 1939. R. H. 705.

DIAGRAMS SHOWING THE RATES OF CHOLERA MORTALITY PER MILLE OF THE POPULATION DURING THE PERIOD 1877-1938. THE YEARS DURING WHICH THE FESTIVALS AT ALLAHABAD & HARDWAR TOOK PLACE ARE ALSO INDICATED.



INDEX.

- Kumbh festivals in Hardwar* -----■
- Adh-Kumbh festivals in Hardwar* -----□
- Kumbh festivals in Allahabad* -----●
- Adh-Kumbh festivals in Allahabad* -----○

Cholera Mortality in British India (excluding Burma) Table II (i).

TABLE II (i).										Annual average.
Period.										
1877—81	.	.	.	.	.	.	.	.	.	288,949
1882—86	.	.	.	.	.	.	.	.	.	286,105
1887—91	.	.	.	.	.	.	.	.	.	400,934
1892—96	.	.	.	.	.	.	.	.	.	443,890
1897—01	.	.	.	.	.	.	.	.	.	383,294
1902—06	.	.	.	.	.	.	.	.	.	367,160
1907—11	.	.	.	.	.	.	.	.	.	397,127
1912—16	.	.	.	.	.	.	.	.	.	328,593
1917—21	.	.	.	.	.	.	.	.	.	392,070
1922—26	.	.	.	.	.	.	.	.	.	143,890
1927—31	.	.	.	.	.	.	.	.	.	297,756
1932—36	.	.	.	.	.	.	.	.	.	140,440
1931	.	.	.	.	.	.	.	.	.	220,375
1932	.	.	.	.	.	.	.	.	.	66,137
1933	.	.	.	.	.	.	.	.	.	68,139
1934	.	.	.	.	.	.	.	.	.	198,886
1935	.	.	.	.	.	.	.	.	.	210,304
1936	.	.	.	.	.	.	.	.	.	158,736
1937	.	.	.	.	.	.	.	.	.	99,054
1938	.	.	.	.	.	.	.	.	.	236,143

It will be seen that the annual quinquennial average mortality from this disease has ranged from nearly 444,000 during 1892—96 to about 140,000 during 1932—36. During the present decennium also the variation in the figures for individual years has been considerable. The year 1938 has recorded the largest number of cholera deaths since 1931, the increase over that of 1937 being 137,000. The cause of this rise was a widespread dissemination of cholera infection all over Northern India as the result of an outbreak of the disease which took place at the Hardwar festival in April 1938. The part played by festival centres in the dissemination of cholera has been recognised by the health authorities of this country and, of all the festivals, the *Ardh* and full *Kumbh melas* at Allahabad and Hardwar have been known to be the most dangerous from this point of view. In the diagram facing this page are shown graphs representing cholera mortality during a period of 62 years in relation to the occurrence of the *melas* at Hardwar and Allahabad. It will be seen that the festival years have generally been associated with extensive outbreaks of the disease.

Apart from the general impression of a possible association between a rise in cholera incidence and the occurrence of these festivals which the graphs suggest, it was considered desirable to investigate whether the relationship, if any, between the two factors can be demonstrated by a statistical examination of the available figures. As may be expected, the festivals at Hardwar and Allahabad have been shown to be responsible for an increased incidence of cholera in the United Provinces. On the other hand, the festivals at Hardwar alone have been shown to have influenced the rise of cholera in the Punjab and Delhi, while no association could be demonstrated between a rise in cholera mortality in the Central Provinces and the occurrence of these festivals either at Allahabad or Hardwar.

Turning to the history of the cholera epidemic in 1938, the Hardwar festival started on 1st February and lasted till the end of April. Although the festival lasted several weeks, it was only on important days that large gatherings of pilgrims assembled and such occasions are particularly dangerous from

the point of view of spread of infectious disease. Important days for the festival were the 28th February, 31st March and 13th April, the total attendance on the last date being stated to have been about a million.

The N.-W. F. Province, the Punjab and Delhi were completely free from cholera during the first quarter of the year. Delhi province recorded its first case of the disease (a pilgrim returning from Hardwar) in the week ending 2nd April and the Punjab during the succeeding week. It may be recalled that the 31st March was an important day attracting a large gathering of pilgrims. Thereafter the infection spread rapidly. The rate of its spread towards the north-west may be seen from the fact that, while in the Punjab the first case took place in Ambala Cantonment during the week ending 9th April, by the end of the following week eleven districts had become infected, that of Lahore forming the western limit. During the week ending 23rd April the infection spread to 16 other districts, so that 27 out of the 29 were infected by the end of that week. In the following week ending 30th April, the disease spread to the N.-W. F. Province. Cholera spread also to Bihar and the Central Provinces, the outbreak in the latter being severe. The United Provinces also suffered heavily. Provincial details regarding outbreaks of cholera will be found later in the paragraphs dealing with individual provinces.

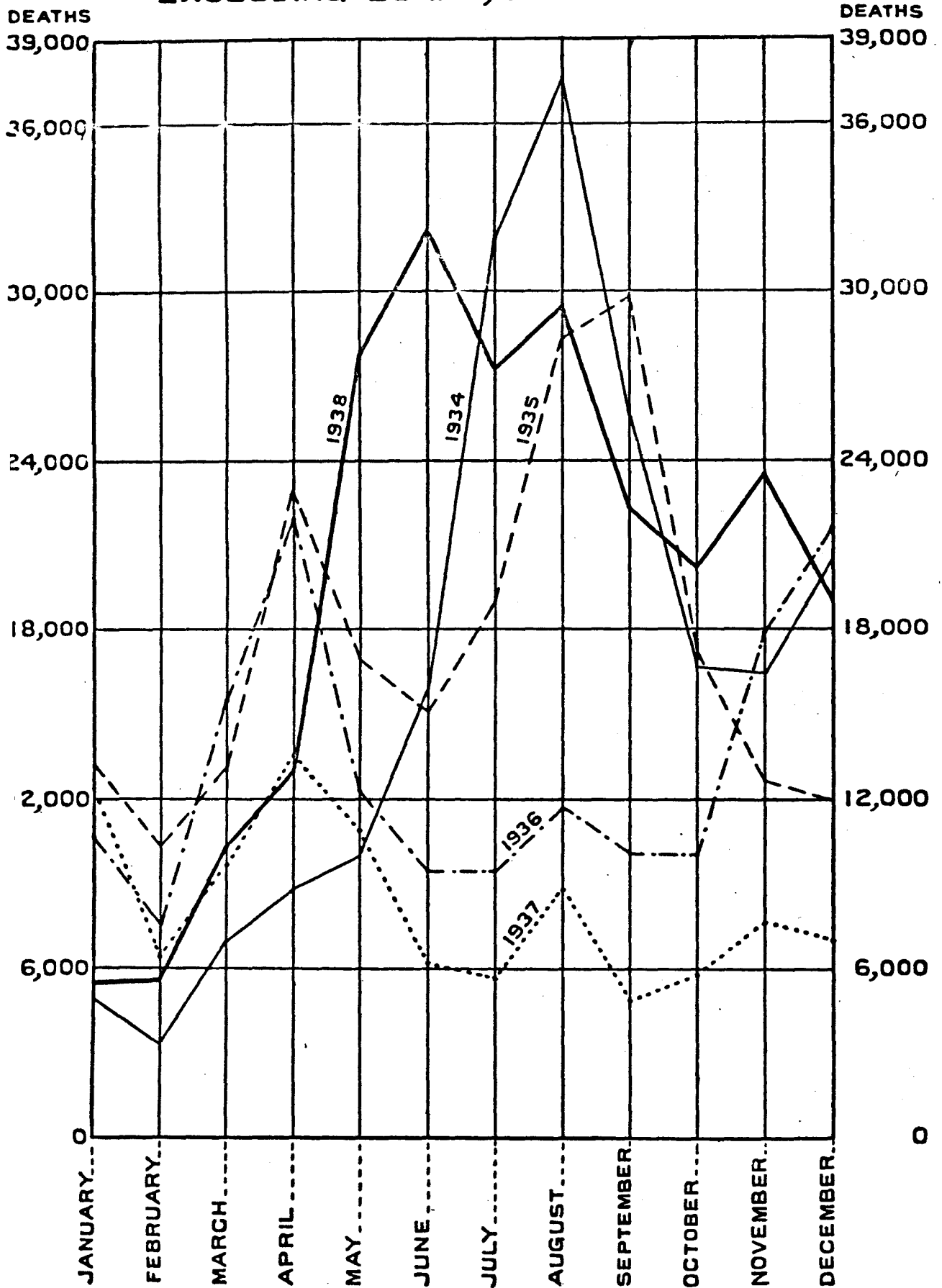
Provincial Governments were called upon to shoulder the burden of additional expenditure as the result of the spread of cholera and the following table presents the information regarding such expenditure:—

TABLE II (ii).

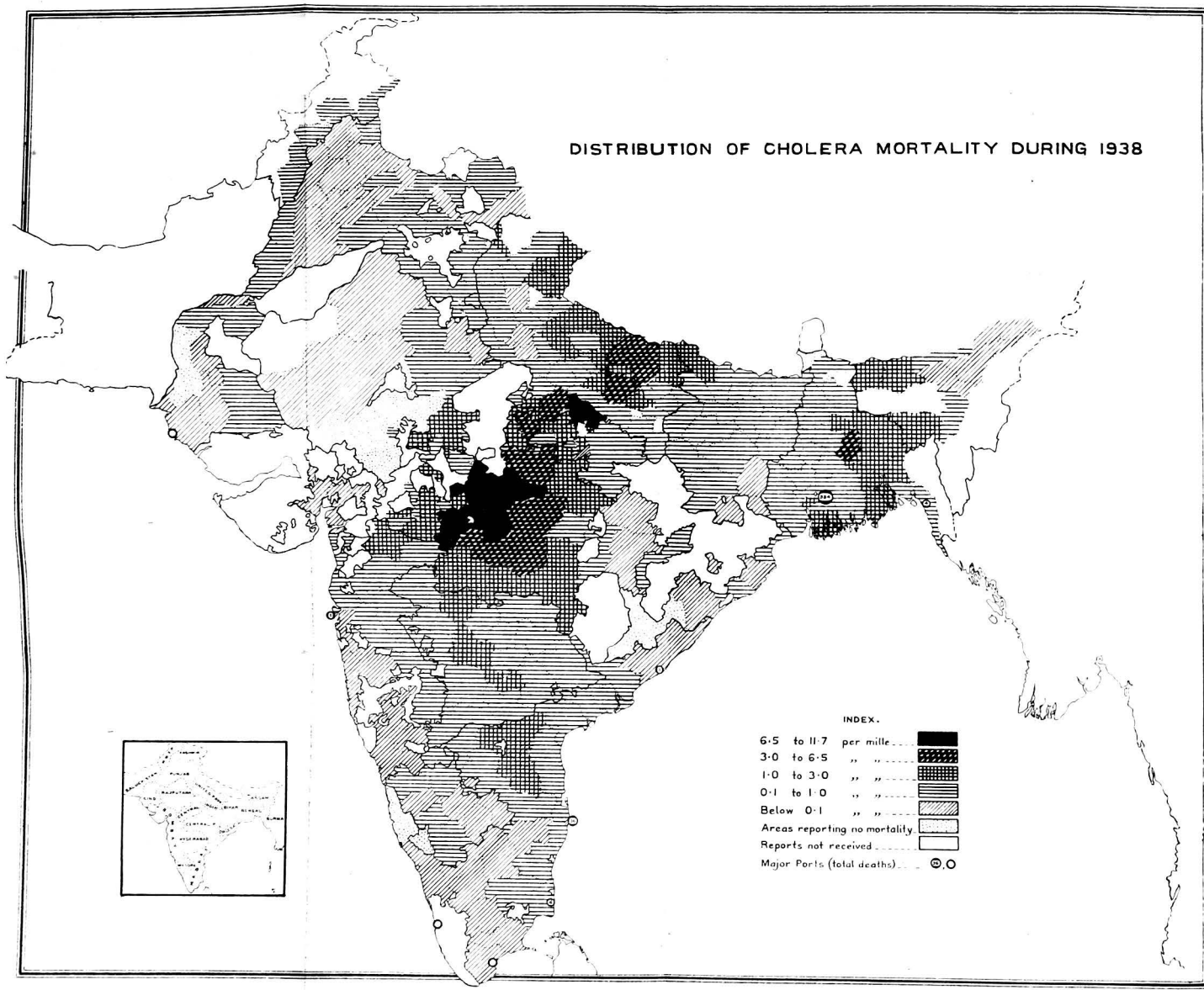
Province.	Cost of additional staff.	Cost of cholera vaccine, other medicines and medical requisites.	Total.
	Rs.	Rs.		Rs.
1. N.-W. F. Province	15,625		15,625
2. Punjab	1,20,000		1,20,000
3. Delhi Province (Delhi city only)	2,432	3,232	5,664
4. United Provinces	81,071	1,14,082	1 95,153
5. Bihar	3,500	800	4,300
6. Bengal	5,860	1,261	7,121
7. Central Provinces	28,985	33,900	62,885
GRAND TOTAL . . . . .	..	..	4,10,748

It will be seen that a sum of over four lakhs of rupees was spent by the different provinces for controlling the epidemic. Apart from this large avoidable expenditure, the disease caused an amount of suffering and mortality which cannot be assessed in terms of money. It is clear that prompt measures are necessary in order to prevent these recurring outbreaks of cholera originating in festival centres. The provision of protected water-supplies and of satisfactory methods of nightsoil disposal in the rural and urban areas of the country can alone eventually solve the cholera problem. At the same time, before

CHOLERA DEATHS BY MONTHS IN BRITISH INDIA, EXCLUDING BURMA, DURING 1934-38.

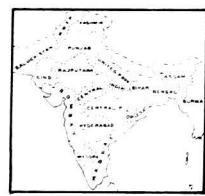


DISTRIBUTION OF CHOLERA MORTALITY DURING 1938



INDEX.

- 6.5 to 11.7 per mille... [Solid black box]
- 3.0 to 6.5 " " [Cross-hatch box]
- 1.0 to 3.0 " " [Diagonal lines box]
- 0.1 to 1.0 " " [Horizontal lines box]
- Below 0.1 " " [Vertical lines box]
- Areas reporting no mortality [White box]
- Reports not received [Dotted box]
- Major Ports (total deaths) [Circle with 'O']



such a stage can be reached, every effort must be made to reduce the incidence of the disease by the adoption of other means that are available.

Such a measure, although its value is strictly temporary, is mass inoculation against cholera by which protection can be conferred on a community threatened with a possible outbreak of the disease. While the sanitary control of the festival area is a necessary measure of protection, the large tracts of territory, which may possibly be infected, through which the pilgrims have to travel to and from the festival centre, constitute danger zones against which, under existing conditions, adequate protection can be afforded only through inoculation. In view of the importance of the problem, the Central Advisory Board of Health decided that a special Committee should be appointed to investigate the possibility of introducing a system of compulsory inoculation of pilgrims attending festival centres. Although in a report dealing with 1938, it may be an anticipation of future events when a reference is made to occurrences taking place in 1939 and 1940, it may not be out of place to record here that this Committee, after careful deliberation, made certain concrete proposals for adoption by provincial and State Governments in order to introduce an indirect form of compulsory inoculation of pilgrims at selected festival centres. The Central Advisory Board of Health, at its meeting in July 1940, commended these proposals to the earnest consideration of the Governments concerned.

In the North-West Frontier Province the deaths from cholera in 1938 numbered 740 against 24 during the previous year. Infection from Hardwar was first imported to Dera Ismail Khan, Kohat, Hangu and Mardan at the end of April and during the early part of May. Later in the month, the disease spread to Peshawar and Bannu. By the end of June the danger from the epidemic was over in the province. The health staff was augmented, prompt preventive measures were taken and anti-cholera inoculation was carried out on an extensive scale. It is stated that the willingness of the Pathan to be inoculated made it possible to put an effective check on the spread of the disease. In all, over 234,000 inoculations were carried out.

In the Punjab cholera deaths in 1938 numbered 5,760 while the corresponding average annual figure for the previous ten years was only 941. During these ten years the maximum mortality from cholera in any single year (1929) was 2,309, so that the incidence of the disease in 1938 was about two and a half times the highest figure recorded during the previous ten years. The height of the epidemic in 1938 was reached in the third week of May when 696 deaths were recorded. The outbreak then gradually declined, the last case reported being on 16th September 1938.

A total of 1,584 different centres was affected, of which 129 were towns and 1,455 villages. Although the *Kumbh mela* is a Hindu festival and infection was brought into the Punjab by returning pilgrims, only 55 per cent of the total number of cases took place among the Hindus, the remaining 45 per cent being distributed among the other communities. A large additional staff was employed and, among other preventive measures, anti-cholera inoculation was carried out on 666,652 individuals.

Delhi province reported 182 deaths from cholera in 1938 while, during the previous year, the disease was altogether absent. Prompt measures were taken in the villages and in the urban areas. In the rural area it is stated that the use of a motor van equipped with the necessary material for the treatment of patients and for preventive work and with a doctor in charge, who knew the people, was of great value in the campaign against the disease. In

In addition the rural health staff also took part in the carrying out of the preventive measures. A question of considerable importance was that of preventing the possibility of widespread dissemination of infection through milk in the urban areas, which depend largely on the villages for this important article of food. It is stated that the Police and Revenue Departments rendered valuable assistance to the health authorities in this campaign and that the vigilance of all concerned was responsible for the prevention of such a calamity.

In Delhi city, where congestion and overcrowding render spread of infection easy, additional doctors were employed and anti-cholera inoculation was carried out on an extensive scale, in all about 70,000 persons being protected. It is stated that this prompt measure was largely responsible for restricting the incidence of cholera to 139 cases. In the province as a whole 93,213 inoculations were carried out.

As may be expected the United Provinces bore the brunt of the cholera epidemic which started at Hardwar. Deaths from this disease numbered 70,622 in 1938 against 6,341 during the previous year. The epidemic reached its peak incidence in June with 21,013 deaths in that month alone. In the rural areas, of the 48 districts the mortality rate from cholera in 14 was above the provincial average rate (1.5), Banda district recording the highest figure (7.8). Other districts with high incidence of the disease in the rural areas were Hamirpur (5.1), Sultanpur (4.6), Gonda (4.6) and Partabgarh (4.5). Low cholera death rates were registered in the districts of Benares (0.19), Muttra, Budaun and Ghazipur (0.11 each), Etah (0.03) and Mainpuri (0.02).

Of the 440 towns in the province, 196 escaped infection while another group of 144 towns experienced only very mild outbreaks causing not more than ten deaths in each case. The highest cholera mortality rate was recorded in the town of Naraini in Banda district (23.2). Other towns with high rates were Ramnagar in Bara Banki district (14.6), Atarra in Banda district (14.0) and Rikhikesh in Dehra Dun district (12.8). Vigorous anti-cholera measures were adopted in all the infected areas. In the rural areas of some districts control of cholera was rendered difficult owing to scarcity of water and arrangements were made through the district authorities and various non-official organisations for the removal of silt from wells and for the provision of drinking water. In addition all the usual preventive measures against cholera were carried out, a large temporary staff being recruited for assisting the permanent health organisation in the prosecution of the campaign. Anti-cholera inoculation was carried out as extensively as possible in the affected urban and rural areas and in all, 1,528,700 inoculations were carried out. Grants totalling Rs. 40,300 were placed at the disposal of district magistrates by Government for preventive measures in rural areas. Temporary regulations under the Epidemic Diseases Act were enforced in a number of rural districts and municipalities.

In Bihar cholera deaths in 1938 totalled 14,750, an increase of 801 deaths over the figure for the previous year. The disease is reported to have started in sporadic form in all the districts except Ranchi and Singhbhum, its maximum incidence having been reached in the month of November. The Director of Public Health reports that, in spite of the general absence of protected water-supplies and efficient conservancy arrangements, the experience of recent years has shown that the employment of trained health personnel under qualified health officers has produced an improvement in the situation by preventing, in many cases, outbreaks of the disease from taking an explosive turn and spreading widely in the community. Ten districts in the province employ health officers with suitable subordinate staff. To combat the epidemic in 1938 it is reported

that temporary doctors on epidemic duty were employed in all districts. The Director states that anti-cholera inoculation has now become a popular preventive measure and that 593,375 doses of the vaccine were issued during 1938 for mass inoculation in the affected areas.

There was an abnormal increase of cholera in Bengal in 1938 in comparison with the previous year, the numbers of recorded deaths from this disease being 71,133 and 32,710 respectively in the two years. This rise does not appear to have been associated with the Hardwar festival. The reason is stated to be the occurrence of extensive floods in October 1938, the spread of the disease being very high in the succeeding month of November. The curve of cholera incidence in Bengal generally reaches its lowest level during the monsoon period, rises gradually in autumn and through the winter months and reaches its maximum in April and May. In 1938, however, the maximum was reached in November, about a month after the flood had swept over wide areas of the province. In the flood months there occurred in the affected areas 14,763 deaths from cholera as against 1,022 during the same period of the previous year. Compared with 1937, of a total of 26 districts, 17 are stated to have experienced an increased incidence of the disease in 1938.

The usual preventive measures were carried out. In order to facilitate work in the areas affected by the flood, it is reported that "floating dispensaries" were employed, each consisting of a doctor, a compounder and a medicine carrier with the necessary drugs and appliances. A total of 3,401,615 c. cs. of anti-cholera vaccine was issued for use in the areas of infection during 1938.

The Central Provinces were hit hard by outbreaks of cholera during 1938, the total mortality from this disease reaching 45,332 as against 1,107 in 1937. Cholera first appeared in January 1938 in Hoshangabad and Bilaspur districts, the infection being imported from outside. The epidemic continued during the succeeding months of February and March. The outbreak of the disease following the Hardwar festival introduced infection to numerous parts of the province and cholera continued to prevail widely till December, when all the districts became free. The total number of anti-cholera inoculations performed was 1,887,632.

In Bombay Presidency the incidence of cholera in 1938 was very much less than in the previous year, the numbers of deaths from this disease being 3,813 and 10,992 respectively in the two years. During the year under review cholera epidemics prevailed in 111 registration circles and 812 villages. For the period 1934—37 the average yearly mortality from the disease was in the neighbourhood of 11,000 and the figure for 1938 was therefore a welcome drop from the high incidences recorded in the previous years.

In 1938 the largest numbers of deaths were recorded in the districts of West and East Khandesh. Other districts experienced varying degrees of prevalence of the disease, Ahmedabad alone being completely free. The first half of the year was relatively free from infection, only 268 deaths being recorded during this period out of a total of 3,813 deaths from cholera for the whole year. The disease reached its highest incidence in the period, August to October.

The usual precautionary measures were carried out in the urban and rural areas. The total number of inoculations carried out was 323,579.

Cholera infection was introduced into Sind in 1938 by pilgrims returning from the Hardwar festival. The first case was reported on 21st April and the last case took place on 28th August. During the intervening period, a total of 343 deaths from cholera was recorded.

Cholera is endemic in certain deltaic areas like that of the Ganges and the Brahmaputra in Bengal and that of the Cauvery in Madras Presidency. In

North-Western India generally the disease is prevalent only in epidemic form, certain years showing little or no incidence of cholera while in others a high mortality from this cause is recorded. For instance, an examination of the cholera deaths in Sind for a period of 22 years from 1917 to 1938 shows that in 1920 and 1930 no deaths took place from this cause while in eight other years, the number of deaths was under 10 each year. On the other hand, in 1929, cholera deaths increased to 6,411. This wide disparity in the incidence of the disease between individual years is, generally speaking, characteristic of the N.-W. F. Province, the Punjab, Sind and Baluchistan, relatively dry areas where the climatic conditions are presumably unfavourable for the continued presence of the disease.

In 1938, 31 cholera deaths were reported from urban areas and 312 from rural areas in Sind. The preventive campaign carried out included the appointment of ten special officers, medical inspection by the railway authorities of passengers at Ruk, Sukkur and Mirpurkhas stations, the provision of facilities to local bodies for the free examination of water-supplies and anti-cholera inoculations totaling 27,434.

In Madras Presidency there has been a steady decrease in the prevalence of cholera since 1935. The numbers of deaths recorded under this cause in the years between 1935 and 1938 were 35,456, 34,117, 23,307 and 10,252. The drop in the figure for 1938 from that for the previous year is particularly noticeable.

From the point of the epidemiology of cholera the different parts of the province present a varied experience. Thus the southern Tamil districts, which receive the bulk of their rainfall from the north-east monsoon, have their cholera season coinciding with the late autumn and winter months, while the West Coast and Northern Circars, which get the benefit of the south-west monsoon, have their cholera season earlier during the second and third quarters of the year. In between these lies a group of central districts and they appear to partake of the characteristics of both the other groups in regard to cholera incidence. In the light of these remarks the cholera history of 1938 may be briefly summarised.

The winter epidemic of 1937 continued in the first quarter of 1938 in a severe form in the districts of South Arcot and Tanjore and to a milder extent in a group of central districts, Chingleput, Cuddapah, Chittoor, Coimbatore, Nellore and Trichinopoly. The epidemic subsided in all the districts except Tanjore where it continued in a mild form throughout the year.

In the second quarter a widespread epidemic started in the East and West Godavari districts of the Northern Circars and spread northwards to Vizagapatam and to the south and west into the Ceded Districts as far as Cuddapah and Kurnool. The height of the epidemic was reached in the third quarter and the infection subsided in the last quarter.

The Director of Public Health states that, in many instances, the spread of cholera has been traced to the migration of labour in connection with the transplantation and picking of the groundnut crop. The question has been investigated in eight districts and it is stated that a programme of preventive work has been formulated for application during the next cholera season. Another important investigation was that of the carrier problem in Madura under the direction of the Director, King Institute, the Municipal Public Health Laboratory carrying out the work. It is reported that the work is not complete and that further progress is expected during the next cholera season. The Director of Public Health states that the passing of the Public Health Act in 1939, the inauguration of a scheme for rural protected water-supplies and

the training in public health of the medical practitioners belonging to the Subsidised Rural Medical Service have contributed to strengthen the organisation for the effective control of cholera in the villages.

The number of deaths from cholera in Assam during 1938 was 11,907 against 5,440 in 1937. The districts of Sylhet and Goalpara suffered most during the year under review, the death rates from this disease being 2·9 and 2·3 *per mille* respectively. Sibsagar and Lakhimpur recorded the lowest rate, namely, 0·02. Cholera deaths were registered in 100 registration circles among a total of 148 and in 2,629 villages out of a total of 28,333 villages in the province. The epidemic reached its maximum intensity in the months of November and December while February recorded the lowest incidence.

Preventive work was carried out by seven mobile units, each consisting of three subassistant surgeons and six men to carry disinfectants, drugs and other articles. It is reported that this staff is insufficient to deal with an extensive epidemic and that the provision of additional units is essential for rendering aid to the people. The total number of persons inoculated during the year was 972,696.

The cholera researches carried in the different laboratories in India are briefly summarised below:—

Central Research Institute, Kasauli.—Investigations were carried out for developing an improved technique for the differential isolation of *V. cholerae*. Many different methods were tried during the year and it was found that considerable success could be obtained by a modification of the liquid enrichment medium of Wilson and Blair. The modification consisted in the substitution of peptone water for broth, and mannose for mannite, and a mixture of salts at 2 per cent concentration in character and proportions similar to those existing in sea water. The improved technique was subjected to field trials in Calcutta in April and May. Seventysix specimens from 37 clinical cases of cholera, which had been declared negative by the ordinary methods in use, were re-examined and 28·9 per cent proved positive by the new method and 15·3 per cent by peptone water enrichment. The medium, however, will not differentiate agglutinable vibrios and mannose fermenting inagglutinable vibrios. A high degree of suppression of all coliform types is reported to be an important result of the use of this medium. The method was under trial in Bengal and *O* agglutinable vibrios from tanks in rural areas were isolated in many cases. The difficulty due to the presence of mannose fermenters of types other than *V. cholerae* in water still remains and the question is being investigated. Chemical studies were in progress with a view to obtaining a substance which would be specifically fermentable by the agglutinable vibrio.

All-India Institute of Hygiene and Public Health, Calcutta.—In order to test the efficiency of the modified differential medium of Wilson and Blair for the isolation of agglutinable *Inaba O* vibrios investigations were carried out on samples of stools from cholera and non-cholera patients, contacts of cholera cases and healthy persons with no contact and on samples of water collected from tanks, wells, rivers and drains in Calcutta and certain villages in Bengal. Peptone water was used as a control. In the case of both media it was found that the isolation of *Inaba O* positive organisms was more frequent in typical cases, although there was quite a number of failures even in clinically typical cases. Some of the clinically atypical cases also yielded positive results. The differential medium, though not wholly efficient, was found to be better than peptone water medium.

Studies were also carried out into the bacteriological aspects of the problem of epidemicity and endemicity of the disease. Four areas exhibiting combinations of high and low epidemicity and endemicity were selected on the basis of previous statistical studies. The investigations carried out included (i) chemical analysis of water-supplies, (ii) serological examination of samples of blood obtained from healthy non-contacts and (iii) continued examination of stools of cases and contacts and of water samples. It is reported that the findings of these investigations suggested that infection with *Inaba O* vibrios by itself might not necessarily cause disease. Apart from the immunity status of the population, the change in virulence or in the quantum of infection might be responsible for the occurrence of epidemics.

The statistical studies were confined to the nineteen homogeneous cholera districts into which the whole of south-west Bengal had been divided. The relationship of certain meteorological factors, namely, temperature, rainfall, relative humidity and number of rainy days, to the incidence of cholera was investigated in respect of five districts by the

method of analysis of covariance. Only for one district was positive correlation shown to exist and that in respect of temperature alone.

The trend of cholera incidence was found to be on the decline in the case of 10 out of 19 districts. A classification of these districts was carried out on the basis of endemicity as well as epidemicity. Foster's "Grating periodograph" was used to investigate the periodicity of the incidence of the disease and in no homogeneous cholera district was this periodicity demonstrated.

The method of forecasting cholera, which had been reported previously, was applied to the homogeneous districts and satisfactory results were obtained in the case of ten districts.

School of Tropical Medicine, Calcutta.—One thousand three hundred and seven samples of faeces were examined from 631 clinical cases of cholera, O agglutinable vibrios were isolated from 58 per cent of the cases, H agglutinable and not agglutinable vibrios from 7 per cent while no vibrios could be isolated from 35 per cent of the cases. It was clear that improved methods of isolation for *V. cholerae* were required.

Sera from 113 cholera patients were examined for the presence of agglutinins. In the majority of patients agglutinins were demonstrated between the seventh and tenth day of the disease, the H agglutinins appearing earlier and in higher dilutions for the homologous and the standard Inaba strains.

Of 15 patients, in whom repeated stool examinations were negative, cholera agglutinins were demonstrated in five persons, samples being collected after the fifth day of the disease. On the other hand, in 13 contacts of cholera patients (workers in the cholera wards) no cholera agglutinins could be demonstrated (1 in 10 dilution) as well as in 110 healthy persons who gave no history of cholera.

Fourteen samples of cholera vaccine were tested for sterility, freedom from abnormal toxicity, antigenic response in rabbits and man and protective value in guinea pigs.

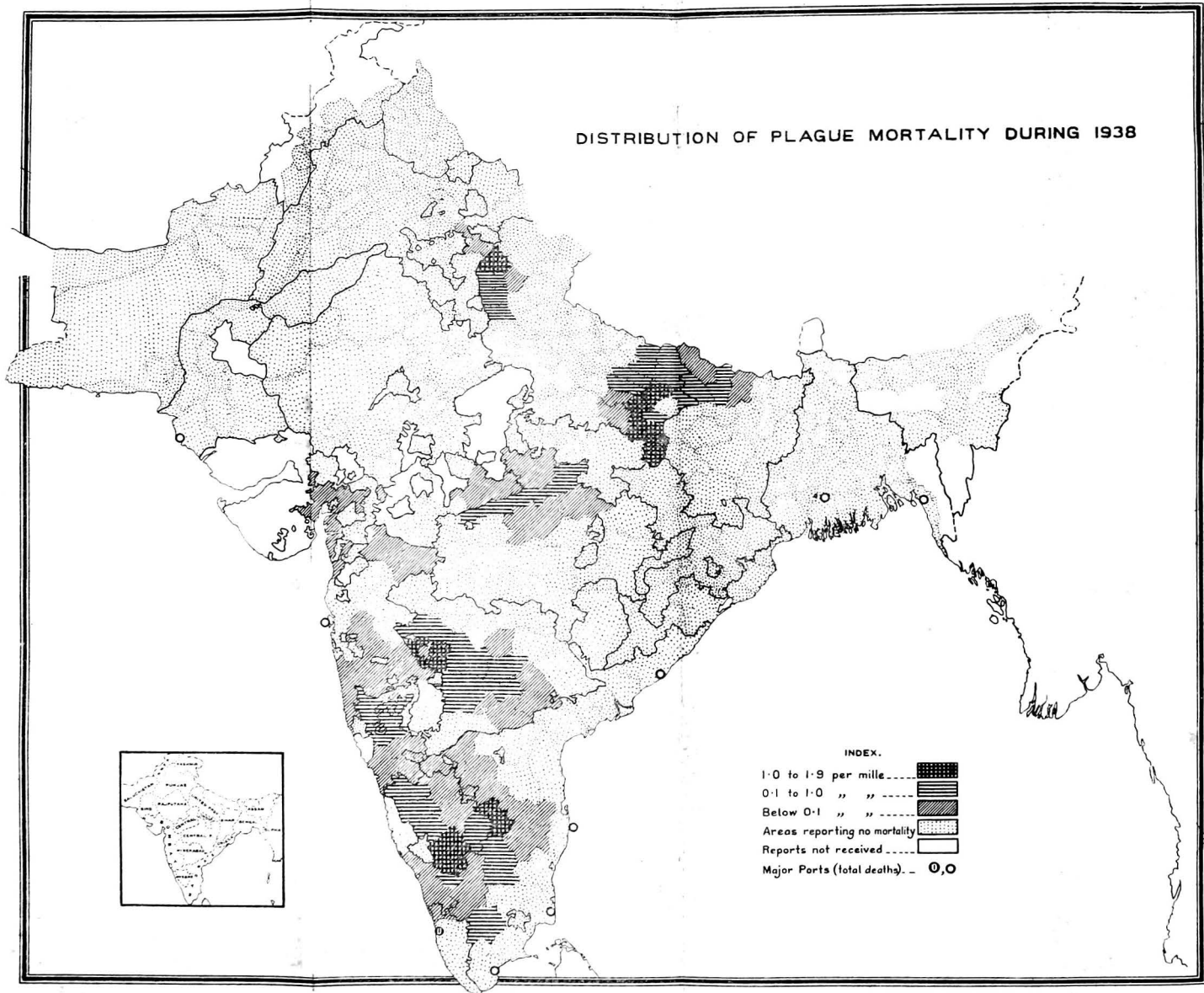
Pasteur Institute, Shillong.—An inquiry was started in Goalpara district in Assam to estimate in a rural population the incidence of vibrios in man and his environment before during and after an epidemic of cholera. Examination of stools from cholera cases, convalescent contacts and healthy persons and water samples was carried out in an epidemic area as well as in a cholera-free area. The alkaline peptone water enrichment method was employed for the cultivation of the vibrio and not the modified Wilson and Blair method. From these investigations the conclusion was drawn that inagglutinable vibrios are natural inhabitants of waters and that such vibrios taken in with water have little chance of survival in the gut of healthy persons, but that in those suffering from an intestinal disturbance they are more often met with in their stools.

During a 10-day period of investigation of an outbreak of cholera in Manipur State stools of 19 cases were examined culturally and the agglutinable vibrio could not be isolated from any of these cases. Samples of blood from these patients taken on an average about the 16th day after the onset of symptoms gave, with a single exception, uniformly negative results. This case agglutinated Inaba smooth suspension up to a dilution of 2,500, a titre very high even for a cholera case. It is not known whether the haemolysis which the serum had undergone was responsible for any non-specific agglutination. It was stated that the negative cultural and serological findings in a number of cases at the commencement of a cholera epidemic appeared to suggest that the vibrio could at times be infective in a less easily cultivable form. Observations were also made on the effect of bacteriophage on the agglutinable vibrio.

King Institute, Guindy.—Previous work had divided Madras Presidency into two zones corresponding to the greater prevalence of the Inaba or Ogawa type of vibrio. Broadly speaking, the strains of *V. cholerae* isolated previously from the Northern Circars and the Ceded Districts, where there were outbreaks of the usual severity, were of the Inaba type and from the southern districts of the province the vibrios were of the Ogawa type. However, during 1938, the few strains of vibrios derived from sporadic cases or small outbreaks in the southern districts of South Arcot, Tanjore and Ramnad were found to be of the Inaba type. Further investigation is required to determine whether this change of type in the Ogawa zone during a period of low prevalence of the disease is accidental or is really significant.

Investigations on the rôle of the common house fly in the spread of cholera continued, laboratory bred flies being used. The length of period during which the vibrio remains alive in the body of the house fly was investigated. Five hundred and twentytwo flies were dissected at intervals ranging from two hours to nine days after feeding with a mixture of sterile milk and a suspension of a young cholera culture. In 22 cases cholera vibrios could be isolated up to eight hours after feeding and in one instance up to 24 hours. Similarly isolation of vibrios from the faecal and vomit spots could not be effected beyond 24 hours.

DISTRIBUTION OF PLAGUE MORTALITY DURING 1938



Mention was made in last year's report of a bactericidal principle in the abdomen of flies which might be responsible for the early disappearance of flies. It was shown that flies caught in nature possessed the same bactericidal substance in their body. Although it was not possible to isolate this substance in a completely pure state, it was separated in a partially pure form. It was shown that it was of a crystalloid nature and that its bactericidal power was not due to an enzyme because it could resist heating to 115°C. for 20 minutes. Further this substance does not appear to have the same bactericidal effect on other organisms, such as *B. typhosus*, *B. paratyphosus* A and B, *B. dysenteriae*, Flexner and Shiga, *B. coli* and *Staphylococci*.

Plague.

15. The incidence of plague in India has been steadily decreasing during recent years. In 1938 the number of deaths from this cause recorded in British India was 17,371, a fall of 10,798 deaths in comparison with that registered during 1937. The N.-W. F. Province, Delhi, Orissa, Bengal, Assam, Sind, Coorg and Ajmer-Merwara completely escaped infection during 1938 while the Punjab registered only one death from plague. Of the total mortality from this disease in British India, 77·3 per cent took place in the United Provinces, 10·6 per cent in Bihar and 6·6 per cent in Madras Presidency. The other provinces which reported plague deaths were Bombay Presidency and the Central Provinces.

The monthly distribution of plague mortality in India for 1938 is shown in table F of Appendix II. The month of highest incidence was March, while all the first four months of the year recorded large figures.

The history of plague epidemics in the provinces may now be briefly reviewed.

In the United Provinces there was a fall in plague mortality from 24,036 in 1937 to 13,436 in 1938. Twentyeight districts were free from infection while the districts of Farrukhabad, Cawnpore, Ghazipur and Bahraich registered only small numbers of plague deaths. High rates of mortality were recorded in Jaunpur (1·85), Saharanpur, Mirzapur and Azamgarh (1·05 each), Gorakhpur (0·97), Basti (0·94) and Fyzabad (0·53). Among urban areas, a few recorded very high rates, Sikandarapur (18·24), Mehndawal (8·08), Sarai Mir (8·05) and Mirzapur-Bindachal (6·72).

It is reported that the usual preventive measures were carried out. A total of 187,856 inoculations was done during the year. Rat destruction by baiting with barium carbonate pills and by cyanogas fumigation was also practised in the affected areas. The latter method is more effective than the former as it kills both rats and fleas and it was therefore more widely practised. Government supplied 569 pounds of barium carbonate free to local bodies in the infected areas and grants amounting to Rs. 7,575 were also given to these authorities for cyanogas fumigation. It is reported that evacuation as a preventive measure against plague is becoming popular with the people and that a sum of Rs. 2,775 was placed at the disposal of district magistrates for assisting evacuation and other anti-plague measures. Wherever necessary, temporary regulations under the Epidemic Diseases Act were promulgated to enable the authorities to take preventive measures against the disease.

In Bihar deaths from plague numbered 1,838 in 1938 as against 1,470 during the previous year. The districts of North Monghyr, North Bhagalpur and Purnea remained free from infection during 1938. Saran district recorded the highest number of deaths (1,173) from this disease. Although the incidence of plague has decreased considerably in this province during the last decade, it is reported that certain endemic foci exist, where the disease starts

anew almost every year with the approach of the cold weather. These foci are in the districts of Champaran, Saran, Muzaffarpur, Darbhanga and North Monghyr. As has been shown in the Netherlands Indies an effective method of eradicating plague infection is that of providing rat-proof houses for the population of the affected areas. The plans and specifications of cheap houses suitable for rural conditions, which the health authorities of the Netherlands Indies have found useful, were supplied by the Public Health Commissioner to provincial Directors of Public Health. Experiments for evolving a similar cheap type of house fitted for Indian conditions were carried out at the Cumbum Valley in Madras Presidency by a Research Unit working on the epidemiology of plague under the auspices of the Indian Research Fund Association. Detailed information regarding the type of house evolved at this place, which costs only Rs. 75, was also supplied to Directors of Public Health. A determined effort to popularise the construction of such houses in the endemic areas of plague infection appears to be a hopeful line of advance in our campaign against the disease and it is to be hoped that provincial health authorities will spare no efforts to secure progress in this direction.

The number of deaths from plague recorded in Madras Presidency during 1938 was 1,155 as against 1,127 during the previous year. There was thus little change in the plague situation in this province. Of the total deaths 85 per cent were recorded in the two districts of Salem (540) and Madura (444). Seven municipalities reported plague, 33 deaths being recorded in all.

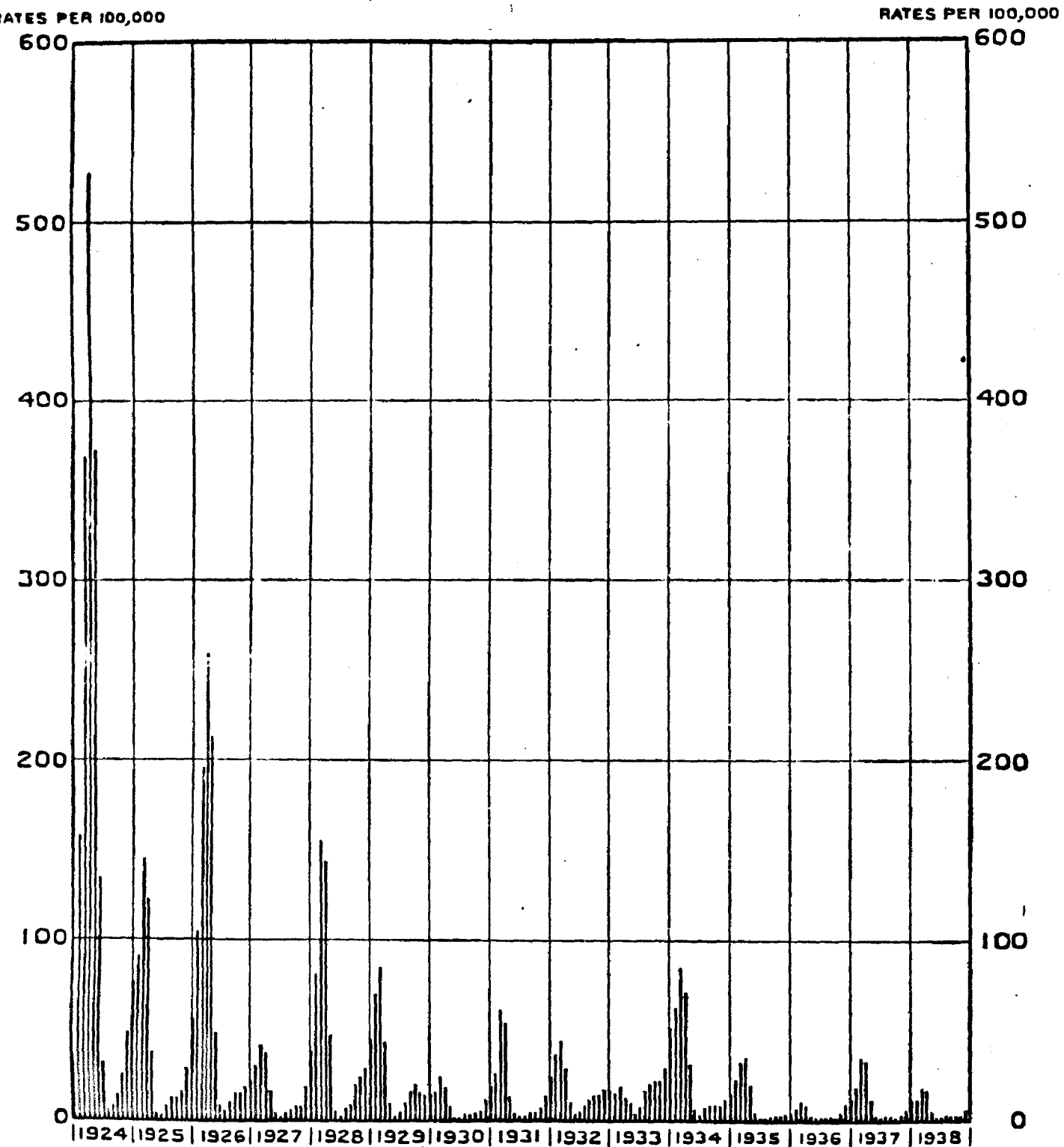
The Madras Government sanctioned, as an experimental measure, routine cyanogas fumigation in seven districts and six municipalities. The cost of the scheme is shared equally between the local bodies concerned and the Government. It is reported that good results have followed the working of the scheme and that the prompt control of plague in two municipalities, Periyakulam and Tiruppur, should be attributed to this measure. Other preventive measures included anti-plague inoculation and evacuation of infected localities, wherever possible. A total of 159,510 inoculations was carried out.

There was a considerable reduction in the mortality from plague in the Central Provinces, from 1,002 in 1937 to 535 in 1938. Deaths from this disease were reported throughout the year except in June. Twelve districts remained free from infection. Of the seven districts which were affected, Jubbulpore reported the largest number of deaths, 263, while Nagpur had only two deaths. Fiftyeight deaths from plague were reported from urban areas. Towns with high death rates were Chota Chhindwara (1·63), Sihora (1·39), Khurai (0·72), Gadarwara (0·66), Saugar and Saugor Cantonment (0·39 each). The usual preventive measures were carried out, the number of anti-plague inoculations being 19,485.

In Bombay Presidency, as in other parts of India, the incidence of plague has been steadily on the decline during recent years. In 1935 plague deaths in the province numbered 2,453, while the figures for the next three years were 578, 506 and 406 respectively. An interesting feature of the epidemiology of the disease, to which the Director of Public Health draws attention, is that the disease seems to have disappeared from certain areas where the infection was considered in the past to be endemic. He states "Kaira and Surat districts in Gujarat and Sholapur, Bijapur, Poona and Ahmednagar districts in the Deccan, which were often visited by plague in the past, are now conspicuous by their freedom from plague for the last three years".

The importance of an attack on the endemic foci of plague has been recognised and it is reported that intensive cyanogas fumigation operations

MONTHLY PLAGUE MORTALITY RATES
PER 100,000 OF ESTIMATED POPULATION
IN BRITISH INDIA (EXCLUDING BURMA) DURING 1924-38



carried out in such areas in the districts of the Southern Registration Circle have proved useful "in localising and arresting the infection". During 1938 the districts most affected were Belgaum (194 deaths), Dharwar (84), Satara (74) and Kanara (36). Only eight towns reported plague, the total number of deaths in these towns being 64.

Plague researches are mainly centred at the Haffkine Institute, Bombay, and the following note by the Director of the Institute indicates the work carried out during the year :—

"Studies of the factors which govern the preparation of an effective plague vaccine were continued. It had been observed that in the case of Haffkine broth vaccine, the total protection resided in the clear supernatant fluid of the vaccine and that bacterial debris had little or no protective power. This observation suggested a study of the conditions which would yield a maximum growth of the plague organisms in broth and at the same time result in maximal solution of that portion of the bacterial body which is immunogenic. Quantitative measurements were made during the year to determine the temperature of incubation which would yield maximal growth in broth. First observations show that maximal growth results at 26°—27°C. Similar measurements have been commenced to determine the pH of the liquid medium which would yield optimum growth. At the same time the protein matter in solution in the supernatant fluid of a vaccine was separated into four different fractions with sodium sulphate. Each of these fractions is being studied for its immunogenic value. It appears that the entire immunogenic power resides largely in only one of these fractions, the fraction precipitated with 50 per cent concentration of sodium sulphate.

"The results reported last year of a small field trial of anti-plague serum were very encouraging. One hundred and twentyfour cases were alternatively given serum and control treatment, the mortality rate of 27 per cent of serum treated cases compared very favourably with the mortality rate of 65 per cent of the control cases. Therefore, the production of serum was continued during the year but no opportunity presented itself for a fresh field trial. In spite of the undoubted curative power of the serum, the question arises whether under Indian conditions an anti-plague serum could become a practical remedy. The disease is almost entirely limited to rural areas, which lack adequate medical personnel for medical relief. Under Indian conditions the new sulphanilamide derivatives offer a decidedly better alternative for dealing with the disease, if a suitable derivative could be found. Studies were, therefore, undertaken to test the value of some of the more important drugs available on the market. Prontosils, sulphanilamide and sulphanilamido-pyridine were tested. In human infection it was noticed that the onset of septicaemia was the deciding factor in the result of the case. Thus to make the laboratory tests correspond to the severe form of the human disease, the administration of the drugs under test was commenced only after the experimental animal, white mouse, has developed septicaemia. Under these severe conditions of test the drugs tested did not show any definite curative properties. Experiments are in progress to test the action of these drugs under less severe conditions of infection."

Smallpox.

16. In table II (iii) are presented the quinquennial average figures for smallpox mortality in British India during the period, 1877—1936, as well as the deaths from this cause in 1937 and 1938.

TABLE II (iii).

Periods.	Annual average.
1877—81	162,942
1882—86	149,777
1887—91	95,831
1892—96	73,816
1897—01	84,265
1902—06	84,914
1907—11	94,534
1912—16	79,214
1917—21	84,828

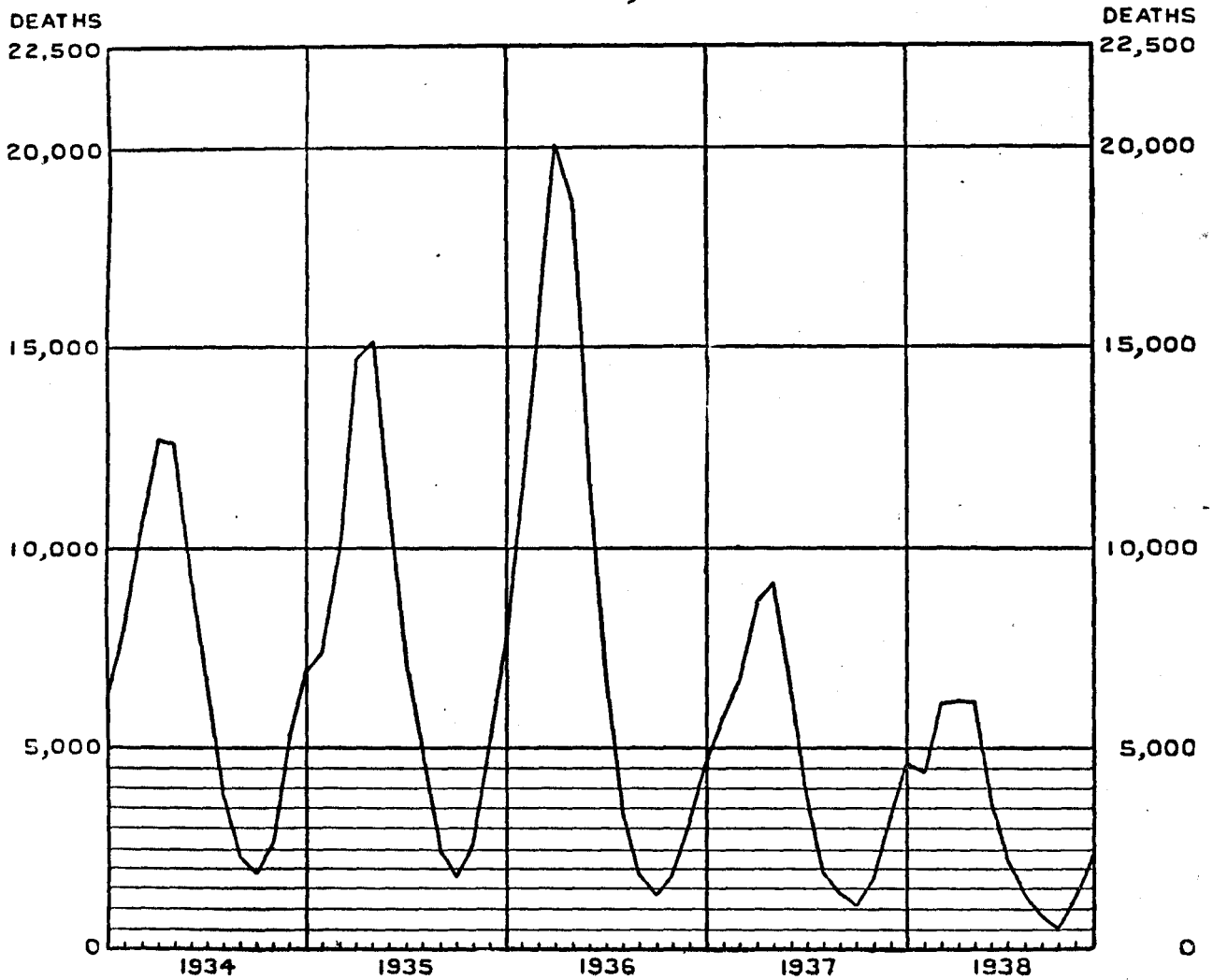
Periods-	Annual average.
1922—26	66,075
1927—31	77,902
1932—36	83,959
1937	54,810
1938	39,844

The last two years have seen a decrease in the incidence of the disease and there has been a drop of nearly 15,000 deaths in 1938 compared with the previous year. However the quinquennial averages indicate that the prevalence of smallpox has been subject to considerable variation and it is not therefore correct to assume that the disease will continue to decrease. While a reassuring factor in the situation is that provincial health authorities are taking an increasing interest in the enforcement of vaccination, which is the most powerful weapon we possess in our fight against smallpox, it is necessary to emphasise, as has been done repeatedly in previous reports, that serious deficiencies exist in our vaccination campaign and that these have to be rectified before India can get rid of this disease. At present India records each year the largest rate of mortality from smallpox in comparison with other countries. In her own interests and those of the rest of the world, which look upon India as the largest reservoir of this infection, it is essential that everything possible should be done to enforce vaccination and thus reduce the incidence of smallpox.

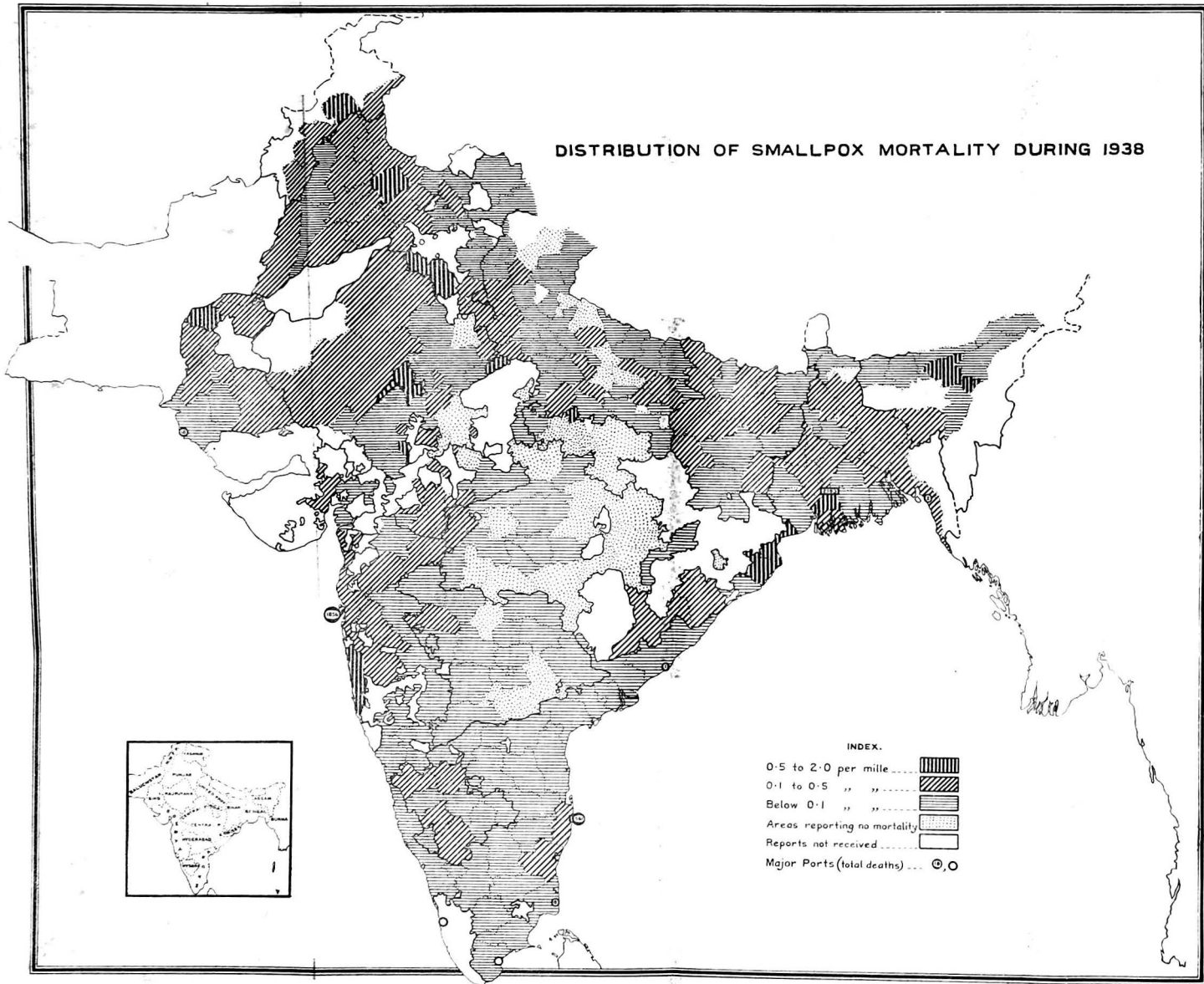
A striking feature of the epidemiology of smallpox in India, to which the Directors of Public Health of several provinces have drawn attention, is a periodicity in the incidence of the disease, the maximum being reached every five or six years. The opinion of these health authorities is that, owing to defects in the enforcement of vaccination, the proportion of susceptible children steadily increases during this period and that the situation is thus rendered favourable for the production of a widespread epidemic. In this connection certain figures relating to the Punjab and Delhi may be quoted. In the former, while the proportions of children aged 0—1 and 1 to 10 to the total estimated population in 1938 were 3·7 and 25·5 per cent respectively, of the total smallpox deaths at all ages during the same year, the percentages relating to children in these two age groups were 28·1 and 50·2. In Delhi province, infants under one year and children aged 1—5 formed 3·2 and 9·2 per cent of the total population, while the corresponding rates of smallpox mortality were 23·5 per cent and 37·3 per cent. It is thus clear that the incidence of the disease has been particularly heavy at these ages. An effective campaign of primary vaccination should have given a considerable measure of protection to these children. A high proportion of smallpox mortality among children is a feature prevalent throughout the country and it gives unmistakable proof of the inadequacy of the measures adopted for enforcing vaccination.

The present inefficient campaign of vaccination is due to many causes, of which some of the important ones are defective registration of births in urban and rural areas resulting in the omission of large numbers of children from the register maintained for unprotected persons, the absence of powers of compulsion for local authorities to enforce vaccination in many parts of the country, lack of legal provision for periodical revaccination and the inadequacy of the staff employed for vaccination. It is essential that all these defects should be remedied as early as possible. At the same time, even under existing conditions, it may be possible to increase the number of vaccinations performed if local authorities will utilise the services of their health personnel to the fullest possible extent and introduce other changes in the existing methods of procedure. For instance, the services of sanitary inspectors, midwives and health visitors should all be available for vaccination. They have innumer-

**SMALLPOX DEATHS BY MONTHS IN BRITISH INDIA,
EXCLUDING BURMA, DURING 1934-38.**



DISTRIBUTION OF SMALLPOX MORTALITY DURING 1938



INDEX.

- 0.5 to 2.0 per mille [Vertical line shading]
- 0.1 to 0.5 " " [Diagonal line shading]
- Below 0.1 " " [Horizontal line shading]
- Areas reporting no mortality [Dotted shading]
- Reports not received [White shading]
- Major Ports (total deaths) ⊙ O

able opportunities of contact with the people in the daily discharge of their duties and these occasions should be utilised for enquiring into the vaccinal condition of the inhabitants of the houses they visit and of conferring protection on those who need it. The health visitor and the midwife have the additional advantage that they have access to the women and children in the homes and if they can win the confidence of the women, the battle against prejudice and ignorance is easily won.

Another important change that may be carried out with advantage is to extend the period during which vaccination is performed to all the twelve months of the year. In certain provinces vaccination is suspended during the summer, except in the presence of an epidemic. In consequence the period of vaccination is mainly confined to the cold season. Two of the reasons advanced for the maintenance of this system are that the vaccine lymph is rendered ineffective by the heat and that the people dislike being vaccinated in the hot weather. The Chief Health Officer, Delhi, states that neither of these reasons should prove to be a deterrent. In his experience, the percentage of successful vaccinations during the hot months in Delhi province is as high as that for vaccinations carried out in the cold weather. The opposition shown by the people to the performance of the operation during the hot weather can be overcome, he thinks, by methods of persuasion. It is true that Delhi is a small province and that rapid means of communication are more available here than in the outlying parts of other provinces. Deterioration in the quality of the vaccine lymph depends partly on the length of time that elapses between its issue from the central vaccine institute and its utilisation for the vaccination of the people. It may be that undue delay in the transit of vaccine lymph to certain distant areas of some provinces may make it desirable to suspend vaccination in those areas during the hot months, but there is no reason why vaccination should not be carried on during all the twelve months of the year over the greater part of these provinces. Delhi registers very high temperatures during the hottest months of the summer and a scheme which has stood the test in this province should prove to be applicable to other parts of India as well.

The wide distribution of smallpox during 1938 in different parts of the country and the variation in the intensity of its incidence may be seen from the map facing this page. Death rates from smallpox in the rural and urban areas are given for British India as a whole and for the provinces in table G of Appendix II. For British India the rural rate was 0·1 *per mille* and the urban 0·3 *per mille*. In the provinces the rural rate varied from 0·01 in the Central Provinces to 0·5 in Ajmer-Merwara and Orissa. In urban areas the corresponding figures were 0·4 *per mille* in Assam and 1·9 *per mille* in Ajmer-Merwara.

The monthly distribution of the disease is shown in table H of Appendix II. In British India the maximum mortality from this cause was recorded in April. Each of the first and second quarters of 1938 registered more than three times the numbers of smallpox deaths recorded in either of the remaining quarters of the year. The incidence of the disease was therefore preponderantly in the first six months, an experience which is shared by all the provinces.

Brief remarks on the incidence of smallpox in individual provinces are given in the following paragraphs:—

The N.-W. F. Province recorded a larger number of smallpox deaths in 1938 than in 1937, the figures being 1,065 and 973 respectively. The districts

giving high death rates were Peshawar (1·08) and Hazara (0·37) while Kohat (0·20) and Bannu (0·13) were the least affected. It is stated that mass vaccination was carried out in the infected localities and the surrounding areas.

There was an increase of 1,464 deaths from smallpox in the Punjab in 1938 compared with the previous year, the recorded figures for the two years being 5,455 and 3,991 respectively. All the districts were affected except Simla. Of the total smallpox deaths in 1938, 811 were registered in towns and 4,644 in rural areas.

Delhi province recorded a considerable fall in smallpox mortality, the figure for 1938 being 90 as against 643 during 1937. Sixtyfour per cent of the cases are stated to have occurred in Delhi city.

Mention has already been made of the attempts made in this province to continue the practice of vaccination during the hot weather and to utilise the services of all members of the subordinate health staff as far as possible, to carry out vaccination. The results are reported to have been quite encouraging. In 1937 the number of vaccinations performed was 28,693 while in 1938 the figure rose to 72,523, an increase of 43,830. It seems fairly certain that, if these improvements can be introduced in other parts of India also, there should be a considerable increase in the proportion of those who are protected against the disease and, in the course of a few years, such a policy is bound to have a beneficent effect on the health of the population by putting an effective check on the periodical epidemics of smallpox which sweep the country.

The number of deaths from smallpox in the United Provinces during 1938 was 4,411 as against 3,200 in 1937, an increase of 1,211. The highest mortality was recorded in May and the lowest in October. The districts of Bulandshahr, Jaunpur and Agra returned high death rates of 0·4, 0·26 and 0·25 *per mille* respectively. Garhwal, Rae Bareli, Kheri reported only one and Sultanpur two deaths during the whole year while Pilibhit and Bara Banki were free from infection. In urban areas, of 440 towns 144 reported mortality from smallpox. High rates were recorded in Kamalganj (10·0), Pahasu (8·9), Safipur (8·6) and Rabupura (7·3).

Bihar recorded a fall in smallpox mortality from 7,485 in 1937 to 5,977 in 1938. High rates were reported from the districts of Palamau (0·5), Gaya (0·4) and Saran (0·4), while Hazaribagh (0·02) recorded the lowest rate. Among towns the worst affected were Gaya (1·5), Muzaffarpur (1·3) and Monghyr (1·1). It is reported that, during 1938, the total number of vaccinations performed was 1,500,764.

It is reported that, in Orissa, smallpox is endemic in the coastal districts and that high rates of mortality from the disease were recorded from those areas where vaccination has not been made compulsory.

In the districts of North Orissa it is stated that a system of vaccination is in force by which the people are required to pay the licensed vaccinator a fee for the operation. Vaccination is not compulsory in such areas and it is therefore only to be expected that no satisfactory progress is being made in the vaccination of the population. But the Director of Health and Inspector General of Prisons reports that local bodies are growing alive to the necessity of introducing compulsory vaccination. It is to be hoped that the introduction of compulsion and of a free service to the people will make for a rapid increase in the proportion of those who are protected against the disease. Without this no improvement of the existing situation can be expected.

The number of smallpox deaths in the province during 1938 was 3,321 against 2,269 in 1937. Its maximum incidence was reached in the month of March. The total number of vaccinations carried out during 1938 was 644,258.

In Bengal there was a considerable fall in smallpox mortality during 1938, the figure being 9,289 as against 27,944 in 1937. Compared with the previous quinquennium the death rate from this disease in 1938 is stated to have shown a decrease of 50 per cent. The largest number of deaths from this cause was recorded in March and then there was a gradual decline till the minimum was reached in November. Of a total of 712 registration circles 461 were affected and 2,599 villages out of 86,361 in the province reported cases.

Although the number of cases in 1938 was much less than in 1937, it is reported that the disease spread over a wider field during the year under report. Thus, while in 1937 the number of towns which escaped infection was 70, in 1938 only 47 towns were free. Of the total deaths in towns (2,654) Calcutta city alone accounted for 2,193 deaths or 82.6 per cent.

In the Central Provinces there was a small decrease in the number of deaths recorded under smallpox, from 460 in 1937 to 409 in 1938. Deaths from this disease were reported from all districts, except Drug and Balaghat, which remained free. The highest incidence of smallpox was in April. The largest number of deaths was recorded in Nimar district (196) and the smallest in Amraoti (14).

Bombay Presidency recorded a large increase in smallpox mortality, from 1,810 in 1937 to 4,355 in 1938. The disease was reported from 1,124 villages in 167 registration circles. The largest number of deaths was recorded in March but the incidence of the disease was high from January to May. The highest incidence of the disease was in Ratnagiri with a death rate of 0.6 *per mille* and the lowest in Dharwar with only two deaths. Bombay city recorded 1,856 deaths from this cause or 42.6 per cent of the total figure for the province. Other towns with a high death rate from smallpox were Panwel (1.78), Bassein (1.42), Chiplun (1.30), Bagalkot and Nasirabad (1.15) and Bhatkal (1.01).

An examination of the recorded smallpox deaths in Sind during the period 1928-38 shows that the incidence of the disease has been subject to considerable variation. For instance, the recorded deaths were as low as 179 in 1928 and as high as 1,093 in 1933 and 1,553 in 1932. In 1938 there was an increase in smallpox mortality over that for 1937, the recorded figures in the two years being 941 and 798 respectively. Of the total deaths from this cause, 70 were recorded in urban areas and 871 in rural areas. Among the affected towns, high smallpox death rates were registered in Garhi Yasin (1.08), Kambar (0.82) and Ratodero (0.55). Among the rural districts Larkana (0.73), Thar Parkar (0.46) and Nawabshah (0.30) reported high rates. Temporary additional staff were appointed and a vigorous campaign of vaccination was carried out in the affected areas.

In Madras Presidency a steady decline in smallpox mortality has been noticed since 1934, the number of deaths from this cause in that year being 18,088 and the corresponding figure for 1938, 2,273. It is stated that the year under review has recorded the smallest mortality from this disease compared with the previous 71 years. The Director of Public Health draws attention to two other significant facts. Since 1929 the ratio of deaths from smallpox among children under one year to the total deaths from this cause at all ages has been declining steadily. The corresponding figure for children

aged 1 to 10 was stationary in the neighbourhood of 30 per cent till 1935 and has since that date shown a tendency to decrease. On the other hand the proportional mortality from smallpox among persons over 10 years of age has so far been steadily increasing. These facts indicate that the campaign of primary vaccination in children has been successful in reducing the incidence of the disease at ages below 10. A similar vigorous revaccination campaign among persons over 10 years of age will undoubtedly reduce the incidence of the disease in the adolescent and adult population. The Government of Madras took powers, a few years ago, to carry out revaccination compulsorily and it is to be hoped that the enforcement of these powers will go a long way to achieve the desired result.

All the districts in the province were affected, but East Godavari, the Nilgiris, Bellary, Kistna and Tinnevely reported only stray cases. The death rate from the disease was less than 0·10 *per mille* in all the other districts except Chingleput and South Arcot which reported 0·24 and 0·12 *per mille* respectively.

Among urban areas, 31 municipalities reported the disease and a total of 735 deaths was recorded in these towns. Of these 735 deaths Madras city alone accounted for 76 per cent. Other municipalities reporting high mortality were Saidapet (23), Nellore (19) and Salem and Kurnool (18 each). The number of deaths registered under smallpox in Assam during 1938 was 1,649 compared with 2,187 in 1937, a decrease of 538 deaths. Infection was reported from 67 registration circles and from 618 villages. The largest number of deaths was recorded in May and the lowest in September. The smallpox death rate for the province was 0·21 *per mille*. Nowgong (0·63) and Sylhet (0·44) recorded the highest rates. Among towns, only four reported deaths from this disease and the total number of deaths in these towns was only eight.

In Ajmer-Merwara, the number of deaths from smallpox in 1938 was 577 as against 595 in 1937. There was therefore little change in the smallpox situation.

In Coorg three smallpox deaths were registered during the year under review and these occurred in the rural areas.

Fevers.

17. The number of deaths in British India classified under the omnibus group of diseases entitled "fevers" in 1938 was 3,883,627 or 14·1 *per mille* of the population out of a total death rate of 24·3 from all causes. In 1937 the corresponding rate for fevers was 13·1 *per mille*. The provincial rates for this group of causes are given in table A of Appendix II of this report. For British India as a whole, the rural and urban rates for fevers were 14·8 and 7·7 respectively. As usual, malaria contributed much the largest share to the total deaths under this head, the figure being 1,577,865 or nearly 41 per cent of the deaths due to fevers.

In the N.-W. F. Province the number of deaths from this cause rose from 39,979 in 1937 to 41,622 in 1938. The districts of Hazara, Kohat and Dera Ismail Khan recorded high rates, *viz.*, 21·1, 20·5 and 20·2 respectively. The lowest rate was recorded in Mardan district, namely, 13·4, which is itself a high figure. The rural and urban fever death rates for the whole province in 1938 were 7·7 and 19·4 respectively compared with 8·1 and 18·5 in 1937.

It is reported that, in the Punjab, febrile illnesses accounted for two-thirds of the total mortality. Although no great reliance can be placed on the reported causes of death under this head, it is interesting to compare the numbers recorded under each disease :—

Malaria	5,015
Enteric fever	10,245
Measles	5,166
Relapsing fever	13
Influenza	25
Cerebrospinal fever	70
Typhus	3
Other fevers	389,661

In 1938 an increase of 66,356 deaths was recorded under 'fevers' compared with the previous year and it is stated that a sudden rise in the figures took place in May and June, which the Director of Public Health considers to be "a fairly regularly recurring phenomenon in years when malaria is not unduly prevalent". The year under review was such a year and it is stated that no explanation has been found for this rise in fever mortality.

The United Provinces also recorded an increase in fever mortality from 792,263 in 1937 to 940,469 in 1938. The largest number of deaths was recorded in May and the lowest in March. Of the total deaths under this head, 819,057 or nearly 87 per cent were registered under malaria. Among urban areas very high death rates from this disease group were recorded in Amanpur (55.3), Jalalabad (45.1), Fatehabad (41.1) and Alapur (38.7). Low rates were reported from Behat (0.86), Mussoorie (0.81) and Juhi (0.75). In the rural areas, the districts of Bareilly (31.1), Pilibhit (30.5), Bijnor (28.8) and Moradabad (28.2) reported high rates while Allahabad and Ballia recorded the lowest rates, 12.4 and 11.1 respectively.

Fevers accounted for 54.5 per cent of the total mortality in Orissa during 1938, giving a rate *per mille* of 16.0 compared with 15.2 in 1937. High rates were recorded in Khondmals (30.0), Angul (22.0) and in the district of Balasore (22.1). Among the towns, Kendrapara (15.1), Jaipur (11.2) and Balasore (10.0) reported high death rates from this group.

The Director of Public Health, Bengal, in his annual report states that "the progressive rise in fever mortality from year to year mainly due to the growing scourge of malaria is the most important public health problem of the province". The rate of mortality under this group of causes rose from 14.9 *per mille* in 1937 to 15.6 in 1938. An interesting map in the report showing the increase in fever mortality in the districts during 1938 over the average for the previous ten years shows that, with the exception of the central and northern districts of Rajshahi, Malda, Dinajpur, Jalpaiguri and Darjeeling and the south and central districts of Khulna and Jessore, the remaining parts of Bengal have shown a rise in deaths due to fevers. The whole of eastern Bengal and western Bengal with the exception of Howrah district have been affected.

While, as pointed out by the Director of Public Health, this rise has been largely due to the increase in the incidence of malaria, it is interesting to compare the figures under different diseases included in the 'fever' group, which the Director has given in his report. It is true that but limited significance can be attached to the absolute value of these figures in view of the defective organisation for recording the causes of deaths, but these defects cannot possibly detract from their relative value for a comparison between the years 1937 and 1938.

Fever deaths in Bengal in 1937 and 1938.

Causes.	Number.		Death rates <i>per mille.</i>		Percentage of increase or decrease in 1938.	Percentage to total fever mortality.	
	1937.	1938.	1937.	1938.		1937.	1938.
Malaria . . .	372,992	416,521	7.5	8.3	+10.6	48.1	50.8
Enteric fever . . .	8,978	9,808	0.18	0.20	+11.1	1.1	1.2
Measles . . .	4,875	2,969	0.10	0.06	-40.0	0.6	0.4
Relapsing fever (spirochaetal).	2	3	0.00004	0.0001	+50.0	0.0003	0.0004
Kala-azar . . .	21,227	21,642	0.42	0.43	+2.4	2.7	2.6
Influenza . . .	2,422	2,143	0.05	0.04	-20.0	0.3	0.3
Cerebrospinal fever.	938	1,337	0.02	0.03	+50.0	0.1	0.2
Typhus fever . . .	2,814	4,034	0.06	0.08	+33.3	0.4	0.5
Blackwater fever	229	212	0.004	0.004	±0	0.03	0.03
Other fevers . . .	361,109	361,094	7.2	7.2	±0	46.5	44.1

Large increases have been recorded under malaria, enteric fever, kala-azar, cerebrospinal fever and typhus.

The urban areas in the province returned a death rate from fever of 4.5 *per mille* and the rural areas of 17.3 *per mille*. Fortythree towns registered rates above the urban average rate of 4.5 *per mille*, while of these 10 returned rates above 10 *per mille*. The lowest rate was in Dum Dum, namely, 0.7 *per mille*. Kurseong was the worst affected town in 1938.

In the Central Provinces deaths from fevers numbered 322,404 during 1938, giving a rate of 21.0 *per mille* against 18.4 in 1937. The urban and rural death rates were 13.1 *per mille* and 22.0 *per mille* respectively. Among the districts, Bilaspur, Raipur and Saugor reported large numbers of deaths from fevers while Buldana, Wardha and Betul reported relatively small numbers.

There was an appreciable increase in the number of deaths recorded under fevers in Bombay Presidency during 1938 as compared with the previous year, the respective rates being 10.4 and 9.2 *per mille*. In 1938 the urban and rural death rates under this head were 6.1 and 11.4 respectively. High rates were reported from the towns of Ankleshwar (25.4), Nadiad (23.8), Borsad (22.1), Rander (22.0), Viramgaon (21.0) and Jambusar (20.2). Among the rural areas the talukas of Sanand (31.4), Parola (25.9), Daskroi (24.6), Edalabad (23.9) and Jalgaon (22.4) recorded high rates of death from fevers.

In Sind fevers were responsible, in 1938, for 27,970 deaths or a rate of 7.2 *per mille* as against 7.1 during the previous year. Among the districts Larkana recorded the highest rate, 10.4 *per mille*, and Karachi the lowest (3.1). Rural and urban rates for the province were 7.9 and 4.1 respectively. Among rural areas high rates were recorded in Ghotki (15.5), Sukkur (13.9), Pano Akil (12.0) and Garhi Yasin (11.8) while Kohistan Mahals (1.9) and Keti Bunder (1.8) reported low rates.

In Assam fever mortality during 1938 reached its maximum in June and its minimum in March. For the province as a whole a decrease occurred in the rate for deaths from this group of causes, the respective rates during 1937 and 1938 being 13.0 and 12.4 *per mille*. Among the districts Goalpara recorded the highest rate, 23.1 *per mille*, and Nowgong the lowest, 8.8 *per mille*.

Malaria.

18. The following table gives the number of cases of malaria treated in the medical institutions of British India and the different provinces and the percentages that these cases constitute of the total number of cases of all

diseases treated. While the figures represent only small fractions of the numbers of malaria patients in each province the percentages in the last column may have some value in showing the relative importance of the disease in the different provinces.

TABLE II (iv).

	Cases.	Percentage of total cases treated.
British India	12,160,908	13.8
N.-W. F. P.	533,119	19.7
Punjab	1,494,267	8.7
Delhi	79,988	8.9
U. P.	1,068,949	10.2
Bihar	503,383	6.0
Orissa	344,020	15.6
Bengal	4,296,758	33.9
C. P.	705,381	15.4
Bombay	681,570	15.7
Sind	263,466	21.7
Madras	1,276,658	6.4
Coorg	133,278	38.1
Assam	662,694	29.8
Ajmer-Merwara	13,255	6.6
Baluchistan	104,122	15.5

In British India as a whole the number of deaths registered as being due to malaria was 1,577,865 in 1938, of which nearly 96.4 per cent took place in rural and the remainder in urban areas. The corresponding mortality rates from malaria were 6.1 *per mille* in rural and 2.2 *per mille* in urban areas. The incidence of the disease in the villages appears therefore to have been much higher than in the towns.

A brief review of the malaria problem in India and of the lines on which the campaign against the disease is being conducted was given on page 238 of the 1937 report. It is therefore unnecessary to make further comments on the subject here and the following paragraphs are therefore devoted to a survey of the incidence of malaria in the different provinces during 1938 and of the measures adopted against the disease, including quinine distribution among the population.

In the N.-W. F. Province it is reported that malaria continued as usual to be the most prevalent disease. Anti-malarial measures were carried out in all the municipal towns in the province, oiling of water collections, drainage of pools and filling up of depressions being carried out by the special staff employed by municipal authorities. In Abbottabad, Peshawar, Kohat, Bannu and other cantonments the military medical authorities carried out anti-malarial measures within their areas and in the surrounding regions also. The usual grant of Rs. 1,000 was paid by the provincial Government to the Kohat military authorities for carrying out these measures in the neighbouring villages and it is stated that these villages have low spleen rates.

For the rural areas the only measure that was feasible was the free supply of quinine to the people. In Hazara district, where a severe epidemic took place, a special doctor was deputed who, among other things, carried out a malarial survey of the schools. In Peshawar distribution of quinine was done through special compounders while in a badly infected tehsil of Bannu, an experiment was tried of opening 20 treatment centres for quinine distribution. These centres were visited by a specially trained compounder. The scheme is said to have been popular and will therefore be repeated. Anti-malarial work was also carried out among the Frontier Constabulary and in the Police Training School with a considerable measure of success, it is stated, in reducing the morbidity rate. A certain amount of work was also done in the Agencies, the Agency Surgeon offering advice and instruction regarding anti-malarial measures during his tours.

The number of deaths recorded as due to malaria in the Punjab in 1938 was 5,015, a figure which the Director of Public Health states underestimates to a large extent the actual mortality from this cause. On the other hand, he points out that, if a third of the deaths due to fevers be accepted as having been due to malaria, the figure would be 136,732, which would appear to be unduly high from a consideration of the distribution of deaths due to febrile illnesses over the year.

Anti-malarial measures, apart from quinine distribution, were carried out only to a limited extent in urban and rural areas except in the vicinity of military cantonments. It is reported that joint schemes for the control of mosquito breeding were formed by the military, civil and railway authorities in these areas.

As the province has not suffered from a severe fulminating epidemic of malaria since 1908, the possibility of an extensive outbreak cannot be dismissed in view of the lowered immunity of the population and, to meet this contingency, it is stated that the nucleus of an anti-malarial organisation, capable of expansion when the occasion arises, has been established in every district. The necessary material and equipment have also been supplied to the districts.

The comprehensive scheme of anti-malaria works which are being carried out in Delhi urban areas and to a smaller extent in the rural parts of Delhi Province has been described in the annual reports for 1936 and 1937. The results of the anti-malaria campaign may be judged from the following figures for spleen rates of school children in Delhi urban area in July 1936 before the commencement of the control measures and in November 1938:—

	Spleen rate.	
	July 1936.	November 1938.
Ward XI	23	5
Ward XII	28	7
Ward XIII	14	2
Ward XIV	18	3
Jumna Village	68	19
Power House quarters	90	22
Sewage Farm quarters	68	4
Railway quarters, Paharganj	21	1
Railway quarters, Sabzimandi	68	6
Nizamuddin	72	44
Jangpura	70	13

The decreases in the spleen rates are striking in every case and, although a certain proportion of it should be attributed to the deficient rainfall during the year, it is certain that the anti-malarial measures were in a large measure responsible for the excellent results.

The figures for fevers recorded at the Delhi dispensaries between July 1st and November 30th, the usual period of malarial incidence, also give an indication of the measure of control that has been achieved. In 1938 the figure was 29,042 compared with 36,204 in 1937 and 59,632 in 1936. The Director, Malaria Institute of India, states that the figure for 1938 would have been much smaller except for the occurrence of an outbreak of influenza. "This is borne out by the fact that the total figure recorded in the first week of October, normally the height of the malarial season, was 1,235, whilst the figure for the last week of November was 1,562. It is doubtful whether as many as 10 per cent of the latter number were actually cases of malaria."

Considerable nuisance used to be caused every year in March and April by a large increase in the breeding of *Culex* mosquito in the sewage farm lying to the south-east of New Delhi. During 1938 a large part of the farm was brought under control by the draining and oiling of stagnant pools and a considerable measure of relief resulted in consequence of these measures. In September 1938 this farm was abandoned and the nuisance disappeared.

The anti-malaria operations in the rural areas of Delhi Province fall into three groups, (1) measures carried out in a three-mile belt surrounding the urban area, (2) operations in Najafgarh thana and (3) operations in other areas. In regard to the three-mile belt, the measures adopted included, in addition to certain permanent works carried out as part of a scheme spread over a number of years for its execution, the issue of quinine for the treatment of patients in all the 60 villages within the 'belt', anti-larval operations and minor drainage works in a group of 10 villages south of the Nizamuddin Chord Line and the spraying of adult mosquitoes in a group of eleven villages, six in the irrigated area and five in the sewage farm area. These villages can be divided into three groups, (1) those which had quinine alone, (2) those which had quinine and anti-larval measures and (3) those which had quinine and adult spraying

Discussing the value of anti-larval measures the Director, Malaria Institute of India, states that, while the average 'catch' in five catching stations fell from 25.8 per week early in July to 5.3 in the middle of October, it is impossible to estimate what part of this improvement may be ascribed to the measures adopted and what part to the failure of the rains. At the same time the fact that this group of villages has shown the largest fall in the spleen rate lends support to the value of the anti-larval measures although the high cost (15 annas per head) makes it impossible to extend these operations on a large scale. As the Director points out, the main value of these operations is the ultimate hope of educating the villagers in the value of these operations and of persuading them to undertake levelling, filling and drainage works on their village site for the benefit of their own health.

Adult spraying was carried out with "Pyrocide 20" diluted with kerosene oil in the proportion of 1 in 20. It is stated that the spraying was quite popular among the people because it afforded them immediate relief from the mosquito nuisance. The cost of such spraying has been brought well within the means of the villagers, the Pyrocide solution for the malaria season costing only Rs. 1-6 per house and the spray pump, with due care, being able to last for several years. It is therefore to be hoped that spraying as an effective method of attack on adult mosquitoes will be adopted by the rural population in course

of time. In the Najafgarh thana quinine distribution was restricted to 24 villages which were within easy reach of each of the welfare centres in the area, anti-larval measures were carried out around every village in the thana and adult mosquito spraying was done only in ten villages in the vicinity of the welfare centres. The services of the health visitors attached to these centres were utilised to demonstrate the use of the spray to the womenfolk in the villages and to enlist their co-operation in the carrying out of the anti-malarial measures.

Quinine distribution, minor levelling, draining and filling operations and mosquito spraying were also carried out, to a limited extent, in the other rural parts of the province. Twentyone quinine distribution centres were instituted in different parts of the province, sanitary inspectors and sanitary assistants regularly visiting these centres and distributing quinine tablets to the people. The filling and levelling operations were supervised by sanitary baildars along with their other duties. Spraying was confined to 38 villages during the months July to October.

In the United Provinces, 819,057 deaths were registered under malaria in 1938, these constituting about 65 per cent of the total deaths from all causes. The Director of Public Health considers that this is far too high a figure and states that the tendency, particularly for the rural registering authorities, is to put down all cases of death accompanied by high fever as malaria and that this tendency varies from district to district. A verification of deaths from malaria, which was carried out, showed that "the percentages of malaria deaths recorded correctly varied from 6 per cent to 75 per cent in rural areas and from 14 to 100 per cent in urban areas." Eighteen districts reported localised outbreaks of malaria, which were, however, not of a serious nature.

Four hundred and eighty-nine pounds of quinine sulphate tablets were distributed to 48 districts for the treatment of the rural population. In addition 1,304 pounds of quinine and 338 pounds of cinchona febrifuge tablets were issued from the provincial reserve to 21 districts for the replenishment of their stock. It is stated that, according to an estimate made by the Inspector General of Civil Hospitals, 1,709 pounds of quinine and 1,716 pounds of cinchona febrifuge were consumed in the province during 1938, giving an average of 22.5 grains per patient with a total of 1,068,949 cases of malaria treated.

An intensive anti-malarial investigation, financed partly by the provincial Government and partly by the Government of India, through the Indian Research Fund Association, was in progress during the year at two centres, Bazpur and Hardoi. The aim is to evolve cheap and effective methods of control under rural conditions. It is too early yet to report results.

A treatment scheme was in operation in about 250 villages with a population of 24,000 in the Terai and Bhabar Estates. In all 14,941 patients were treated. Further, under a mass treatment scheme with cinchona febrifuge and plasmochin in selected malarious villages in the districts of Hardoi, Unao and Lucknow, 948 cases, including relapse cases, received treatment. Anti-larval measures were carried out in a number of villages.

In Bihar the areas which show a high incidence of malaria are stated to be (1) a long narrow belt of territory in North Bihar contiguous to Nepal, (2) certain endemic areas in the districts of Champaran and Purnea, (3) a group of villages on the outskirts of the Chota Nagpur plateau and the river ghats in Gaya district and (4) certain scattered areas in the districts of Ranchi, Hazaribagh, Palamau, Singhbhum and Manbhum.

Muzaffarpur district suffered from a severe epidemic of malaria and, to cope with the situation, a number of special treatment centres was opened. Arrangements were also made for the distribution of quinine through Health Inspectors, Union Boards and through voluntary organisations. Clearing of vegetation and other anti-mosquito measures were also carried out in a number of places. The Government made a grant of Rs. 31,000 and the District Board contributed Rs. 7,600 towards the expense. The Government also supplied, free of cost, 1,425 pounds of quinine and the services of six doctors were made available for combating the epidemic. In the districts of Bhagalpur, Purnea, Darbhanga, Champaran and Monghyr, where also large scale epidemics of the disease took place, similar active measures were taken for the treatment of patients and for preventive work and Government offered help to the local authorities by grants from the provincial funds and by the free supply of large quantities of quinine.

The Assistant Director of Public Health, Chota Nagpur Circle, carried out the spleen examination of 9,340 children in 1,156 villages in the districts of Ranchi, Santal Parganas, Singhbhum and Hazaribagh, the rates being 8·3, 2·0, 8·3 and 5·2 per cent respectively.

It is reported that malaria was prevalent throughout the province of Orissa in a more or less epidemic form during 1938. In Ganjam district the coastal villages of Chatrapur, Kodala and Berhampur North Ranges are reported to have been severely affected. Similarly the districts of Puri, Cuttack and Balasore suffered from widespread epidemics of the disease. Preventive work was carried out in these areas by the appointment of temporary staff and by the free supply of quinine by the district boards and by the Government. Antimalarial operations were also carried out in limited areas. Special mention may be made of such operations in Koraput, Jeypore, Pattanghi and Malkangiri in the district of Koraput at a total cost of Rs. 6,548. The Director of Health states that, owing to lack of funds, anti-malarial schemes for certain local areas in the badly affected districts could not be taken up during the year.

The Director of the Malaria Institute of India visited the province in September 1938 and inspected certain areas for studying the malaria problems. He was of opinion that, as practically nothing was known of the Anopheline vector or vectors responsible for the transmission of the disease in different parts of Orissa, the deputation of a research unit from the Malaria Institute for carrying out local investigations was the first step to be taken in attempting a scientific control of the disease.

It is stated that, in 1938, malaria accounted for 50·8 per cent of the total mortality from fevers in Bengal and 31·6 per cent of the deaths from all causes in the province. The Director of Public Health points out that in Bengal 93 per cent of the population live in villages and the remaining 7 per cent in towns while the proportions of malarial deaths in 1938 were 99·3 per cent for rural and 0·7 per cent for urban areas. These facts give some indication of the extent to which malaria constitutes a menace to the health of the rural population. The Director considers that, if the malaria problem can be solved, three quarters of the victims of preventable disease in the province will have been saved.

In 15 out of 27 districts the death rate from malaria in 1938 was above the provincial average of 8·3 *per mille*. Eleven districts reported rates above 10 *per mille* and, of these, Rajshahi (19·0) had the highest figure. Sixteen districts recorded rates varying from 1 to 10 *per mille*, while Calcutta (0·7) had the lowest death rate from malaria during the year under review.

In regard to quinine supply the Director states that the malaria patients in the province require 350,000 pounds of the drug every year for adequate treatment. The total amount used in the province during 1937-38 was 112,353 pounds, of which 51,839 pounds were produced locally and the balance of 60,514 pounds were derived from foreign sources. The maximum capacity of quinine production in the provincial quinine factory is stated to be 60,000 pounds and the Director points out that immediate efforts are necessary to make the province self-sufficient in regard to the supply of quinine.

A comprehensive malaria survey, consisting of intensive investigations in selected villages in highly malarious areas, was started in November 1937 and continued during 1938. During the latter year 285 villages were surveyed and a large amount of field and laboratory findings has been collected. The survey is expected to be completed in 1939 and when the material is analysed and studied, the report on these surveys should provide a fund of information regarding the malaria situation in Bengal, on which future health policy in regard to this disease can be based.

The provincial grant for the distribution of quinine was Rs. 1,40,000 in 1936-37. It was raised to Rs. 2,00,000 in 1937-38 and again to Rs. 4,00,000 during 1938-39. The basis of distribution of grants to district boards was partly the ratio of the income of each board spent on quinine distribution and partly the ratio of the malaria patients treated in the district to the total malaria patients in the province during the preceding year. In 1938, for the first time, plasmochin worth Rs. 50,000 was made available to Civil Surgeons for use in the medical institutions under their charge and detailed instructions were issued for the combined use of quinine and plasmochin in the treatment of patients.

The menace to the health of Calcutta and its suburbs by the breeding of the salt water species of mosquito, *A. ludlowii* (*A. sundaicus*) received considerable attention during 1938. Breeding places of this mosquito exist in Wards No. 18, 21, 28, 29 and 31 of Calcutta city, some of them being highly populated parts of the town. Certain areas in Ward 21 were shown to have been newly invaded by this mosquito during the year.

In addition there was extensive breeding of the mosquito in the villages bordering the Salt Lake area as well as in a widely distributed area along the banks of rivers. In regard to the latter Canning, Hasnabad, Bhangore, Kulti, Baruipur, Sankrail, Akra, Barrackpore, Magrahat, Hotar and Diamond Harbour may be mentioned in order to indicate the distribution of the breeding grounds of this mosquito.

In Calcutta city it is reported that control measures were carried out throughout the year by the Corporation staff on anti-mosquito duty. In the Salt Lake area the operations were under the charge of the provincial Public Health Department, the scheme being financed partly by the Calcutta Corporation and partly by the District Board of 24-Parganas. It is stated that the density of the larvae of this species has been appreciably reduced and that the spleen rates in the villages in that area remained, with a few exceptions, below 10 per cent during the year. No epidemic of malaria took place.

In the river side areas, at Budge Budge, control measures were in operation throughout the year under the supervision of the provincial Public Health Department, financial support being derived from the municipality, the mill authorities and the District Board of 24-Parganas. It is stated that the area remained free from *A. ludlowii* and from malaria throughout the year. In other places the authorities of the Bengal-Nagpur, Eastern Bengal, East Indian and Kalighat-Falta Railways took active steps for controlling the breeding

of this mosquito in their respective areas. It is also stated that many municipalities and other bodies also carried out some control work, although inadequate, in accordance with the instructions issued by the Public Health Department.

In the Central Provinces the number of deaths registered under malaria rose from 267,588 in 1937 to 302,250 in 1938, an increase of 34,662. The rural death rate from malaria was 20.9 and urban 16.9. The large rainfall in September and October, giving an excess over the average figure for the previous 70 years to the extent of nine to 47 per cent in different parts of the province, is stated to have been particularly favourable for the epidemic prevalence of malaria. Among the districts, Bilaspur (27,874) reported the largest number of deaths from this cause and Nagpur (14,377) the lowest.

The curve of malaria mortality in Bombay Presidency shows that there is a progressive fall from January to May, which records the lowest figure, and then a steady rise till December when the maximum mortality from this disease is reached. During 1938, malaria deaths numbered 29,790 as against 25,373 in 1937. Bombay city recorded 99 deaths from this disease in 1938. High rates were recorded in the towns of Poona (4.2), Nasik (3.5), Malogaon (3.4), Igatpuri (2.1), Poona Suburban (2.0), Ilkal (1.3), Karwar (1.3) and Hubli (1.1) and in the rural areas in the districts of Nasik (8.4), Poona (3.9), Thana (2.7), Kanara (2.5), Ahmednagar (2.0), Belgaum (1.8) and Dharwar (1.6).

For anti-malarial measures 50 subordinate medical officers were appointed for duty in the most malarious parts of the province. These officers were allotted areas beyond a radius of five miles around each dispensary, the doctor in charge of the dispensary being responsible for the area with the five-mile range. For the special staff of fifty officers Taluka officers were asked to draw up their tour programmes and to suggest modifications, as and when required by local conditions. Each medical officer visited every village within his range once a fortnight. The work of these officers was supervised by the Assistant Directors of Public Health.

An investigation into the incidence of malaria in Pandharpur town was started by the municipality and it continued throughout 1938. Suggestions are being considered for making rules relating to the control of tank irrigation and farming in and around the town, for filling low-lying areas, for a drainage scheme and for the maintenance of an anti-malaria staff.

The Government of Bombay first sanctioned a grant of Rs. 68,730 for the distribution of quinine and later increased the amount to Rs. 71,730. The agencies for the free distribution of quinine included the officials of the Revenue and other departments, school authorities and the public health staff.

In Sind it is stated that the incidence of malaria has increased with the inauguration of the Lloyd Barrage and Canal Construction scheme. It is stated that, while no record of the total incidence of malaria is available, the numbers of patients treated in the urban and rural medical institutions indicate that the prevalence of the disease in the province is extensive. The Director of Public Health reports that a proposal has been submitted to the Government for the appointment of a malariologist and suitable subordinate staff for the province and that the proposal will receive favourable consideration as soon as the finances permit.

The number of deaths recorded under malaria in Sind during 1938 was 1,686 as against 1,514 in 1937. The urban and rural death rates from this cause in 1938 were 1.8 and 0.14 respectively. Among urban areas high rates

were reported from the towns of Ghotki (12·4), Rohri (6·5), Larkana (5·9), Shikarpur (5·4) and Tatta (4·4). The lowest rate was recorded in Karachi (0·08). In rural areas, the districts of Karachi (0·23) and Dadu (0·19) recorded high malaria death rates and Thar Parkar (0·07) showed the lowest rate.

Karachi municipality maintains a fairly large anti-malaria staff and Hyderabad a relatively smaller staff. In these two towns continuous anti-malaria operations were carried out. In some other towns also, preventive measures such as oiling and filling of pits were carried out.

During the malaria season eight touring medical officers were sent out to tour in the rural areas, especially in those parts in which medical aid is not available. Besides treatment of patients, these officers carried out spleen surveys of children, mapped out mosquito breeding places, collected mosquitoes for identification, sent blood smears for examination at the headquarters and advised the people regarding preventive measures against malaria and the value of quinine in its treatment. They visited in all 273 villages. In addition anti-malaria work was also carried out by the doctors in charge of Government travelling dispensaries.

Other measures taken by the Government included the manufacture and sale of cheap mosquito nets, the distribution of leaflets illustrating personal preventive measures against malaria and the value of quinine against the disease, and large scale distribution of the drug. For this distribution the services of officers of the Public Health, Revenue and Educational Departments, administrative officers of District School Boards, voluntary organisations and zemindars employing large forces of labour have been utilised. A sum of Rs. 33,000 was sanctioned for the distribution of quinine during 1938-39. Government also authorised the Director of Public Health to incur expenditure up to Rs. 1,000 per annum on the free supply of magnesium sulphate along with the quinine tablets.

Another useful measure taken by the Government of Sind has been the maintenance of a hatchery for the supply of larvivorous fish (*Gambusia*).

Heads of Government Departments, local authorities and private institutions were advised to give the spraying of residential quarters with Pyrocyde 20 a thorough and systematic trial. It is reported by the Director of Public Health that the replies so far received indicate the effectiveness of spraying in reducing the prevalence of mosquitoes and malaria.

The anti-malarial measures in Madras Presidency included (1) the continuation of the work already in progress at Krishnadevipeta in Vizagapatam Agency, the purpose being that of collecting adequate information for formulating a general scheme for the Agency as a whole ; (2) a limited scheme of anti-malarial works in connection with the Papanasam hydro-electric project ; (3) control measures in Hospet municipality, whose results are reported to be satisfactory ; (4) the maintenance of certain anti-malarial works carried out from the Government of India grant for rural development in 1935-36 in Ramnad (Rameswaram), Nellore and Chingleput districts and (5) three investigations organized at Pattukkottai, Wynaad and Ennore financed partly by the provincial Government and partly by a Government of India grant through the Indian Research Fund Association.

At Pattukkottai, where irrigation malaria is the problem, *A. culicifacies* is the chief carrier and irrigation channels, burrow pits and wells form its main breeding places. The fixing of water-tight calco gates for the irrigation channels has been started, most of the burrow pits have been drained by the Public

Works Department and orders have been issued for the prevention of the formation of such burrow pits in future, the badly aligned field channels in a demonstration area have been properly realigned in order to secure the co-operation of the agriculturists and a central larvicidal fish nursery is being maintained for distributing *Gambusia* in wells.

In the Wynaad, *A. fluviatilis* appears to be the sole carrier, the breeding places being the drains in the rice fields and hill streams. The planting of certain species of trees for providing shade over the water channels has been started on an experimental scale and herbage packing has also been tried in Sultan's Battery and Kalpatta.

In Ennore, where *A. culicifacies* breeds in casuarina pits, certain difficulties were experienced when control of breeding was attempted through the distribution of *Gambusia* and further investigations are in progress for developing other lines of attack.

A rapid malaria survey was carried out during the year in the Shevaroy (Salem district) and while a detailed investigation by a special unit was considered essential for the introduction of systematic control measures, an extension of the scheme for the free distribution of quinine to this area was recommended provided the local authority undertook to provide the necessary staff for supervision.

A scheme of permanent anti-malarial measures for Uttangarai (Salem district) was discussed at a conference of the officers of the Revenue, Public Health, Public Works and Local Board Departments and the scheme was submitted to Government for sanction.

The scheme for the free distribution of quinine operated in nearly 1,500 villages during 1938 in the coastal area of Vizagapatam district and in parts of Nellore and Anantapur districts, which suffered from severe epidemics of malaria during the year. About 1,800 pounds of quinine were distributed. Quinine was also sold at a reduced price. It is stated that, although a wide distribution of the drug was attempted through new agencies such as village headmen and teachers of schools maintained by the Government and local bodies, the value of quinine in the campaign against malaria has not yet been fully appreciated by the people and that more propaganda is needed to make its use more popular.

The amounts of quinine and other cinchona products distributed free and sold in the provinces during 1938 are shown in the table below. Both for rural and for urban areas Bengal is well ahead of all other provinces, its total amount (62,135 pounds) being many times greater than that of the next province, Madras (9,795).

TABLE II (v).

Distribution of Quinine, Cinchona Febrifuge, Totaquina and other Cinchona Alkaloids during 1933.

	Rural areas.													Urban areas.											Total.																	
	Distributed free.				Sold.				Total.					Distributed free.				Sold.				Total.			Distributed free.				Sold.				Total.									
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Total columns 10-13.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Total column 23-26.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Quinine.	Cinchona febrifuge.	Tota-quina.	Other cinchona alkaloids.	Total column 36-39.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40			
British India	29,537	17,327	1,164	659	31,644	575	238	..	61,182	17,901	1,402	659	81,145	6,228	4,234	356	237	7,381	834	2,473	114	13,609	5,068	2,829	344	21,850	42,233	22,530	1,552	1,073	41,761	1,410	2,711	116	83,984	23,938	4,204	1,182	113,368			
N.-W. F. P.	720	382	1	..	..	..	..	..	720	382	1	..	1,103	380	273	..	..	..	..	..	..	..	380	273	..	..	653	{1,373}	769*	1	..	..	..	..	1,373	769	1	..	2,143
Punjab . . . . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2,302	407	..	..	..	..	..	..	2,302	407	..	..	2,709
Delhi	23	10	..	..	..	..	..	..	23	10	..	..	33	194	98	..	..	..	..	..	..	..	194	98	..	..	292	217	108	..	..	..	..	..	217	108	..	..	325
U. P.	3,250	2,538	..	..	681	..	..	..	3,931	2,538	..	..	6,469	1,230	1,070	..	..	..	..	..	..	..	1,233	1,070	..	..	2,303	4,480	3,608	..	..	..	..	..	5,164	3,608	..	..	8,772
Bihar	3,312	3,312	3,312	3,312	3,685		
Orissa	795	493	55	14	316	1,110	493	55	14	1,672	271	72	315	72	387	1,066	565	55	14	1,353	1,425	565	55	14	2,059		
Bengal	13,073	12,418	226	576	27,566	7	..	..	40,639	12,424	226	576	53,865	2,068	1,851	128	128	3,754	232	..	111	5,822	2,083	128	237	8,270	15,141	14,269	354	702	31,320	239	..	111	46,461	14,607	354	813	62,135	
C. P.	1,019	353	45	25	986	20	7	..	2,005	373	52	25	2,456	853	488	41	100	944	39	..	1	1,797	526	41	94	2,459	1,872	841	86	125	1,930	59	7	1	3,802	899	93	119	4,913			
Bombay ‡	3,893	447	33	177	2,372	1	..	2	6,205	448	33	179	6,925		
Sind	2,005	129	12	33	505	2,510	129	12	33	2,684	162	55	1	7	162	55	1	7	225	2,167	184	13	40	605	2,672	184	13	40	2,909		
Madras	1,551	197	748	..	1,386	19	231	..	2,937	216	979	..	4,132	68	14	105	3	2,586	412	2,473	..	2	2,654	426	2,578	5,663	1,619	211	853	3	3,972	431	2,704	..	2	5,591	642	3,557	5	9,785		
Coorg	731	285	77	11	29	760	285	77	11	1,133	82	105	75	82	105	75	..	262	813	390	162	11	29	842	390	162	11	1,395	
Assam	3,048	519	*	*	176	529	3,225	1,048	*	*	4,273	836	134	6	1	50	151	886	286	6	1	1,178	3,884	654	6	1	227	680	4,111	1,334	6	1	5,452		
Ajmer-Merwara	10	3	..	..	..	..	..	..	10	3	..	..	13	84	74	..	..	..	..	..	..	..	84	74	..	..	158	94	77	..	..	..	..	..	94	77	..	..	171

* Less than half pound.

† Quinine worth Rs. 0-10-0 only was sold to the villagers.

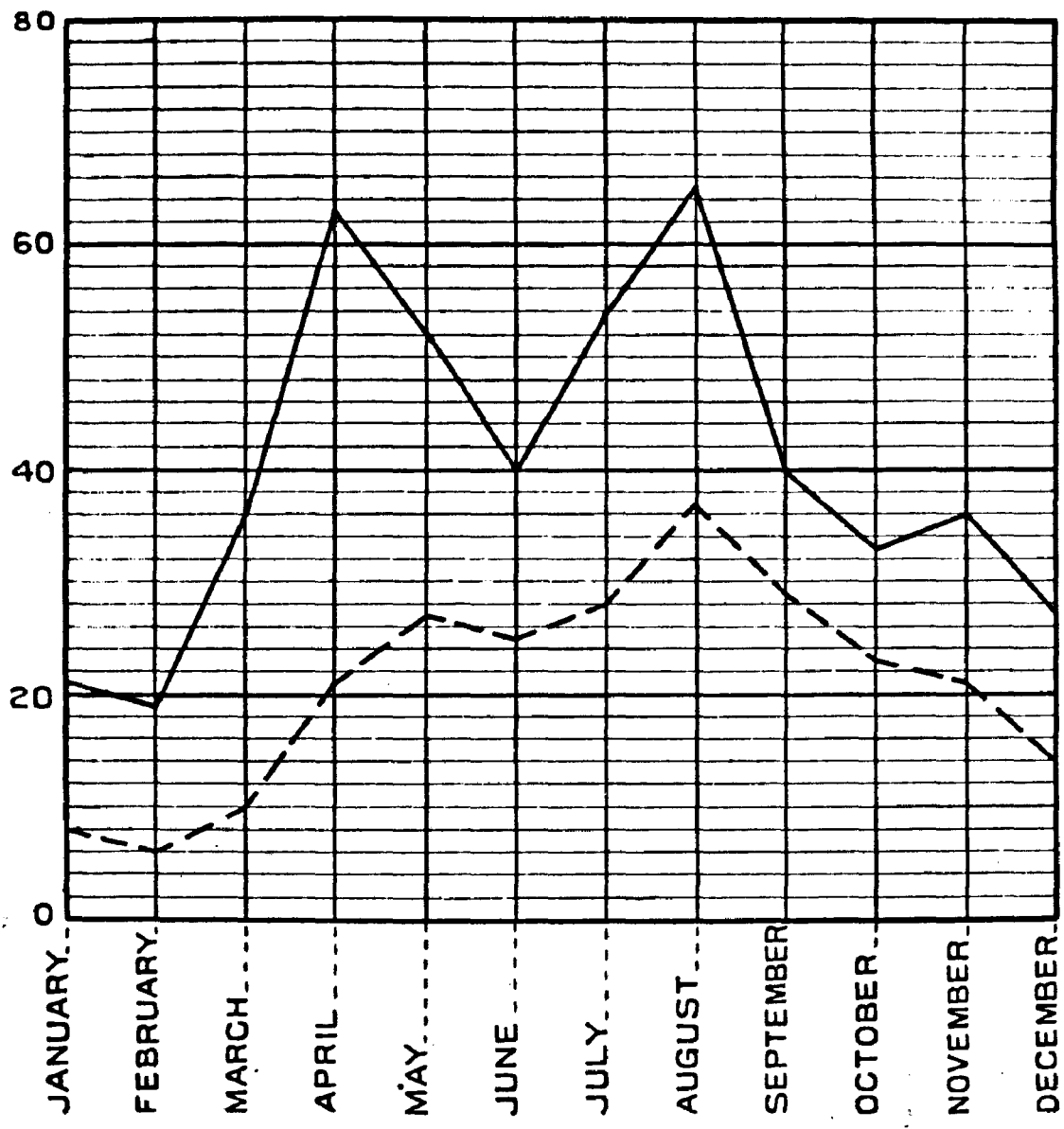
‡ Details according to rural and urban areas not available.

§ Including 273 lbs. distributed free in tribal area.

* Including 114 lbs. distributed free in tribal areas.

MEAN MONTHLY DEATH RATES PER MILLE FROM DYSENTERY AND DIARRHOEA AMONGST BRITISH OTHER RANKS AND INDIAN OFFICERS AND INDIAN OTHER RANKS DURING 1932-1938

RATE P.M.



BRITISH OTHER RANKS
 INDIAN OFFICERS AND }
 INDIAN OTHER RANKS }

Dysentery and Diarrhoea.

19. The number of deaths recorded as due to dysentery and diarrhoea in 1938 was 292,482 giving a rate of 1.1 *per mille* of the population compared with 1.0 for the previous year. The rates for urban and rural areas in 1938 were 2.4 and 0.9 respectively.

The monthly distribution of deaths from dysentery and diarrhoea shows that the incidence of these diseases was highest during the months of July, August and September. The vital statistics for the civilian population in India lack accuracy in many directions, including the recorded date of occurrence of death. In attempting, therefore, to study the seasonal incidence of dysentery and diarrhoea it is desirable to make use of more reliable figures. The graphs facing this page are based on figures kindly supplied by the Medical Director, Army Headquarters, India. These graphs show the rates *per mille* of average strength of the case incidence from dysentery and diarrhoea among the British and Indian troops of the Army in India. It will be seen that, in each case, there are two peaks, one in April-May and the other in August. February is the period of lowest incidence while the incidence of these diseases is high during March to September. In a recent study* of the seasonal incidence of dysentery in the Army in India during 1933-38, it was pointed out that, as fly breeding largely influences the incidence of the disease, the presence of appropriate warmth and moisture is the decisive factor in the seasonal prevalence of dysentery". For the country as a whole the warm moist months, July to September, are the most favourable for the spread of the disease and the period, November to February, the least favourable. Since the Army is distributed all over the country it is reasonable to assume that the seasonal incidence of dysentery among the troops represents its seasonal incidence among the civil population also.

Provincial rates for deaths from dysentery and diarrhoea, which are given in Table K of Appendix II, vary considerably from 2.6 *per mille* in the Central Provinces to 0.1 in Bihar. It is difficult to say how far these differences are due to inaccuracy in the recording of deaths under these causes and how far they are due to actual differences between the provinces regarding the incidence of these diseases.

Respiratory Diseases.

20. The number of deaths from respiratory diseases in British India during 1938 was 536,649 as against 487,319 in 1937. There was thus an appreciable increase in the recorded deaths under this group, the corresponding rates *per mille* being 1.9 and 1.8 respectively. Provincial death rates from respiratory causes are shown in Table M of Appendix II classified into the two sexes and into rural and urban areas. The urban rate (6.3) is more than four times that of the rural areas (1.5). The mortality rate of males (1.1) is higher than that of females (1.7).

Among the provinces Delhi and Bombay recorded the high rates of 8.1 and 6.4 respectively while Bihar had the lowest figure of 0.1. There is no doubt that the vagaries of the existing machinery for the registration of the causes of death are largely responsible for such wide differences in the provincial rates. The urban rate in every province is higher than the rural rate, although

*" The seasonal incidence of dysentery in India amongst Military Personnel " by Lt.-Col. T. O. Thompson, R.A.M.C. and Lt.-Col. C. D. M. Buckley, M.C., R.A.M.C., Journal of the Royal Army Medical Corps, December 1939.

the ridiculously large differences between the two rates in certain areas (0.02 and 14.7 and 0.9 and 12.0 in Ajmer-Merwara and Coorg for rural and urban areas respectively) must be largely due to defective registration. Nevertheless, it is safe to assume that respiratory diseases take a higher toll of lives in the towns and cities than in the villages. The prevalence of more overcrowding and ill-ventilation in urban than in rural areas mostly accounts for the higher mortality from this group of causes.

The monthly distribution of deaths from respiratory diseases is shown in Table N. In British India as a whole and in the provinces the largest numbers of deaths were recorded in December and January while the warm summer months showed a reduction in mortality from these causes.

Tuberculosis.

21. While no accurate figures are available regarding the incidence of tuberculosis in the country, the available evidence seems to suggest, as pointed out in previous reports that [the disease has been spreading from the more congested urban to the rural areas and now constitutes one of the most important problems in India from the point of view of the public health. Like leprosy it is one of those social diseases whose control can be attempted only by a comprehensive plan of improvement of living conditions. While medical measures are undoubtedly essential for tracking down infection and for affording relief to the patient as well as for preventing the spread of infection, social measures directed towards improved housing conditions and better nutrition constitute an equally important part of the preventive campaign.] Education of the people in regard to the mode of spread of the disease and the methods of personal prophylaxis against infection are also necessary in order to secure their intelligent cooperation in the fight against tuberculosis.

In India, with its relatively primitive health organisations for most parts of the country, it is difficult to attempt to provide the highly specialised tuberculosis services which more advanced countries possess. For the larger cities and towns, with their congested populations and better financial resources, special organisations will no doubt be built up in course of time for combating the disease. It is the vast rural population scattered over wide areas that presents the most difficult problem. A gradual extension of rural medical service must precede any attempt to provide a specialised tuberculosis service. When an adequate rural practitioner service has been brought into being, it may be possible to provide tuberculosis organisations on a regional basis so as to include a number of villages in each group, the rural dispensary doctors being made the instruments through which the special knowledge of the expert at headquarters is made available to the villagers. The specialist can visit each village at stated intervals, examine all the suspected and recognised cases of tuberculosis and the medical advice given by him will then be followed under the direction of the local doctor during the intervals between such visits. As the educational campaign in the home is a very important part of the programme, a staff of tuberculosis health visitors constitutes an essential link in the chain of preventive measures and provision must be made for their inclusion in the scheme. In some such way as has been indicated above it should be possible to provide a tuberculosis service for the rural areas, which combines preventive work with that of affording immediate relief to the patients.

The work of the existing organisation for combating tuberculosis has been summarised on pages 240 and 241 of the 1937 report. It is therefore sufficient to summarise briefly here the work in the provinces during 1938.

In the N.-W. F. Province a tuberculosis sanatorium at Dadar was under construction during the year under review and was opened to the public in May 1939. The total cost of the institution is stated to be Rs. two lakhs and it provides 70 beds for patients. The appeal for funds for anti-tuberculosis work issued by the Marchioness of Linlithgow in December 1937 and the wide response it produced in the province have helped to bring home to the authorities and the people that the disease constitutes an increasing menace to the public health. The Director of Public Health states that the statistics relating to the recruitment of the Police and Army indicate that the incidence of the disease is increasing.

It is reported that, in the Punjab, no expansion of anti-tuberculosis work took place in 1938 and the reason is stated to be that local bodies desired to postpone an expansion of their programmes of work until a provincial Tuberculosis Association had been started and a definite policy for the province had been formulated.

Tuberculosis is notifiable in all the towns of the Punjab, while in the rural areas, its notification is not compulsory. Although medical practitioners generally hesitate to notify cases of tuberculosis it is stated that some slight improvement has taken place in recent years.

Anti-tuberculosis institutions were maintained in four towns in the province and the Government paid its usual yearly grants of Rs. 7,500 and Rs. 5,000 to the Dharampur and Samli Sanatoria.

The Chief Health Officer, Delhi Province, in his annual report has discussed the tuberculosis problem in his area. While registered mortality figures for this disease must be considered to be an underestimate of the actual events, the fact that 1,057 deaths were attributed to tuberculosis in 1938 indicates, he states, that there exist at least 10,000 active cases of the disease disseminating the infection in the urban and rural areas of the province. The results of a survey covering 3,743 cases attending the Delhi Tuberculosis clinic during a period of 18 months since its establishment in 1936 throw further light on the tuberculosis problem. Of the total number of 3,743 patients pulmonary cases were 3,227 and non-pulmonary 516. Discussing the question of institutional treatment and the isolation of patients from the point of view of controlling the spread of infection, he points out that the early afebrile and febrile cases requiring sanatorium treatment numbered 1,161, the advanced febrile cases for admission to hospital 1,486 and the hopeless cases 580. On the assumption that, under Indian conditions, an average stay of four months in an institution is necessary for each patient, he points out that 716 beds would be necessary in order to provide for the patients in all the different categories. The number available at the Silver Jubilee Tuberculosis Hospital is 90 and when the proposed extension takes place, it will rise to 114 beds. When it is remembered that the figures provided by the survey represent only a fraction of the total incidence of tuberculosis in the province, the disparity between the required number of beds and those now available becomes even more striking. A much wider extension of institutional treatment as a part of the preventive campaign is therefore not practicable. The organisation of a domiciliary service directed towards the utilisation of the available facilities in the homes of the patients and particularly towards the protection of the children exposed to infection appears to be the best possible method of developing preventive work.

[The Chief Health Officer also lays stress on the part played by overcrowding and insanitary home conditions in the spread of tuberculosis and states that, without slum clearance, "all others fall into insignificance, if not complete uselessness".] In this connection it is satisfactory to record that the

Delhi Improvement Trust is taking active steps to remove the slums and to provide a scheme whereby sanitary dwellings will be made available to the poorer sections of the community within their means.

The desirability of providing for the daily distribution of milk to school children is also emphasised. The success of a scheme in operation in New Delhi should stimulate the other local bodies in the province to adopt a similar measure to improve the physical efficiency of the schoolgoing population.

In Bihar active anti-tuberculosis work is stated to have started in 1936 when a provincial branch of the King George Thanksgiving Anti-Tuberculosis Fund was established. A local committee has been formed in each of the 16 district headquarters with the District Magistrate as President and generally the Civil Surgeon as the Secretary. Clinics have been opened and are stated to be functioning actively in 12 district headquarters towns and it is expected that similar clinics will be opened in the remaining towns also in the near future. The district committee has the administrative control of the clinic, which is situated in a separate building of its own in the compound of the Sadar Hospital provided by the provincial headquarters. Each clinic has a medical officer who has had special training in tuberculosis and it is also proposed to provide a male and a female health visitor at the clinic.

Provision for institutional treatment is proposed to be made by the construction of 50-bedded cheap sanatoria for each district. The structures are of a semi-permanent nature and are expected to last about 10 years. The estimated cost, including equipment, is Rs. 27,500. The cost of maintenance of these institutions is stated to be Rs. 11,000 a year and it is expected that three-fourths of this amount will be realised from paying patients for whom about 20—23 beds will be allotted in each sanatorium. The construction of an inexpensive sanatorium of this kind is about to be started in Patna in order that it may serve as a model to other districts.

The problem of isolating infectious cases cannot be solved, except at a prohibitive cost, by the provision of hospital accommodation. It is therefore essential to develop a system of domiciliary treatment for the majority of the patients attending the tuberculosis clinics. The clinic is proposing to provide each patient, free of cost, a spittoon and a face mask in order to reduce the chances of infection to other members of the family. It has also been suggested that, in order to promote the consumption of milk by patients, the keeping of goats should be encouraged.

Other activities included intensive propaganda and the training of doctors in anti-tuberculosis work at the special course for medical graduates at Calcutta under the auspices of the King George Thanksgiving Anti-Tuberculosis Fund.

The report of the Director of Public Health, Bengal, mentions that schemes for two surveys have been submitted to the provincial Government for sanction. One of them is to be carried out in a mixed rural and urban population and the other in an industrial population. The surveys are intended to collect accurate information regarding the incidence of tuberculosis among the different sections of the population and at different age periods and to study the various factors associated with the prevalence of the disease. Further, a detailed scheme for the control of tuberculosis in the province has also been submitted to Government.

The activities of the Bengal Tuberculosis Association were summarised in the annual report for 1936. This Association has five dispensaries in Calcutta, one in Howrah and four in other parts of the province. In addition to these activities the Senior Medical Officer of the Association visited a number

of places in the province and discussed with the local authorities the tuberculosis problem and the possibility of developing anti-tuberculosis work. A course for the training of tuberculosis health visitors was arranged during the year. The course lasted six months and, of the 31 students attending the course, 22 were successful in the examination held at the end of it. In addition the Association gave training to eight students of the Sir John Anderson Health School in anti-tuberculosis work.

The number of beds available at Jadabpur Tuberculosis Hospital was extended by 20 during the year, besides the provision of temporary accommodation for 10 male patients. In addition quarters for the nurses were built for which the Calcutta Corporation made a grant of Rs. 25,000. The Corporation also sanctioned a grant of Rs. 50,000 to the hospital through the King Emperor's Anti-Tuberculosis Fund, the proceeds of which will be utilised for the provision of an additional 150 beds.

In the Central Provinces four new tuberculosis clinics were established during 1938 at Nagpur, Jubbulpore, Amraoti and Raipur and 5,277 patients were treated at these clinics. At the tuberculosis sanatorium at Pendra in Bilaspur district, the number of patients at the beginning of the year was 93 and 168 were admitted during the course of year, thus making a total of 261. Of these it is reported that five died, 52 were discharged as cured, 27 as partially cured and 32 as showing no response to treatment while 34 left as they were non-tuberculous cases, leaving 111 patients at the end of the year.

Tuberculosis clinics have been opened by the Bombay Government in Ahmedabad, Surat, Poona, Nasik, Sholapur and Belgaum Civil Hospitals. In addition there are private sanatoria for the treatment of the disease in a few towns. Panchgani and Nasik municipalities have resolved to adopt bye-laws for the confidential notification of cases of tuberculosis in their areas.

In Sind the Karachi Corporation and Hyderabad Municipality maintain tuberculosis dispensaries and it is reported that good work was done by these institutions.

Hookworm Disease.

22. The distribution of hookworm infection in India was briefly described in last year's report. As the main cause of the infestation is the indiscriminate pollution by nightsoil of the inhabited areas in towns and villages, the value of an organised campaign against this disease in raising the general standard of the health of the people by eradicating not only hookworm disease but also other bowel diseases cannot be over-emphasised. In fact the organisation of a popular system of nightsoil conservancy for the rural population is one of the most urgent health problems in this country. In all those areas in which hookworm disease is prevalent, a campaign based on mass treatment, the provision of latrines and education of the people to make use of them can become a successful method of convincing the population of the value of preventive health work. Work on these lines has been in progress in the province of Madras for some years. In the Punjab too a considerable amount of anti-hookworm work has been done since 1934 but the provision of bore-hole latrines was tried only in one area and there the experiment met with little success. Efforts have therefore been concentrated on keeping village sites clean by encouraging the people to dispose of their filth by trenching it in a place well away from the inhabited area.

In Madras it is reported that the anti-hookworm campaign carried out in 1938 included examination of 9,567 specimens of stools, 197,895 treatments and intensive propaganda by the exhibition of cinema films on hookworm,

lectures with magic lantern demonstrations or charts and the distribution of leaflets. As was pointed out in last year's report, there are six rural sanitation units, each consisting of a trained medical man and assistants, maintained by the Public Health Department, their work being coordinated by a Special Health Officer in the office of the Director of Public Health. These units are lent to the different district boards in the province for work in their respective areas. One of their important functions is that of stimulating the construction of bore-hole and trench latrines in the rural areas and of encouraging the people to make regular use of them. It is stated that the local bodies in the districts are taking an increasing interest in this rural sanitation work. In many districts squatting slabs for bore-hole latrines in private houses are supplied by local authorities at half cost or at concession rates. It is stated that, for the province as a whole, the local bodies spent on rural sanitation Rs. 1,32,342 and that in one district alone a sum of Rs. 14,795 was spent during the year under review. A number of public latrines had been constructed in 1935-36 and 1936-37 out of grants from the Government of India for rural development and it is stated that they were maintained, in most districts in good condition by the local bodies concerned.

In the Punjab it is reported that surveys carried out in different districts since 1934 have shown that the disease is widely prevalent. The percentages of infested persons in the districts vary from 4.1 per cent in Hissar to 87.5 per cent in Jullundur. Antihookworm activities increased considerably in 1938, the number of units for mass treatment being increased from four to eight. In 1938 the total number of persons treated was 87,863 as against 49,423 in 1937. Since the beginning of the campaign against the disease 350,933 persons have undergone treatment. It is reported that tetrachlorethylene has proved to be a safe and effective remedy.

In the Central Provinces examination for hookworm disease was stated to have been carried out in 1938 in six jails and a total of 113 cases was discovered. They underwent treatment and 109 are stated to have been cured.

Leprosy.

23. The geographical distribution of leprosy in India and the work of the organisations, official and voluntary, engaged in leprosy relief work have been briefly described in previous annual reports. Short reviews of the work carried out during 1938 by the Indian Council of the British Empire Leprosy Relief Association and by the Mission to Lepers, the most important voluntary organisation engaged in antileprosy work, are given on pages 181—183 of this report. The campaign against the disease has been carried on, as in previous years, by the establishment of treatment clinics by surveys of leprosy incidence in limited areas, by field and laboratory research into the problems associated with the incidence of the disease, by the training of medical men in modern methods of diagnosis and treatment and by propaganda among the people.

The work so far carried out has brought out certain salient facts. Leprosy, though an infectious disease, is not easily transmitted from person to person and appears to require prolonged periods of contact for the transfer of infection. Childhood is the most susceptible age period and any preventive campaign, if it is to be successful, should lay particular emphasis on the protection of children from infection. No specific treatment has yet been discovered for leprosy, although a considerable amount of research has been carried out in the past, and while treatment has undoubtedly its place in the antileprosy campaign, the available methods do not appear to hold out the hope that the many thousands of infectious lepers in the country can be rendered innocuous by treatment alone.

In its social aspects the disease presents certain problems. While the decrepit and disfigured leper beggar in the street spontaneously causes a feeling of revulsion in the mind of the onlooker, Hindu religious practice encourages the giving of alms to these people and thus promotes their congregation in large numbers in festival centres all over the country. [In some of the larger cities begging in the streets has become an organised and remunerative profession for lepers and a thriving population of these people, many of whom are infectious, exists in such places, their numbers being reinforced by arrivals from the rural areas.] Although it is true that, because these leper beggars live segregated from the general population of these cities, the danger of infection to the public is small, the propagation of children by these lepers and their continuous exposure to infection during the early ages of life lead to a steady increase in the leper population. Moreover some measure of commingling of lepers with the lower sections of the uninfected community cannot be avoided and this also contributes its share to the spread of the disease. The presence of these social factors emphasises the necessity for a wide programme of education as an essential part of the campaign against the disease. Until the people begin to realise that their fullest cooperation for carrying out the necessary preventive measures can alone secure a reasonable measure of success in the fight against leprosy, governmental and voluntary efforts, however well organised they may be, must largely fail to produce results.

The fact that at least a quarter of the estimated population of a million lepers in India are considered to be in the infectious state and that the incidence of the disease is higher in the rural than in urban areas renders the control of leprosy extremely difficult. Segregation of the infectious cases will undoubtedly have to play an important part in the campaign before the spread of the disease can be arrested. Lack of funds, popular sentiment and administrative difficulties stand in the way of making any rapid progress. Cheap methods suited to Indian rural conditions, coupled with intensive efforts to win the cooperation of the people, can alone achieve success. As has been pointed out by the Inspector General of Civil Hospitals in Bihar*, "In the present financial circumstances of India provision for lepers can be best achieved by leper colonies in cheap huts, directed by competent social workers and medical officers. These leper colonies become largely self-contained and self-supporting. Such leper colonies in inexpensive huts are indeed the only practical method of attempting to deal with the large numbers of lepers involved. Large expensive modern hospitals for lepers are neither essential nor desirable. The funds available should be devoted to the extension of cheap leper clinics run by keen whole-time workers and social workers, to the provision of cheap colonies, to increased propaganda, to leper surveys and research work, especially on more efficient methods of treatment. Such lines should provide our unceasing present aim".

Antileprosy work in the provinces during 1938 may now be briefly summarised.

In the Punjab it is reported that leprosy surveys were carried out in 1938 in Ludhiana, Hissar and Gurgaon districts and in the Nurpur and Seraj tahsils of Kangra district. Of 3,101 villages surveyed lepers were found in 237 and the total number of cases detected was only 456. Of these 250 are reported to be non-infectious and 206 infectious. The surveys carried out

* "Notes on leprosy in Bihar with suggestions for the future development of Bihar Leprosy Relief Association" by Colonel H. Stott, I.M.S., Inspector General of Civil Hospitals, Bihar, and Secretary, Bihar Leprosy Relief Committee.

since 1931 have covered 20 districts and 10,046 villages in these districts. Lepers were discovered only in 1,126 villages and the total number of cases was 2,459. It is clear that leprosy does not constitute such an important health problem in the Punjab as it does in some other parts of India.

Nineteen new clinics were opened during 1938 by the Government and local bodies, the total number in the province at the end of the year being 124.

Thirty medical men and 21 nurses from the areas surveyed were given special training in leprosy during the year. The numbers of medical men and health personnel trained in leprosy in the province by the end of 1938 were two health officers, 294 doctors, three sanitary inspectors and 24 nurses.

The Leprosy Officer, in addition to giving the special training mentioned above, delivered lectures and gave demonstrations on leprosy to the final year medical students and post-graduate classes at the King Edward Medical College, Lahore, the Medical School, Amritsar, and the Women's Christian Medical College, Ludhiana. He also inspected the leper homes in various parts of the province.

In Bihar antileprosy treatment for in-patients in special institutions is carried out (1) at five Mission Asylums situated at Purulia, Bhagalpur, Muzaffarpur, Gaya and Saldaha, and (2) at three institutions under the management of local committees, which are maintained by public subscriptions and by grants from the Government and local bodies. These three institutions are at Deoghar, Purulia and at Dhanbad. In addition it is reported that there were in 1938, 44 outdoor leper clinics against 41 in 1937. At these clinics 9,598 patients were treated during the year under report as compared with 17,967 in the previous year.

The Purulia Leper Home and Asylum is reported to have made some progress in its activities during the year, the outstanding feature being a large increase in the number of children who came under treatment. Increase of hospital accommodation for leper patients included the addition of a ward at the Saldaha institution and the preparation of plans for the conversion of a bungalow at the Bhagalpur leper institution into a well-equipped treatment centre with facilities for laboratory work and an operation theatre.

During the year two sub-assistant surgeons were deputed for training in leprosy at the Calcutta School of Tropical Medicine. As usual a course of lectures on leprosy was delivered to the students of the Prince Edward Medical College, Patna, by the medical officer in charge of the Gait Skin Clinic, Gulzarbagh. Lectures were also given to the senior students of the Darbhanga Medical School.

The Director of Public Health, Bengal, states that, although leprosy is prevalent throughout the province, its incidence is particularly high in the districts of Rangpur, Midnapore, Murshidabad, Birbhum, Nadia, Rajshahi, Bankura, Dinajpur, Dacca, Hooghly, Mymensingh and Burdwan. The campaign against the disease has hitherto been mainly directed by the local bodies, which provided treatment clinics according to their financial resources. The question of isolation of infectious cases had not so far been considered at all. In order to meet the situation, therefore, the Director of Public Health has, it is reported, drawn up a comprehensive scheme which has been approved by the provincial government. This scheme provides for suitable grants to the local bodies of those districts in which the prevalence of the disease is high. Arrangements have also been made with the British Empire Leprosy Relief Association for carrying out leprosy surveys in the affected areas.

Leprosy is reported to be widely prevalent in the Central Provinces, the areas most affected being the districts of Bilaspur, Raipur, Drug, Chanda, Wardha, Chhindwara, Amraoti, Yeotmal, Buldana, Akola and Nimar. During 1938 two more treatment centres for leprosy were established at Bhandara and Arni respectively, thus increasing the total number of centres in the province from 35 to 37. The widespread outbreak of cholera that took place all over the province during the year and the temporary transfer of the medical staff of the leprosy clinics to cholera duty led to a fall in the number of patients treated at these clinics during 1938, the figure being 87,599 compared with 92,201 in the previous year. It is reported that, during the year patients free from the symptoms of leprosy numbered 118 and that an improvement of their conditions was recorded in respect of 1,542 patients. A resurvey of the affected areas resulted in the discovery of 409 new cases and these were brought under treatment. Eleven Assistant Surgeons, 18 Assistant Medical Officers and 16 private practitioners in the province have had special training in leprosy at the Calcutta School of Tropical Medicine. In 1938 the Provincial Leprosy Specialist was sent to Calcutta for training in field investigations and a Sub-assistant Health Officer underwent a refresher course in Chandkhuri.

It is reported that, in Madras Presidency, leprosy surveys were carried out during 1938 in a number of towns and villages in the districts of South Arcot, Chittoor and East Godavari. In a population of about 78,000 in 82 villages in these districts, 1,503 cases of leprosy were detected. It is stated that an intensive survey will probably result in the discovery of an additional 1,000 lepers. During school surveys, of 24,139 pupils examined nearly 400 were definitely cases of infection and 500 suspicious cases.

Approximately 4,000 cases were treated during 1938 in the leper institutions of the province and of these 337 were discharged as "disease arrested". The Government have ordered that, in future, admission as in-patients to institutions receiving grants-in-aid from provincial funds should be restricted to infectious cases amenable to treatment. The number of outdoor leprosy clinics during the year was 456 and the number of new patients treated was 33,500.

Twentytwo health officers underwent post-graduate training in leprosy during 1938.

In Assam a total of 4,375 lepers received treatment during 1938 in the institutions under the control of the Medical and Public Health departments. The number of centres under the Public Health Department for the treatment of leprosy remained the same as in 1937, namely, 62. Ten medical officers of Public Health Department were given training in leprosy locally. Sub-assistant Surgeons under the Department, who were engaged in kala-azar surveys, also carried out leprosy surveys in their respective areas. Propaganda lectures on leprosy, with the aid of magic lanterns, were carried out by Assistant Surgeons of the Public Health Department.

Leprosy research carried out during 1938 is briefly summarised below :—

A study of leprosy in Burmans and Indians by Dr. Lowe and his co-workers at the Calcutta School of Tropical Medicine showed striking differences in the incidence of the various types of the disease. In Burmans the severe lepromatous type forms about 50 per cent of the total compared with about 25 per cent in Indians. Further, in the Burmans the mild neural form shows a tendency to develop into the severer forms. The mild types are found chiefly in children among the Burmans while, among Indians, they are found in all age groups. The conclusion is drawn that racial immunity to leprosy is lower among the Burmans than among Indians.

A clinical and bacteriological study of about 3,000 cases in Calcutta at different parts of the year during the past two years has shown marked seasonal variations in severity in lesions of the neuro-macular type. From February to September signs of activity and inflammation are more evident than at other times of the year and during February to May, the proportion of lesions showing bacilli in smears rises from a normal of about 6 per cent to over 20 per cent, the proportion again falling suddenly below 5 per cent in June. It is probable that this increased activity of the lesions is due to climatic factors.

The findings of a survey of leprosy incidence in a group of 42 villages in Bengal are of considerable interest. The gross incidence was 4 per cent, of which only 18 per cent are of the severe lepromatous type, a much lower figure than has been found in some other parts of the world. The great majority of infections were contracted in childhood, about a third having been infected by close relations, another third by more distant relatives, and the remaining third by either unknown persons or by persons who were in no way related to the patients. Close contact at the earlier ages produced the severer forms of the disease, lepromatous cases being more infective than the mild neural ones. About 80 per cent of the cases of leprosy gave a history of contact. Males showed a higher incidence and greater severity of symptoms than females.

Laboratory studies included (1) the complement fixation test with W. K. K. antigen, it being shown that positive results were obtained in practically all cases of leprosy in which bacilli can be found in smears, (2) cultivation of *M. leprae*, which has so far been unsuccessful and (3) inoculation of human leprosy material on splenectomised Syrian hamsters in order to investigate their susceptibility to leprosy, a claim which has been advanced by Adler but which has not so far been substantiated by the work done in Calcutta.

At the Lady Willingdon Leper Settlement, Chingleput, in Madras Presidency, Dr. Cochrane investigated the influence of skimmed milk on the progress of treatment of leprosy. Although the numbers of cases under observation were small and no definite opinion could therefore be expressed, certain tentative conclusions have been drawn:—

1. administration of skimmed milk (eight ozs. of fluid milk a day) for a period of nine to 18 months did not appear to have any influence on the neural lesions of leprosy, while
2. some slight evidence has been produced to show that, in respect of the lepromatous type, administration of skimmed milk is of value.

Yaws.

24. In last year's report the geographical distribution of yaws in India and its main epidemiological features were briefly reviewed. During 1938 information regarding its prevalence is available with respect to the provinces of Madras, the Central Provinces and Assam. In Madras it is reported that the disease was prevalent in the districts of Madura, Kurnool and Tinnevely. In Madura the disease was first noticed in a village in July 1937 and 89 cases were treated that year. In September 1938 there was a recrudescence of the infection which lasted till February 1939 and gave rise to 40 cases in all. In Kurnool the disease was confined to an aboriginal tribe and in Tinnevely the infection was restricted to a single village and there only to fishermen.

In the Central Provinces it is reported that the health staff of three districts Chanda, Bilaspur and Drug discovered 255 cases of yaws, all of whom were brought under treatment.

In Assam, 3,234 cases of this disease were treated in 1938 against 2,607 in 1937. Three more centres for treatment were opened in each of the districts of Goalpara and Nowgong and two medical licentiates were given training in the diagnosis and treatment of yaws.

Kala-azar.

25. The incidence of kala-azar is mainly confined to north-eastern India, in the provinces of Bihar, Bengal and Assam. The United Provinces and Madras also have a certain number of cases every year. In Bihar, Bengal and Assam the prevalence of this disease is reported to have been greater in 1938 than in 1937. The figures given in the following table relate to the cases treated and the deaths taking place in medical institutions in the provinces from kala-azar during 1938. They provide some indication of the degree of its prevalence in individual provinces.

TABLE II (vi).

	Cases.	Deaths.
N.-W. F. P. . . . .	..	..
Punjab	9	..
Delhi	1	..
U. P	995	9
Bihar	116,568	387
Orissa	66	3
Bengal.	107,146	420
C. P.	11	..
Bombay	23	2
Sind . . . . .	..	..
Madras	2,263	20
Coorg . . . . .	..	..
Assam	8,775	112
Ajmer-Merwara . . . . .	..	..

In Bihar, as pointed out in last year's report, there has been a recrudescence of the infection in that area of the province which lies to the north of the Ganges. From the above table it will be seen that Bihar reported the largest number of cases of this disease treated in medical institutions and that the figures for this province and for Bengal are well over a hundred thousand in each case.

Knowledge regarding the exact mode of transmission of infection is still lacking, although intensive researches are in progress in Bihar under the auspices of the Indian Research Fund Association. As treatment of patients with the many varieties of pentavalent preparations of antimony now available on the market results in curing the disease in about 95 per cent of the cases, in all the affected areas the main effort has been concentrated towards providing facilities for treatment. In Bihar it is reported that the Government sanctioned Rs. 6,200 for meeting the expenditure on five treatment centres and deputed five doctors for special training at the Patna Medical College. These centres started functioning early in February 1939. In order to strengthen this campaign of treatment, 15 additional centres in North Bihar have, it is reported, been sanctioned during 1939-40.

In Bengal it is stated that the annual grant of Rs. 1 lakh for the campaign against kala-azar was fully utilised for the purpose during 1938-39. In the districts of Bankura and Birbhum the incidence of the disease was negligible. In Darjeeling district, in view of the steady increase in the spread of infection, a special scheme was put into operation costing about Rs. 17,500. Nineteen special officers were appointed for the campaign and, in addition to the treatment of cases, they also carried out propaganda among the people. Two sanitary inspectors were also deputed for educating the people and inducing the patients to avail themselves of the facilities for treatment that had been provided. In all, 15,816 old and 2,951 new kala-azar cases were treated during 1938 in the Darjeeling district. In the other districts a sum of Rs. 61,740 was distributed to the respective district boards, the basis of allotment being the expenditure by the boards on the treatment of the disease and the numbers of patients treated in each district. The Government also spent a sum of Rs. 20,700 for treating kala-azar patients in the various medical institutions of the province.

In Assam the number of deaths from kala-azar in 1938 was greater than that of the preceding year by 281 and the number of patients by 5,217. Medical officers of dispensaries were deputed to survey villages within their areas of jurisdiction and subassistant surgeons belonging to the Public Health Department carried out similar surveys in other areas where a recrudescence of the disease was suspected. In consequence of these investigations many new centres for treatment were started in different parts of the province. The following table gives the numbers of kala-azar cases treated in the province during the years 1928-38.

TABLE II (vii)

Districts.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.
Cachar	394	470	376	370	391	472	529	478	574	445	716
Sylhet	8,988	9,162	6,726	5,512	4,719	4,210	4,612	3,869	3,645	3,672	4,622
Goalpara	2,316	2,389	1,439	992	1,089	1,159	1,107	1,245	1,276	2,046	2,541
Kamrup	3,577	2,598	1,814	1,690	2,061	2,223	2,197	1,465	1,309	918	1,189
Darrang	2,228	1,399	1,106	942	665	757	876	738	636	514	989
Nowgong	2,614	2,433	1,440	1,057	1,075	1,663	1,726	1,651	1,471	2,317	3,265
Sibsagar	1,555	2,387	1,495	1,095	1,269	1,251	1,372	938	864	1,396	3,050
Lakhimpur	28	23	23	3	12	13	18	12	6	2	13
Khasi and Jaintia Hills	6	..	..	..	..	1	5	..	..	..	..
Naga Hills	5	9	21	5	16	12	14	7	5	15	39
Lushai Hills	1	..	..	4	2	1	..	..	..	..	..
Garo Hills	1,690	2,905	1,905	882	605	850	927	690	793	717	824
Sadiya Frontier Tract	8	3	2	2	1	2	1	..	..	2	..
Manipur State	166	35	83	38	53	36	14	7	8	7	20
Total	23,576	23,813	16,430	12,592	11,958	12,650	13,398	11,100	10,587	12,051	17,268

SECTION III.

MATERNITY AND CHILD WELFARE.

Introduction.

26. The outstanding event of the year was the publication of the Report on Maternity and Child Welfare in India by a special committee appointed by the Central Advisory Board of Health to review the existing maternity and child welfare services in this country. In view of the importance of the committee's recommendations chronological exactitude was sacrificed and an account of the committee's findings was included in the report of the Public Health Commissioner with the Government of India for 1937. It is unnecessary to repeat the summary already given, but the importance of the subject warrants the attention of all official and voluntary organisations concerned with work in this field being again directed to the report. The report was adopted in its entirety at the second meeting of the Central Advisory Board of Health in Madras in January 1939.

The publication of the report is of too recent date to have had any influence on the organisation or extension of maternity and child welfare work in the provinces and the situation in the provinces has not materially changed.

Keen interest continues to be manifested in the welfare of women and children by voluntary organisations and in certain provinces by official agencies, and there is evidence that the importance of the work not only to the well-being of individuals, but also to the efficiency and prosperity of the nation is being increasingly recognised. Women's organisations particularly are alive to the situation, and sooner or later they will take steps to have the resolutions passed at their annual conferences implemented. The driving force of public opinion has potentialities which, if properly directed by expert advice, hold out a hopeful prospect for the future but, if misdirected, may result in wasteful expenditure, uncoordinated effort and diminished benefit to the community.

The limited number of medical women employed as directors of maternity and child welfare is a severe handicap to the utility of the work. One result is the scanty information submitted by the provinces and States regarding the facilities available for the care of women and children throughout India; this in turn makes the compilation of this section of the annual report difficult and considerably diminishes its value as a means of reviewing progress and appraising the value of the work undertaken. It is admittedly difficult to collect information regarding the work in civil child welfare centres and the time may not yet be ripe for the introduction of tabular statistical forms in this field, but statistics relating to the provision of hospital beds for expectant and lying-in mothers are available and can be given in provincial public health reports.

In Sind and Madras efforts were made during the year to elicit particulars of the causes of deaths directly due to childbearing. In Madras special forms have been drawn up for use in the larger city maternity hospitals as well as modified forms for use in welfare centres, dispensaries and district hospitals. In Sind municipal towns employing qualified health officers were asked to collect the information. The figures for 1938 are said to be meagre, but the scheme has been inaugurated and future returns are expected to be more valuable. The next step required is the collection of similar information regarding the causes of death amongst infants and toddlers. A limited enquiry carried out in hospitals and welfare centres is the only possible prospect at the moment.

Closely connected with this suggestion are the questions of the training in pediatrics given to medical students and the facilities available for admission to hospital of sick children. Both of these are known to be unsatisfactory and while the subject may not be considered to be the direct responsibility of the health departments, the complementary nature of the scheme makes the provision of children's hospitals a subject of vital interest to the public health authorities.

Maternal Mortality.

27. Rates of maternal mortality from the provinces show wide variation. Further, as has been emphasised in previous reports, these rates cannot, on account of defective registration of births and deaths and unreliable certification of the causes of deaths, be accepted as representing, with any degree of accuracy, the true state of affairs.

A considerable amount of information relating to maternal deaths has been, however, collected for 1938 from hospitals having 300 deliveries or more per year. Hospital figures relate to a select population of only those women who are able and willing to enter a hospital for confinement, and are therefore not representative of the community as a whole. Most of the hospitals from which returns were received are situated in large cities and, except for a certain number of cases admitted from the surrounding rural areas (often late in labour), hospital figures represent urban conditions. Further, hospital cases include a high proportion of cases of abnormal labour and complications of pregnancy. Special enquiries conducted in a few areas on the whole population, suggest that obstructed labour and eclampsia have a high hospitalisation rate while, on the other hand, abortion, anæmia of pregnancy, puerperal sepsis after delivery outside, and cases of intercurrent diseases associated with pregnancy are relatively less likely to gain admittance to these institutions.

These facts have to be borne in mind in considering the hospital figures^s for 1938 which are discussed below.

The total number of maternal deaths for which detailed information is available is 1,558 of which 1,368 (88·1 per cent) are due directly to childbearing and 190 (11·9 per cent) are due to diseases associated with childbearing. The deaths have been classified according to the divisions of the International List of Causes of Death, with an additional heading for anæmia. Anæmia deaths have been classified with the deaths due directly to childbearing and not those due to associated diseases because of the intimate relationship which exists between pregnancy and anæmia.

The distribution by cause is shown in the following table :—

TABLE III(i).

Cause of death.	Number of deaths.	Percentage of total (1,368).
Abortion, septic	19	1·39
Abortion, non-septic	10	0·73
Ectopic gestation	7	0·51
Other accidents of pregnancy	8	0·58
Placenta prævia	70	5·12

Cause of death.	Number of deaths.	Percentage of total (1,368).
Other hæmorrhages	111	8.11
Puerperal sepsis	354	25.88
Puerperal tetanus	2	0.15
Eclampsia	211	15.42
Albuminuria and chronic nephritis	96	7.02
Other toxæmias	27	1.97
Embolism, thrombosis and sudden death	33	2.41
Accidents of labour	164	11.99
Unspecified conditions	1	0.07
Anæmia	255	18.64
Total deaths due directly to childbearing	1,368	100.00
Deaths due to diseases associated with childbearing	190	..
Total	1,558	

The outstanding importance of puerperal sepsis (25.88 per cent) and toxæmias of pregnancy, especially of eclampsia, are well shown in this table. This corresponds with findings in other countries. The high figure for deaths due to anæmia is, however, particularly noteworthy, for it indicates the importance of this complication of pregnancy as a cause of maternal deaths in India. The importance of anæmia is by no means limited to the 18.64 per cent of deaths for which it was the only cause found, for many deaths from sepsis, and albuminuria of pregnancy occurred as terminal events in the course of a severe anæmia. Such deaths, however, have been included in their respective groups.

AGE AND CAUSE OF DEATH.

The following table shows that, in the age-periods under 20 years, eclampsia caused more deaths than even sepsis. Anæmia also was of relatively high importance in young women. In the later age groups sepsis and anæmia were the most important causes.

TABLE III (ii).

Cause of death.	Age groups.						
	12-15.	16-20.	21-25.	26-30.	31-35.	36-40.	41-45.
Abortion, septic . . . . .	..	1.3	0.8	0.9	3.0	4.7	..
Abortion, non-septic . . . . .	..	0.8	0.5	0.6	1.8	..	..
Ectopic gestation . . . . .	..	0.3	0.5	0.3	1.8	..	..
Other accidents of pregnancy . . . . .	..	1.0	0.3	0.3	1.2	..	..
Placenta prævia . . . . .	..	..	5.7	7.3	11.5	7.8	8.3
Other hæmorrhages . . . . .	..	3.8	7.0	12.6	11.5	14.1	8.3
Puerperal sepsis	25.0	23.9	29.4	26.8	23.6	17.2	33.4
Puerperal tetanus . . . . .	..	0.3	..	0.3	0.3	..	..
Eclampsia	34.3	32.6	11.5	4.2	7.5	1.6	8.3
Albuminuria and chronic nephritis	6.3	7.1	7.6	7.3	5.5	7.8	..
Other toxæmias . . . . .	..	2.8	1.0	1.9	1.8	4.7	..
Embolism, thrombosis and sudden death . . . . .	..	2.5	2.1	1.9	3.6	3.1	8.3
Accidents of labour	3.1	7.4	11.2	16.7	12.7	23.4	16.7

Cause of death.	Age groups.						
	12-15.	16-20.	21-25.	26-30.	31-35.	36-40.	41-45
Unspecified conditions . . . . .	..	..	..	..	0.6	..	..
Anæmia	31.3	16.2	22.4	18.9	13.9	15.6	16.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

PARITY OF MOTHERS AND CAUSE OF DEATH.

The distribution of deaths by parity and cause shown in table III(iii) indicates a high proportion of eclampsia deaths amongst primigravidæ, with sepsis, anæmia and accidents of labour in decreasing importance. In multigravidæ, on the other hand, sepsis and anæmia were of almost equal importance in the second pregnancy. Hæmorrhage is of increasing importance as parity increases and this is clearly shown both by the figures for placenta prævia and also for other hæmorrhages. Deaths from septic abortion show a tendency to increase with the higher parity. Accidents of labour are more important relatively in older women.

[Table

TABLE III(iii).

Parity.

Cause of death.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15 and over.
Abortion, septic	0.5	1.0	3.0	..	0.9	1.1	5.0	..	4.3	9.5	..	..	..	..	..
Abortion, non-septic	0.7	0.5	..	1.5	0.9	1.1	1.2	..	2.1	..	..	..	..	..	..
Ectopic gestation	0.9	0.5	..	..	0.9	..	..	..	..	..	4.3	..	..	..	..
Other accidents of pregnancy	0.2	0.5	0.6	0.8	0.9	..	2.5	..	2.1	..	..	..	..	..	..
Placenta prævia	0.9	2.4	4.9	5.3	6.0	13.8	8.8	11.4	6.4	14.3	26.2	..	20.0	33.3	25.0
Other hæmorrhages	3.0	6.8	4.9	12.1	10.2	17.2	8.8	18.2	19.1	9.5	21.7	..	40.0	..	..
Puerperal sepsis	25.6	27.6	33.5	26.5	26.5	18.4	17.3	25.0	25.6	14.3	13.1	33.3	40.0	66.7	25.0
Puerperal tetanus	0.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Eclampsia	33.3	12.1	7.3	9.1	5.1	2.4	6.3	4.5	2.1	9.5	4.3	..	..	..	..
Albuminuria and chronic nephritis	7.7	8.3	4.9	6.1	7.7	3.4	8.8	4.5	10.6	9.5	8.7	..	..	..	..
Other toxæmias	1.9	2.4	1.8	0.8	2.6	1.1	3.8	2.3	..	4.8	..	16.7	..	..	..
Embolism, thrombosis and sudden death	2.6	1.5	4.9	1.5	1.7	2.4	1.2	2.3	2.1	4.8	4.3	..	..	..	..
Accidents of labour	7.0	11.2	17.7	13.6	14.5	16.1	11.3	18.2	12.8	23.8	13.1	33.3	..	..	..
Unspecified conditions . . . . .	..	..	..	..	0.9	..	..	..	..	..	..	..	..	..	..
Anæmia	15.2	25.2	16.5	22.7	21.2	23.0	25.0	13.6	12.8	..	4.3	16.7	..	..	50.0
Total	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

Midwifery Services.

28. The anomalous position of the *dai* under the provincial Nurses, Midwives and Health Visitors Registration Acts has already been commented on in previous reports. Except in the Punjab the law ignores her, although in many provinces the training and certification of indigenous *dais* are proceeding energetically and considerable sums of money are being expended for this purpose. In the United Provinces the question of amending the Nurses, Midwives and Health Visitors Registration Act to include *dais* is under consideration.

Local authorities hold divergent opinions as to whether the registration of the *dai* should be done centrally by the Nurses, Midwives and Health Visitors Councils established under the Acts or whether she should be registered and licensed by the local authority of the town or district in which she practises. Registration by the Nurses, Midwives and Health Visitors Councils would make for uniformity in the standards of training and examination and would secure the maintenance of the register by an organisation competent to appraise the qualifications of the applicant for admission to the register. Further local pressure would be less likely to influence the result. Against these advantages must be set the enormous amount of work which would devolve on the Nurses, Midwives and Health Visitors Council and the difficulty of maintaining accurate records of the distribution of the *dais* by towns and districts. This latter duty would eventually devolve on the local authority of the area of work of the *dai* and on this authority would also fall the duty of supervision. In the first instance, until more is known of the extent and nature of the problems likely to arise, the registration of the *dais* by districts instead of centrally seems best to meet the situation. Many municipalities already possess powers under Municipal Acts to regulate the practice of midwifery within the limits of their jurisdiction, but few have exercised these powers. In Bihar action has been taken in this direction during the year. The Director of Public Health states that "the municipal commissioners have framed byelaws, under Section 14(I) of the Bihar and Orissa Nurses Registration Act, 1935, to restrict the practice of unqualified *dais*. They have moved the local government to confirm and publish the byelaws, with the proviso that the byelaws may come into force on the 1st January 1941 and that, if the municipal commissioners consider on the 1st January 1941 that the number of trained *dais* is not sufficient, they will have the right to extend the said date". Training classes for *dais* are held at most of the Sadar and Sub-divisional hospitals in this province. Four hundred and ninetytwo *dais* were trained and registered in the Punjab in 1938 as against 216 in 1937. In the Central Provinces 55 *dai*'s certificates were issued during the year and 650 *dais* were under training. These provinces issue their own certificates. In addition 139 Victoria Memorial Scholarships Fund certificates were issued during the year by the Maternity and Child Welfare Bureau, Indian Red Cross Society, against 119 in 1937.

In Bombay, 79 *dais* were trained during the year under the auspices of the Lady Wilson Village Maternity Association which has now been amalgamated with the Bombay Mofussil Maternity, Child Welfare and Health Council. The Bombay Mofussil Maternity, Child Welfare and Health Council has also suggested a course of training lasting one year for assistant midwives, the object being to abolish the indigenous *dai* by providing a more qualified type of worker for rural areas. As part of the scheme of medical relief for rural areas in Bombay, the Government have sanctioned a scheme for subsidising nurse-midwives. The scheme provides that each district local body can appoint four nurse midwives and receive 4/5ths of the cost from govern-

ment. The number appointed during the year was 16 against the budget provision for 76.

In Sind a branch of the Countess of Dufferin's Fund was formed to provide for the training of women as hospital assistant nurses and midwives and to render such help as might be necessary in the sphere of medical relief. Two schools have been selected for the training of midwives, namely, the Lady Dufferin Hospital, Karachi, and the Louise Lawrence School of Midwifery. A scheme for the training and employment of midwives as a nucleus for the formation of a provincial maternity and child welfare service has also been submitted to the Sind government.

The training of *dais* is officially discouraged in Madras Presidency.

Lack of any agreed definition of the word *dai* makes the differences between the provinces more apparent than real. Many of the women now being trained, for example in Bihar and in *dais* training schools do not belong to the illiterate, hereditary *dai* class, but are of a standard more comparable to the lower grades of midwives in other provinces.

The returns from centres training *dais* indicate that very little attempt is being made to retain a hold over the trained *dais* by supervision, refresher courses and follow up. Supervision after training is essential and perhaps the very considerable activity now taking place with regard to registration may be taken as evidence that the generally accepted principle of supervision is about to be put into practice. A knowledge of the numbers of midwives practising and of the area of their practice is the first step towards supervision.

Seven schools for the training of *dais*, indigenous and others, were in existence in 1937 in Ajmere, Rajputana ; Sylhet and Silchar, Assam ; Dera Ismail Khan and Peshawar, the North-West Frontier Province ; Sukkur and Hyderabad, Sind. The demand from Indian States, tea gardens and local bodies for the services of *dais* trained at these schools is greater than can be met and this is evidence of the fact that these schools are meeting the need in a way which gives satisfaction to the employing authorities.

DOMICILIARY AND INSTITUTIONAL MIDWIFERY.

Information regarding the provision for institutional midwifery continues to be scanty. One hundred and fortythree beds are maintained in 12 hospitals in the North-West Frontier Province. In Sind six of the seven headquarters municipal committees maintain women's hospitals or maternity homes and one gives financial assistance to a voluntary organisation. In the larger municipal towns the services of trained *dais* and midwives are easily obtained owing to the opening of private maternity homes, but in the rural areas very little skilled assistance at confinements is available. The Director of Public Health writes that none of the district boards except that of Larkana, which maintains 19 rural maternity homes, takes sufficient interest in the maintenance of this service to the public.

Infant and Child Welfare.

29. Table III (vi) gives consolidated figures for the numbers of welfare centres and health visitors employed during the past six years.

TABLE III(iv)

	Centres maintained by										Total No. of centres under trained health visitors.	
	Government.		Local bodies.		Voluntary organisations.		Total.		Total cen- tres.	Health Visitors.		
	R.	U.	R.	U.	R.	U.	R.	U.		R.		U.
1933*	2	6	186	157	71	149	259	312	571	34	186	220
1934	13	7	233	193	91	147	337	347	684	31	205	236
1935	15	7	162	247	49	207	326	461	787	51	225	276
1936	10	9	218	215	113	268	341	492	833	52	244	296
1937	19	10	332	305	72	172	423	486	909	62	251	313
1938	18	13	362	349	62	189	442	551	993	69	252	321

* Including Burma.

The statement shows a gradual, if slow, increase in the number of centres from 571 in 1933 to 993 in 1938. More significant is the fact that only approximately one-third of the centres are in charge of trained health visitors. The percentage of centres which may be regarded as adequately staffed to carry out sound educational work has not materially altered during the period under review, the figures being 38.5 per cent in 1933 and 32.3 per cent in 1938. In the early days of the maternity and child welfare movement the services of qualified health visitors were not easily obtainable and it is perhaps as well that the pioneers did not stop to consider too long the difficulties and drawbacks attendant on the employment of imperfectly trained workers. At the present time there is less excuse for contentment with a worker who has no knowledge or experience of preventive and educational health work. In the absence of these qualifications the worker tends to concentrate on the actual delivery service, the charitable distribution of material comforts and the dispensing of medicines. Those services are of unquestioned value, but they do not constitute the fundamental basis nor the most vital aspect of maternity and child welfare work. Material and medical relief brings only temporary amelioration in the health of the mother and her children while a delivery service, without the accompanying prenatal care of the mother, will do little to eliminate abnormalities from the practice of the midwife, to conserve the wellbeing of the mother or to prevent the occurrence of stillbirths, neonatal deaths and disabilities amongst the children born. The aim of maternity and child welfare work, namely, that of educating parents in the precautions to be taken and the rules to be followed for securing positive and abundant health for themselves and their children, cannot be overstressed. If education is to have lasting value, "consistent, persistent and insistent" persuasion is necessary to secure the practice of the principles taught.

Child Welfare Work.

RAILWAYS.

30. Child welfare work on the railways has reached a considerable degree of development. Families of employees are entitled to free medical attention in railway hospitals and dispensaries and accommodation for confinement is provided in several hospitals. Nurses and midwives have been employed in railway hospitals since 1909.

In 1932 the Medical Section of the Indian Railway Conference Association discussed the advisability of enlarging the scope of maternity and child welfare work on the railways. " At this Conference, the Chief Medical Officers drew the attention of the Railway administration to the remarks of the Public Health Commissioner with the Government of India in his Annual Report for 1928 emphasising the gain in the shape of stabilised labour which results from maternity and child welfare work among the families of the employees. In view, therefore, of modern trends of thought and generally accepted practice it was resolved to recommend that maternity and child welfare work be fostered on the Railways. The Conference pointed out that such activities could be divided into two separate but coordinated categories—one consisting of the official medical facilities provided for wives, children and dependents as required under the rules, the other relating to the establishment of welfare centres for instructional and propaganda purposes, the visiting of mothers and children in their homes, the distribution of milk and cheap clothing and the organisation of baby shows, etc. It was decided that work under the second category should be controlled by committees of voluntary workers and supported by unofficial funds augmented, if possible, by grants from the Staff Benefit Fund ".

A review of the existing services in 1932 showed that the Bombay, Baroda and Central India Railway had since 1929 maintained 11 maternity and child welfare centres, the North Western Railway five maternity and child welfare centres and one midwife while the Madras and Southern Mahratta Railway had two centres. During the succeeding five years very considerable expansion has taken place. The Bombay, Baroda and Central India, the Great Indian Peninsula, North Western, Bengal Nagpur and Assam Bengal Railways in 1938 maintained 33 welfare centres with a staff of doctors, health visitors and midwives at a cost of nearly one lakh of rupees (Rs. 93,222). Preventive and educational work is maintained on a voluntary basis and is additional to the officially maintained curative and obstetric services in hospitals and dispensaries.

Apart from the usual welfare centre activities and home visiting, women's classes are held, lectures are given to fathers on home hygiene and baby shows are regularly held. Clean and tidy homes and garden competitions are held and the effect of these in some of the railway colonies has been very striking. Each centre has at least one free cinema show including health films each year. *Dais* training classes are conducted and scholarships for the training of health visitors have been provided.

Since the welfare work started, the welfare staff of the Bombay, Baroda and Central India Railway have been responsible for 6,338 confinements with the very creditable mortality rate of 1.7 per 1,000 cases.

Misunderstandings were encountered in the initial stages of the work regarding the respective spheres of work of the official medical services and the voluntary maternity and child welfare organisations, but mutual cooperation and a better recognition of the respective complementary rôles of the welfare centre and the hospital have now been achieved.

GENERAL POPULATION.

In the field of civil maternity and child welfare, the position remains much the same as in 1937 and fresh developments alone are reviewed. In Sind a maternity and child welfare sub-committee of the Sind Branch, Indian Red Cross Society, was established during the year and has done much to further a more uniform standard of work throughout the province.

In Madras 40 women medical officers, 43 health visitors and 439 midwives were employed during the year on approved schemes as against 32 medical officers, 17 health visitors and 351 midwives in 1937. The Madras Corporation adopted a scheme for the city maternity and child welfare services which will bring the work more into line with government schemes in the Presidency. The staff, under the reorganisation scheme, will be increased to eight medical women and twelve health visitors in 1939.

In addition to two medical women, 26 health visitors and 17 centres maintained by the Delhi Municipal Committees for maternity and child welfare for a population of approximately 464,000, there were in 1938, nine fully equipped and staffed welfare centres for a rural population of 220,000, which is perhaps better provision for a rural area of similar size than is found anywhere else throughout India.

Proposals have been submitted to the Government in the North-West Frontier Province to transfer all infant welfare centres to the provincial branch of the Indian Red Cross Society for maintenance and supervision, to establish a centre in each district and to provide government grants-in-aid for approved centres.

In the Punjab an interesting development took place during the year. The Inspector-General of Civil Hospitals issued instructions that medical women attached to civil hospitals should conduct prenatal clinics in welfare centres under the health department as part of their recognised duties. The result has been that more centres are now holding special prenatal consultations and there has been a marked improvement in the quality of the service given. The need for constant supervision of the staff employed in health work is stressed in the Punjab report. Supervisory visits rose from 74 in 1937 to 111 in 1938.

Health Schools.

31. The numbers of health visitors trained during the year were eleven in the Punjab Health School, Lahore, nine in the Lady Reading Health School, Delhi, eight in the Nagpur Health School, six in the Bombay Presidency Infant Welfare Society Health School, eight in the Madras Health School and eight in the Seva Sadan Health School, Poona.

The Sir John Anderson Health School, Calcutta, was opened in 1937, but as the course is of 18 months' duration no students passed out in 1938. The Poona Health School was taken over from the Seva Sadan Society by the Bombay Mofussil Maternity, Child Welfare and Health Council, reorganised and reopened in 1938. The Madras Health School maintained by the Madras Branch, Indian Red Cross Society, closed during the year under review, but a few months later the provincial Government established a school for the training of health visitors. The course in Madras lasts 11 months, which includes three months' nursing practice at the Prince of Wales Children's Hospital, rural experience at the Poonamallee Health Unit and practical training in the centres run by the Madras Corporation.

The number of health schools in India has remained practically unchanged throughout the past decade, the Bombay Presidency Infant Welfare Society Health School being the only new institution. Other schools have, however, had vicissitudes in fortune, being closed at times or experiencing changes in the body of management. The Lucknow Health School, which closed in 1932, has not yet been reopened, although one lakh of rupees from the Silver Jubilee Fund has been set aside for the erection of a new building.

The total number of health schools in India in 1938 was seven, with accommodation for training 70 pupils per annum. Although the demand for health visitors exceeds the supply, few of the schools are running to their maximum capacity. Dearth of qualified candidates is a factor for the maintenance of the relatively high scale of salary now secured by health visitors, which in turn leads to the demand for a less efficient grade of worker on a lower salary. The disadvantages of this policy are fully discussed in the Report on Maternity and Child Welfare by the special committee of the Central Advisory Board of Health.

The outstanding need of the moment is the carrying out, by health departments, of systematic reviews of the maternity and child welfare services within their areas. The review should include a survey of the schemes in their entirety as well as an examination of the various branches of the work individually. On the review an appraisal can be made, with some accuracy, of the extent to which the area is covered by the welfare services, the degree of availability of skilled attendance at the time of birth, the adequacy of the provision for maternity and children's hospitals, the distribution of the welfare centres in relation to the needs of the population and the efficiency of the arrangements for home visiting and medical consultations at prenatal clinics. Unless the position is reviewed periodically it is impossible to evaluate the work being done or to judge how far the money, skill and human effort devoted to the services are being wisely expended.

SECTION IV.

THE HEALTH ACTIVITIES OF PROVINCIAL GOVERNMENTS AND SOME OTHER HEALTH ADMINISTRATIONS.

Introduction.

32. A comprehensive review of the development of public health administration in India from the beginning of the present century was given in the report for 1937. In such a survey of the march of events over a long period of years it was possible to view the health problems of the country in their proper perspective, to assess the progress made in different directions and to indicate the trend of possible lines of advance for the future. It is not proposed to attempt a similar survey in this year's report. Short accounts are given below of various activities of provincial public health departments which do not find a place elsewhere in this report.

School Health and Medical Inspection of School Children.

33. School health work forms an important part of the general scheme of health administration for the community. The large majority of the school children spend the greater part of their lives in their homes and the conditions under which their home life is spent must largely influence their health and well-being. Even so their aggregation in schools for a few hours in the day creates special health problems such as those of the spread of infectious disease and it also provides valuable opportunities for health work among these children.

[The aim and scope of school health work should be that of creating an environment conducive to the healthy development of the physical and mental powers of the children and of inculcating in them, by example and precept, such habits as are essential for the maintenance of their health. The provision of hygienic surroundings, adequate nutrition, exercise and rest, periodical medical examination and correction of the defects discovered, health education, the development of a corporate life and the awakening of the child's interest for an active participation in such life, these are all part of the campaign of health in schools.] Medical inspection without adequate provision for the treatment of defects is largely barren of results. Instruction in health matters by formal teaching from text books fails to produce any lasting benefit unless the necessary hygienic appliances are provided and the pupils are taught, by the example of the teachers, the correct use of such appliances. [An ill-nourished child can hardly derive sufficient benefit from his education and, in the case of large numbers of school children, public provision to supplement their diet, either without payment or at a reduced cost, appears to be essential if their physical health and mental efficiency are to be maintained.]

School health work can play an important part in promoting the welfare of the community by socialising the outlook of the children and by providing them with opportunities for active participation in health work. In this connection the lead * given by the educational authorities in the Punjab may be quoted as an example deserving adoption in other parts of India. In 1925 and 1926 district community councils were established at the headquarters of each district in the province with the District Inspector of Schools, in the

* "The Better Village Movement in the Punjab and the Part Played by Village School" by F. L. Brayne and the Education Department of the Government of India, page 48 of the Report of the 7th Biennial Conference, Tokyo, Japan, by the Health Section of the World Federation of Education Association.

majority of cases, as the secretary. Another innovation was that community work was introduced as part of the course at the training schools for vernacular teachers. The village schoolmaster can play an important part in rural development. His intelligent cooperation is necessary not only for securing the goodwill and confidence of the people when new and unfamiliar ideas are presented to them, but also for instilling in the minds of the rising generation certain elementary principles regarding health, agriculture and cooperation which are all essential for developing community life on proper lines. The training course for pupil teachers includes these subjects and special emphasis is laid on the practical application of the principles that are taught. They are taught to organise among themselves and manage on their own initiative supply societies, thrift societies and Red Cross societies. They are taught elementary hygienic principles and are required to carry out, with their own hands, such works as the cleansing of streets, removal of vegetation from choked drains and disposal of manure and street sweepings in pits. They are also taught simple facts relating to the control of infectious disease, improvement of housing conditions and methods of health education. In consequence of these changes in the curriculum in training schools for teachers, it is stated that the pupils of rural schools are taking an active part in health work and in other measures designed for the welfare of the people. During epidemics, they assist by active propaganda in the carrying out of preventive measures such as chlorination of wells, vaccination against smallpox and inoculation against other diseases. They also take part in the distribution of quinine during epidemics of malaria and in intensive cleanliness campaigns in the villages situated close to their schools. Apart from the direct benefit that accrues to the community from these activities, the possibilities arising out of the training that awakens in these children the desire to serve the community cannot be overemphasised.

In the following paragraphs the school health work carried out in the provinces during 1938 has been briefly summarised. Certain provinces have devoted but little or no attention to this branch of health administration while, in a few, activities of a varied character have been inaugurated. However, speaking of British India as a whole, it is not incorrect to say that the pace at which improvement is being effected in the measures designed for the welfare of school children is definitely slow and should be accelerated.

In the N.-W. F. Province medical inspection of school children is carried out in the six district headquarter towns by four wholtime and two part-time subassistant surgeons. In the rural areas subsidised medical practitioners are responsible for this work in their respective villages. The scheme was extended to seven villages in the province during 1938. In Peshawar city a female subassistant surgeon carries out the inspection of the pupils of the high schools for girls.

In the six headquarter towns, 53,172 school children were examined. Of these 1,467 were girls attending schools in Peshawar. Treatment was recommended for 16,808 children (31·6 per cent) and of these 79·4 per cent received treatment for their defects. In the rural schools 1,853 pupils were examined. Of these 47·9 per cent actually underwent treatment.

As regards nutrition it is reported that, in six high schools in Peshawar, midday meals are being served to the children and that 2,866 boys are receiving milk. Lectures on personal hygiene and first aid were given, it is stated, to the students of all the high schools in the province. A number of school buildings was inspected and the defects discovered were brought to the notice of the school authorities concerned for necessary action.

The Director of Public Health, Punjab, states that medical inspection of schools in the urban areas had been conducted during 1931-37 on an experimental basis and that, in 1938, the Government decided on the basis of the experience gained in the organisation of this work, that the control of medical inspection in the municipalities with health officers should be entrusted to those officers. The Public Health Department issued a memorandum outlining a scheme for the establishment and maintenance of medical inspection in schools by voluntary subscriptions from students. The response to this circular has been so encouraging that the number of municipalities with properly organised schemes for medical inspection quickly rose from three to eight by the end of the year under review. In these eight municipalities 35,914 boys and 7,839 girls were medically examined during 1938. In two towns the expense is met entirely from voluntary subscriptions from the pupils of the classes above the primary standard, while in the other six towns the municipal committees bear either the whole cost or contribute part of it. The Director of Public Health points out that a gratifying feature of the development of school health work in the province has been the acceptance of the contributory principle by the parents of the pupils.

As regards treatment of defects, in some cases provision for it has been made as part of the medical inspection scheme and in others treatment has been left entirely to the parents who are informed regarding the defects discovered in their children. In a few cases it is reported that provision has been made for the free supply of milk and of articles like spectacles to the poorer children.

In Delhi province the organisation for the medical care of school children in New Delhi is stated to be satisfactory, in the Notified Area Civil Lines to be the next best and in Delhi City to be the least efficient of the three. The work of the school medical officers in New Delhi has grown, it is stated, both in efficiency and in popularity. During the year under review the Bengalee schools for boys and girls joined the scheme. The following figures quoted from the report of the Chief Health Officer show the volume of work accomplished during 1938 :—

	Boys.		Girls.	
	1938.	1937.	1938.	1937.
Annual routine inspections	1,450	1,227	1,457	1,160
Clinic attendances	16,400	10,600	15,478	13,924
Eye clinic attendances	712	448	772	460
Dental clinic attendances	913	432	930	433
Revaccinations	859	755	877	122
Cholera inoculations	497	..	386	..
Home visits	84	60	60	..
Lectures	83	..	30	..

Compared with 1937 there has been an appreciable rise in the services rendered under each head in respect of both boys and girls.

It is stated that school medical officers are required to visit the homes of the pupils who absent themselves from school for three days and of those who are reported to be suffering from infectious disease. The value of such visits is stated to be considerable because they enable the medical officers to establish the correct diagnosis in many cases, to prevent children from returning to school while still in an infectious state, and to carry out preventive measures such as isolation of the patient and surveillance of contacts, in so far as home conditions permit of the enforcement of such measures. Improvements introduced during the year included the employment of a trained nurse at the primary school in the city extension area for carrying out treatment for minor

ailments under the instructions of the school medical officer, the issue of stock remedies for such treatment, the introduction of fuller record cards and health education of the children by lectures given by the medical officers with the aid of magic lantern slides and cinema films.

The chief causes for which attendances at the clinics were recorded were respiratory diseases (23·4 per cent for boys and 31·4 per cent for girls), external eye conditions (13·1 and 17·4 respectively), skin diseases (12·9, boys) and malnutrition (6·7 and 18·4 respectively). During the course of the annual routine examination 79·6 per cent of the boys and 75·4 per cent of the girls were found to be suffering from at least one defect. The dental surgeon laid stress on the need for improving the diet of the children and he deprecated the use of starchy and sugary articles of food at the expense of vegetables and fruits.

The Chief Health Officer has summarised in his report the results of certain experiments with milk as a supplement to the diet of the children. His general conclusions are that the addition of one pound of whole milk to the diet of the child has a profound effect on his health and growth, that half a pound of whole milk, while not so beneficial, produces appreciable benefit and can therefore be recommended for wide adoption and that a pound of skimmed milk appears to have approximately the same effect as half a pound of whole milk. The price of half a pound of pasteurised whole milk is only 9 pies while a pound of skimmed milk similarly treated costs one anna and the Health Department has therefore recommended the use of half a pound of whole milk.

In the Notified Area Civil Lines the number of students, including boys and girls, covered by the scheme of medical inspection was 445. During 1938 the scheme was reorganised, the medical officer-in-charge of the Balak Ram Hospital, Timarpur, and the lady doctor of the local welfare centre being the medical officers. Arrangements were also made for the services of a dentist and of an ophthalmologist. It is stated that the attendance of the boys at the clinics was not satisfactory because they had to travel some distance to the Balak Ram Hospital for the treatment of their ailments. An appeal to the parents to provide their children with milk also met with an unsatisfactory response.

In the rural areas school medical service is being rendered by the subassistant surgeons in charge of dispensaries but, in view of the distances to be covered, the arrangement is stated to be unsatisfactory. It is stated that, with the opening up of the countryside by the new roads that have been constructed and the utilisation of the services of the subassistant surgeons of two newly established dispensaries, it will be possible to improve the school medical service in the rural areas to some extent.

In the Najafgarh thana the transfer of this function to the Medical Officer of Health of the Health Unit has permitted, it is pointed out, of organising a system of follow up by the medical officer and his health visitors. First aid boxes have been issued to most schools in the area and further issues were to be made in 1939.

In the United Provinces wholetime school medical officers are working in 13 of the larger municipalities. In addition, in 19 municipalities, the medical officers of health are also carrying out the functions of school medical officer. Further, thirty district health officers are responsible for conducting school health work in the towns within their districts. It will thus be seen

that, in this province, considerable attention is being devoted to this branch of health administration in the urban areas. In five of the 13 municipalities mentioned above central school clinics have been working since 1934 and, in 1938, they were established in the remaining eight municipalities also.

The district health officers are also responsible for school health work in the rural areas of their districts. Although it has not been possible to organise medical examination and treatment of school children in the rural areas to the same extent as in the towns, the promotion of Junior Red Cross groups in village schools and the provision of first aid medicine chests are stated to have enabled the health authorities to organise work on useful lines.

The main defects discovered during medical inspection were enlarged tonsils and adenoids, dental defects (especially caries), anæmia, malnutrition, skin diseases and defective vision. The percentages of children in urban and rural areas with these defects are given below.

	Enlarged tonsils and adenoids.	Other glandular enlargement.	Dental defects.	Defective vision.	Malnutrition.	Skin diseases.	Anaemia (mainly due to chronic malaria).
Urban areas	12.9	6.8	13.7	13.3	19.4	3.3	0.6
Rural areas	2.7	1.9	8.2	Not available.	18.1	3.1	4.6

Except for anæmia the percentages for the rural areas are smaller than those for the urban areas. This may partly be due to the fact that the examination of rural children is not so thorough as of those in the towns. The higher percentage for anæmia in the children of village schools can be explained by the fact that the incidence of malaria is definitely higher in the rural areas and that the facilities for treatment are less than in towns. The figures for malnutrition are stated to be of doubtful value because of the personal factor involved in the assessment of this condition by different medical officers. It is also stated that the condition is not due so much to poverty as to faulty diet resulting from lack of knowledge regarding what constitutes a balanced diet.

In the cities of Agra, Cawnpore, Allahabad, Benares and Lucknow, a scheme for the free supply of milk to poor and ill-nourished children was in operation during 1938 as in previous years. The number of children benefited by the scheme during the year was 611. In these cities facilities have also been provided for dental treatment and for the examination and correction of defects of vision. Poor children are provided with spectacles free of cost.

In Bihar, among 13,403 boys examined, 5,334 or 39.7 per cent were found to suffer from some disease or other. The percentages of those suffering from various ailments are given below:—

	Number of children.	Percentage of the total.
Malnutrition	2,230	16.6
Enlarged tonsils	1,386	10.3
Errors of refraction	1,214	9.0
Pyorrhoea and carious teeth	756	5.6
Enlarged glands in the neck	701	5.2
Functional heart troubles	161	1.2
Eye diseases	89	0.6
Adenoids.	46	0.3

School medical officers, in addition to the medical examination of students and treatment of patients at the school clinics attached to divisional hospitals, give lectures on health subjects to the students. They also conduct regular inspections of school and hostel buildings and it is stated that these inspections have, in recent years, helped to improve the general sanitation of these premises.

A scheme for the supply of a midday meal on payment of annas eight per child per month has been working in a high school in Purulia since 1934 and it is reported that this scheme has now been adopted by a number of other high schools in the province.

In Orissa, 4,775 students were medically examined in the high schools and middle schools of the province. Of them 67 per cent showed some defect or other. As regards their nutritional state, for 34 per cent it was reported to be satisfactory, for 55 per cent it was fair and for 11 per cent unsatisfactory. The diet provided in the hostels attached to the schools consists mainly of rice, dal and vegetables, milk, ghee, meat and fish being taken occasionally and in small quantities by only a proportion of the students. Although certain schools provide a meal at midday, the majority of the schools do not and the desirability of paying more attention to this subject is stressed by the Director of Public Health.

In the rural areas the staff maintained by the district boards examined 4,094 pupils of the Middle English and Middle Vernacular schools and, of this number, 51 per cent were found to require treatment.

No examination of girl students was carried out during the year. Other activities of the school medical staff included health lectures to the students, inspection of school premises and hostels and a course of lectures during the summer vacation to the village people and teachers on village sanitation and control of epidemic diseases.

The work in relation to the medical inspection of schools in Bengal may be considered under three heads :—

- (i) inspection of school children in Calcutta,
- (ii) inspection in other municipalities,
- (iii) inspection in rural areas.

In Calcutta the number of scholars medically examined was 8,342. In other municipalities 84 schools were visited by 26 medical officers and a total of 9,734 pupils was examined during the year. In the rural areas 144 schools were visited and 4,751 students were examined. The main facts revealed by these examinations are set out in tabular form below :—

Percentage of pupils among the total examined having :—

	Mal-nutrition.	Skin diseases.	Defective teeth.	Diseases of the nose.	Enlarged tonsils.	Enlarged adenoids.	Enlarged lymph glands.	Diseases of the eye.	Enlarged spleen.	Infectious diseases.
Calcutta . . .	15.7	1.9	8.3	1.5	10.4	2.3	3.9	19.5	0.36	0.64
Other municipalities.	21.7	5.4	9.7	3.1	5.6	1.2	3.7	7.4	3.2	...
Rural areas . . .	23.0	16.7	6.0	3.2	2.8	1.2	1.4	1.1	13.5	4.4

A comparison of the figures for the three areas in the above table brings out certain interesting facts. As was stated in an earlier paragraph the figures for malnutrition must be considered to be of doubtful value for the reasons

already stated. In regard to the incidence of enlarged spleen, the figures for Calcutta, other municipalities and for rural areas clearly indicate that the malaria problem is more acute in the rural areas than in urban areas and that, compared with other towns, Calcutta enjoys greater freedom relatively from the incidence of this disease. The progressive rise in the figures for skin diseases as we pass from Calcutta to other municipalities and the rural areas is also striking. On the other hand eye diseases show a progressive diminution. It would be interesting to know the reasons responsible for such variations in the incidence of these conditions.

A movement known as the "Bratachari movement" is stated to have now become well established in quite a large number of the schools in the province. It is stated that this movement, "Besides contributing directly towards the improvement of health, has great moral spiritual and disciplinary effect on the young people and that it helps to direct youthful energies into healthy channels of good citizenship". The Government sanctioned during the year, it is reported, a sum of Rs. 9,000 as a recurring grant and another sum of Rs. 1,000 as a non-recurring grant for the development of this movement. In addition, the Boy Scouts and Girl Guides movements are also stated to have shown encouraging development in the province, the Government sanctioning Rs. 6,000 and Rs. 1,000 respectively to these organisations. It is stated by the Director of Public Health that, during the year under review, a scheme for medical inspection in all the high schools in the province was approved by the Government and that a sum of Rs. 20,250 was sanctioned by the Education Department for this purpose. Another sum of Rs. 40,500 was also sanctioned for the supply of midday meals to school boys.

In addition to the activities outlined above the Calcutta University Students' Welfare Committee has made provision for the medical examination, on a voluntary basis, of the students attending colleges in Calcutta.

In the Central Provinces routine medical inspection of school children was conducted by assistant surgeons, assistant medical officers in charge of dispensaries and subassistant health officers on epidemic duty and monthly inspection reports were submitted by these officers to the Director of Public Health. During 1938, 113,307 children were examined. In addition to the medical examination of the children, the inspection included investigations into the sufficiency of accommodations in schools, their lighting, ventilation and sanitation and the provision of drinking water.

In Bombay and Madras Presidencies routine examination of school children does not appear to have been carried out during the year, although inspection of schools in relation to the sanitation of the premises and health education work were carried out.

In Coorg also similar work was carried out for the improvement of school buildings and their surroundings, the provision of protected water supplies and of hygienic types of latrines.

In Assam, it is reported, that periodical medical inspections of selected institutions were carried out and that recommendations were made for the improvement of the health of the pupils and for the general sanitation of the hostels attached to those schools.

Fairs and Festivals.

34. Fairs and festivals play an important part in the life of the people, lending colour and variety to their otherwise drab existence. This remark applies in particular to the large rural population among whom, except during

the months when agricultural operations are in progress, little opportunities for employment exist and life becomes monotonous. The festivals that take place in different parts of the year give them opportunities for travel, for meeting people from other parts of the country and for taking part in religious and social activities. These gatherings have therefore an educative value on the population and the greater facilities that are now available for travel than in the past have increased the popularity of the festivals. In recognition of the opportunities that these gatherings provide for educating the people in matters useful to them in their daily lives, agricultural, industrial, health and other exhibitions are being held at many of the festivals.

At the same time festivals play an important part in the dissemination of infectious disease, particularly cholera. The health authorities in the country have recognized this danger and within recent years considerable attention has been paid to the importance of this problem. While in respect of some of the larger festival centres modern amenities such as a protected water supply and drainage are being provided on a permanent basis, for the large majority of festival centres action has been confined to the sanitary control of these areas during the period of the festival. This is partly due to the fact that the funds available are limited and that the provision of similar measures all the year round will not be possible. It is desirable that provincial health authorities should formulate a programme of improvements for all the larger festival centres in their areas, that the necessary works should be arranged in order of priority and that provision should be made for the execution of the scheme within a specific period of years. In this connection it may be mentioned that the necessary funds can be made available by various forms of taxation, which will fall mainly on those who can afford to pay and not on the poorer section of the pilgrims. Cattle fairs are often associated with these festivals. They also attract shop keepers and trade is briskly carried on on these occasions. A small tax on animals, vehicles, shops and on pilgrims should prove to be a source of recurring income to the authority responsible for the control of the festival. Further, temple authorities at festival centres derive a large part of their income from the celebrations and these authorities can legitimately be made to pay a share of what they collect for the improvement of the living conditions of the pilgrims from whom they derive their income. Statutory provision should be made for the collection of these funds and for their administration. A pilgrim committee on which all the local interests and the Government are represented would appear to be a suitable organisation for the purpose.

Brief notes on individual provinces are given below.

In the N.-W. F. Province it is stated that sanitary and medical arrangements were made as usual for all fairs and festivals held during 1938 and that no outbreak of any epidemic disease took place.

No fair of any outstanding importance was held in the Punjab during the year but it is reported that the *Kumbh* fairs held at Hardwar and Brindaban in the United Provinces between 1st February and 30th April necessitated the provision of special arrangements to prevent the importation of cholera into the province by the returning pilgrims. Nevertheless as has already been pointed out on page 25 of this report, cholera broke out on an extensive scale in many parts of the province as a result of the spread of infection from the Hardwar festival. The action taken to control the spread of cholera in the province has already been described on page 26.

In the United Provinces there take place every year a large number of festivals in different parts of the province. In addition there are some festival centres of special importance such as Hardwar, Benares and Brindaban. The Brindaban festival passed off without any outbreak of cholera except for an imported case from Bengal on 14th March. On the other hand, as has already been pointed out, there occurred in Hardwar an explosive outbreak of the disease which spread rapidly through the greater part of Northern India and produced many thousands of cases and deaths. Smaller outbreaks of cholera, it is reported, also took place in connection with four other festivals in the province, the maximum number of cases in any of these centres being 15.

Two festivals of importance are stated to have occurred in Bengal during 1938, namely, Ganga Sagar *mela* and Nagalbund *mela*. In previous years the Ganga Sagar *mela* was recognised as the focus from which cholera infection used to spread far and wide through Bengal and into the neighbouring provinces. It is stated that the sanitary control of the *mela* has within recent years been so satisfactory that the festival is now regarded as harmless from the point of view of infection. The health departments of the provincial Government, the Corporation of Calcutta, Calcutta port and the District Board of 24-Parganas all took part in the organisation of preventive measures during 1938 and it is reported that only 12 patients were admitted to the isolation ward provided for the festival and one case of cholera died on the way back from the festival.

During the Nagalbund *mela*, which was attended by 1,50,000 pilgrims it is reported that no outbreak of any infectious disease took place.

A large number of festivals is held every year in the province of Orissa. Most of these are of local interest and are attended by the people of the district in which they are held and by people from the adjoining districts. On the other hand there are certain festivals held at Puri which attract pilgrims from all over India. It is reported that the measures for sanitary control at Puri were elaborately planned and carried out and that, although cholera was prevalent in different parts of the district, the festivals passed off without any serious extension of the infection. In all there were only 44 attacks and 3 deaths.

In the Central Provinces subassistant health officers were on duty at all important festival centres for the purpose of organising sanitary and medical arrangements. During 1938 efforts were directed towards the improvement of water supplies and the provision of conservancy arrangements at these places. Chlorinated water for the use of pilgrims was made available in the pilgrim centres.

The success achieved in the control of cholera by the introduction of a system of indirect compulsory inoculation against the disease at Pandharpur in Bombay Presidency has already been mentioned in the last report and the year 1938 gave further proof of the efficacy of this measure. There were in all only three attacks and two deaths from cholera, although the festival was attended by 159,438 pilgrims and cholera broke out in two villages within eight and ten miles of Pandharpur about three weeks before the festival.

It is reported that sanitary arrangements were also made for other important festivals in the province and that no outbreak of cholera took place in them.

In Madras Presidency it is reported that all the festivals during 1938, which numbered 785, passed off without any outbreaks of epidemic disease, with the solitary exception of the festival at Bhadrachallam. Here, although the disease was brought under control in the festival area, it is reported that the returning pilgrims spread the infection to East and West Godavari and into the neighbouring districts. On the other hand Mahodayan festival, which takes place usually only in 20 to 30 years, was celebrated on 31st January in several seaside centres in the province. Elaborate sanitary arrangements were made by the local authorities concerned under the guidance of the public health staff and it is reported that no outbreak of cholera took place in any of these centres.

In Assam festivals took place in a number of centres but the gatherings were small in comparison with the festivals in other parts of India, the maximum number in the largest festival being in the neighbourhood of 12,000. The Public Health Department made the necessary arrangements at these festival centres and no outbreaks of epidemic disease are stated to have occurred.

Health Propaganda.

35. Health education of the people has engaged the increasing attention of provincial health authorities in recent years. All the usual methods of propaganda, such as lectures to groups of people, with or without magic lanterns and slides, film demonstrations, health exhibitions, distribution of leaflets, posters and pamphlets, have been employed by the health departments. Vans equipped with suitable propaganda material are employed in many provinces to carry the message of health to the rural population. The organisation of health weeks is widely practised in some provinces in order to focus the attention of the public on the subject of health and intensive efforts are made during the week for educating the people. Health songs and dramas render powerful aid to the movement because of the emotional content of the messages that they convey and these are being utilised particularly in schools in order to impart to the children elementary knowledge regarding health and disease. In the following paragraphs brief accounts are given of the activities in this direction during 1938 in individual provinces.

In the N.-W. F. Province, in addition to routine propaganda by means of posters, pamphlets and magic lantern lectures, it is reported that a health section was also provided at two exhibitions, an agricultural show at Tarnab (Peshawar) and a horse and cattle show at Kohat, which attracted large numbers of visitors.

The Bureau of Epidemiology of the Public Health Department, Punjab, is in charge of the preparation of propaganda material for the province. Broadcast talks were prepared on 26 subjects. In an All-India exhibition held in Lahore, the Bureau participated by providing a health stall. A small exhibition on health matters was also arranged at the Criminal Tribes Industrial Settlement, Moghalpura.

In the United Provinces a considerable amount of health education work was carried out during 1938. The Hygiene Publicity Bureau of the Public Health Department is in charge of this work and as the officers of the Bureau hold the additional posts of Honorary Secretaries of the U. P. Branch of the Indian Red Cross Society, the St. John Ambulance Association and the Junior Red Cross, coordination of the activities of these organisations with those of the Health Department in the field of health education is ensured.

In 1938 a total of 4,804 Junior Red Cross groups functioned in 3,958 schools. The number of members was 109,950. The health activities of these children were of a varied character. They participated in preventive work against epidemic diseases, such as distribution of quinine for malaria, sterilisation of wells with potassium permanganate, distribution of essential oil mixture and propaganda among the people for popularising anticholera inoculation. In Fyzabad the juniors constructed the model of a sanitary village for demonstration to the public and of a bore-hole latrine for the education of school children. Other activities included the celebration of health and Red Cross weeks in certain places, personal cleanliness campaigns and participation in flood relief work in the affected areas.

The number of district centres of the St. John Ambulance Association was 22 at the end of 1938. Including 900 men of the police force, a total of 3,472 men was trained during the year and granted the certificates of the Association. The Mackenzie School Course certificate was granted to 6,920 men.

Health education of the people was carried on by the members of the public health department on the usual lines. A publicity van equipped with health exhibits, loud speakers, cinema films and gramophone records toured in 28 districts, covering an area of 7,789 miles and gave demonstrations to a population of nearly 146,000. A health exhibition was arranged in connection with the *Kumbh mela* at Hardwar and smaller exhibitions were held at various fairs and festivals in different parts of the province.

New propaganda material prepared by the Hygiene Publicity Bureau included leaflets on cholera and typhoid fever, a story issued as a pamphlet dealing with the evils of drink and an article entitled "Your child's food and eating habits", which was issued in Urdu and Hindi for the use of Junior Red Cross groups in the province. A new cinema film on plague and another describing the arrangements for the Hardwar festival were also prepared.

In Bengal there are 12 units equipped with health films for touring in the districts. Their tours are arranged by district officers in consultation with the local people. It is stated that 1,605 demonstrations were held during the year. In addition an exhibition van also worked for five months in different parts of the Province.

In Bombay Presidency health propaganda was carried out by the Bombay Presidency Baby and Health Week Association, the Sanitary Associations of Broach, Ahmedabad and Bombay, the Maternity and Infant Welfare Association, Sholapur, and the branches of the Red Cross Society. The usual methods of health education of the people were employed and it is reported that a large section of the community came within the range of these activities.

The Karachi Health Association, the Red Cross Society and the Junior Red Cross are the voluntary organisations which take an active part in health propaganda in Sind. The Provincial Public Health Department also carried on health education on the usual lines and, in addition, health stalls were organised in connection with a number of agricultural and other exhibitions. Malaria and tuberculosis received special attention, leaflets and pictorial posters being extensively used for educating the people. The Government allotted Rs. 15,000 for the construction of model villages and an equal amount for rural reconstruction work and for propaganda.

Health propaganda, which is one of the routine duties of the public health staff in Orissa, received considerable attention during 1938 and it is reported that talks on various health subjects were delivered in 9,795 villages and in almost all the towns of the province. The total audience is reported to have been in the neighbourhood of 800,000. In addition, eight health exhibitions were held in Ganjam district and two in Balasore district.

The Health and Baby week was celebrated in many centres in the district of Ganjam and at one centre in Koraput district and a gratifying feature of these events was that the different departments of public administration participated in the celebrations. During the last quarter of the year a travelling health unit, equipped at a cost of Rs. 4,000, toured in the district of Balasore and carried on propaganda against the use of opium. In the district of Cuttack it is reported that health units were organised in 12 villages on a voluntary basis and that these organisations took an active part in health education.

In the Central Provinces health education was carried out in rural areas by subassistant health officers at all the schools and villages which they visited, by delivering lectures with the aid of coloured charts and pamphlets on various health subjects.

In Madras Presidency production of propaganda material has been centralised in the office of the Director of Public Health, where a health officer is in charge of this work. One hundred and eleven leaflets and pamphlets and 24 posters on different subjects have so far been issued. In 1938 a set of 37 posters on maternity and child welfare, entitled "Sita and Nagamma" was prepared in the form of a story and issued in all the languages of the province, as well as a set of 24 health maxims in Tamil and three coloured book-marks on "Food and Nutrition". In addition four cinema films, a set of magic lantern slides on rural reconstruction and some health models were purchased and added to the stock of propaganda material available for loan to local authorities and voluntary organisations engaged in health propaganda.

The District Boards of Nellore, Cuddapah, Chittoor, Coimbatore, Guntur, Godavari East, and Tanjore maintained mobile propaganda units equipped with cinema machines and magic lanterns, which toured in their respective areas.

Since the opening of a broadcasting station at Madras by the All-India Radio, the Public Health Department participated in the broadcasting programmes by contributing short talks on public health subjects. During the year, 27 talks were given.

A health week was celebrated in most of the districts and municipalities in the province and intensive propaganda was carried out during the week. The Public Health Department participated in the All-India Khadi and Swadeshi Exhibition at Congress House held from the middle of December 1938 to the middle of January 1939.

It is reported that in Assam health propaganda with the aid of magic lanterns was carried out by the Assistant Surgeons of the Public Health Department in the course of their inspection of dispensaries. The subjects dealt with included general sanitation and food as well as the common infectious diseases such as malaria, kala-azar, tuberculosis, smallpox, leprosy, and cholera. The expenditure was partly met from the public health budget and partly from the King George Thanksgiving (Anti-Tuberculosis) Fund.

Food Adulteration.

36. Food adulteration in India presents certain special problems. Its control is vested in provincial governments and, as the Food Adulteration Acts in the provinces were mostly enacted with but limited consultation among provincial authorities, the standards fixed for individual articles of food vary widely. Further, uniformity of laboratory practice does not exist in the provinces so that the results of the analyses of the same article of food in different laboratories are not likely to be quite comparable. In consequence of these facts the enforcement of the provincial Food Adulteration Acts has impeded the free flow of interprovincial trade in certain important articles of food such as ghee. Another aspect of the problem is that local authorities are responsible for administering the Acts within their areas and that no active efforts are being made by these authorities to enforce the provisions of law in the absence of a strong public opinion against the sale of adulterated food. Prosecution of every case of adulteration and the infliction of deterrent punishments on the offenders by the magistrates can alone put down the evil practice. Undue leniency in regard to both exists in most parts of the country. Under these circumstances it is a matter for gratification that the whole question of food adulteration is under investigation by a special committee of the Central Advisory Board of Health and that as the result of the recommendations made by the Board, it may become possible, at no distant date, to attempt to secure uniformity in respect of standards, of laboratory technique and of legislative and administrative methods, which should go a long way towards a more efficient control of adulteration throughout the country.

From the administrative point of view control of food adulteration does not appear to present the obstacle of lack of funds which impedes progress in most fields of public health activity. While the procedure may not be the same in all provinces, in some the public analyst under the Act is maintained by the provincial Government and contributions towards the total expenditure are recovered from the local authorities by the Government. Local bodies are permitted to retain the money recovered as fines from the persons convicted of offences under the Act and it is known that the amount that the local authorities realise from this source exceeds, in many cases, the money they have to pay to the provincial Government. Under existing conditions a strict enforcement of the Act need not therefore be a financial burden to the local bodies. This and other aspects of the problem will no doubt receive attention from the Food Adulteration Committee of the Central Advisory Board of Health and its report may be expected to provide an illuminating survey of existing conditions and of the changes necessary for tightening control over food adulteration.

The work done in the provinces during 1938 for controlling food adulteration is summarised below :—

It is reported that, in the N.-W. F. Province, the Punjab Pure Food Act and the rules framed under this Act by the provincial Government were in force in 1938 in all the municipalities and notified areas. One hundred and twentyfive samples of ghee were examined in the provincial laboratory and of these 42 per cent were found to be adulterated. Of 70 samples of milk which were examined 29 per cent were shown to be adulterated.

The chemical laboratory maintained by the Public Health Department of the Punjab carries out the analysis of articles of food and drink in connection with the enforcement of the Punjab Pure Food Act for the large majority

of the local authorities which have adopted the Act. As may be seen from the following figures, within recent years a considerable increase has taken place both in the number of municipalities working the Act and in the number of samples sent for analysis.

	No. of local bodies which have the Government Public Health Chemist as the Public Analyst.	No. of samples examined.
Up to 1936	39	209
During 1937	64	865
During 1938	96	1,143

Of the 1,143 samples examined during the year under review, 788 were of ghee, 171 of milk and 18 of butter. These products together formed 85.5 per cent of the total number of samples examined. The percentage of adulteration in samples of ghee was as high as 65.2. This figure, as pointed out by the Director of Public Health, exaggerates to some extent the prevalence of adulteration because samples are collected mainly from suspicious sources. Nevertheless the figure is sufficiently high to justify the assumption that adulteration of this important article of food is widely practised in the Punjab.

Although a noticeable increase has taken place in the number of samples sent by local bodies for analysis, the Director points out that there is considerable room for improvement as is evidenced by the fact that 66 out of the 96 local bodies, which have the Government Public Health Chemist as their analyst, either sent a fewer number of samples than 10 or none at all during the year.

Twelve local bodies maintained their own analyst and a total number of 2,971 samples of different articles of food was examined by them during the year. The percentage of adulteration is reported to be 37.

The Punjab Pure Food Act is in force in Delhi Province and the Chief Health Officer reports that the Act worked satisfactorily during the year under review. The articles of food to which sampling was confined were milk, ghee and butter. In the combined areas of New Delhi, Delhi city and Civil Lines, 2,971 samples of milk, 822 of ghee and 30 of butter were examined during the year, the percentages of adulteration being 17.2, 36.6 and 33.3 respectively.

During 1937 considerable opposition was offered by the traders to the enforcement of the Act. In 1938 much of this opposition disappeared partly because an agreement was reached that first offenders should be warned and given an opportunity to stock better ghee and partly because graded and tested ghee became available to the merchants. On the other hand the Chief Health Officer states that the fines imposed by the courts were not sufficiently heavy to prove deterrent to the sellers of adulterated ghee and this explains the fact that the percentage of adulteration in 1938 showed no improvement over that for the previous year.

The improvement of the milk supply of Delhi urban area requires a strict enforcement of the Act as well as arrangements for the provision of a supply of pure milk on which the public can rely. Only in this way can the unscrupulous *gowala* be forced to recognise the necessity for improving the quality of his own milk. A step in this direction was taken during the year by the initiation of a scheme for the supply of good milk with the collaboration of Messrs. Keventers, Ltd. From the point of view of public health it is to be hoped that the scheme will also help towards raising the standard demanded by the public in the methods of production of milk and that this will lead to the elimination of the nuisance now associated with the insanitary cow-byres in Delhi.

In the United Provinces the number of samples of food analysed has grown steadily during the past few years. In 1934 the total number of samples received by the Public Analyst was 6,448 and by 1938 the number had risen to 11,210. Excluding some samples which were received in a state unfit for analysis and others which were analysed for purposes other than those of the Food Adulteration Act, of 11,012 samples examined 20·6 per cent were shown to be adulterated.

The application of the Food Adulteration Act was extended in 1938 to three notified areas, three towns, the Magh *Mela* area of Allahabad and certain bazars and fairs in the rural areas. During the year the Act was in force in 85 municipalities, 42 notified areas, 17 cantonments, two festival centres and several towns and villages in 39 districts.

The number of persons prosecuted under the Act was 2,104 and of these 1,342 were fined, the average amount of fine being nearly Rs. 41. It is reported that the punishment awarded by many magistrates was sufficiently heavy to be deterrent while others imposed fines as low as Rs. 5, a figure too small to prove a hardship to the vendor of adulterated food.

The butter, ghee and fat licensing rules for preventing the sale of vegetable product as genuine ghee are stated to be in force in 51 areas. The Government have advised all local bodies to adopt these rules.

In Bengal the number of samples received for examination by the Government public health laboratory decreased from 12,123 in 1937 to 9,114 in 1938. This is due to the fact that the establishment of two laboratories by the district boards concerned was permitted by the Government and these laboratories served the districts of Jalpaiguri, Birbhum and Bankura. Further, the district boards of Nadia and Murshidabad, in anticipation of being able to establish similar district laboratories, withheld the despatch of their samples to the Government laboratory. Of the various articles of food examined mustard oil, ghee and milk formed large proportions. The percentages of adulteration for these articles were 35·7, 59·4 and 74·6 respectively in district board areas and 15·6, 45·9 and 53·3 in municipalities.

The Public Health Institute maintained by the Government in the Central Provinces examined 15 samples of butter, 32 of ghee, one of khowa and five of tea. All the samples of butter were found to be adulterated as well as 34·4 per cent of the ghee samples while an equal percentage of the latter were shown to be rancid and unfit for human consumption. All the tea samples were genuine but the single sample of khowa was adulterated.

Separate public analysts worked in the municipalities of Nagpur and Jubbulpore and they examined 766 samples of ghee and 513 of milk.

The Bombay Prevention of Adulteration Act was in force during 1938 in the towns of Bombay, Ahmedabad, Surat and Broach. The following figures show the numbers of samples of different articles of food examined and the percentages of adulteration.

	Milk.		Ghee.		Butter.		Other articles.	
	No. of samples.	Percent- age of adultera- tion.	No. of samples.	Percent- age of adultera- tion.	No. of samples.	Percent- age of adultera- tion.	No. of samples.	Percent- age of adultera- tion.
Bombay	6,744	17	1,754	3	862	10	946	49
Ahmedabad*	2,236	Not avail- able.	190	Not avail- able.	8	Not avail- able.	Not avail- able.	Not avail- able.
Surat	39	25	40	30	...	...	...	...
Broach	69	84	36	22	...	...	...	...

* The percentage of adulterated samples was 35.

In Sind the number of samples examined under the Food Adulteration Act has shown a steady increase from 1,211 in 1934 to 5,054 in 1938. The Act was in force during 1938 in the municipalities of Karachi, Shikarpur, Hyderabad, Tatta and Sukkur. In December 1938 its operation was extended to the town of Larkana but no samples were taken for examination before the end of the year. The percentage of adulteration in samples of milk varied from 58.9 in Sukkur to 26.1 in Karachi and in ghee and butter together from 47.5 per cent to 19.5 respectively in the same two towns.

During 1938 the operation of the Food Adulteration Act was extended to 12 municipalities and 9 panchayats in Madras Presidency. At the end of the year the Act was in force in the areas of 90 local bodies including Madras city. Madras city has its own Public Analyst while the samples from all the other local bodies in the province are analysed by the Government Analyst at the King Institute, Guindy. During the year 1936-37, 7,972 samples were analysed compared with 7,017 during the previous year. These included 1,317 samples examined in Madras city. The numbers of samples examined for different articles of food and the percentages of adulteration are given below for the period from 1st October 1936-37 to 30th September 1937-38 :—

Nature of the sample.	1936-37.		1937-38.	
	Total No. of samples.	Percentage of adulteration.	Total no. of samples.	Percentage of adulteration.
Ghee	1,962	34.4	2,108	34.1
Butter	368	38.3	368	40.2
Milk	2,844	59.4	3,407	51.3
Gingelly oil	1,214	9.1	1,255	13.0
Other samples	629	20.3	834	17.4
Total for the year	7,017	39.1	7,972	36.7

There is but little variation between the two years in the percentage of adulterated samples in respect of the different articles of food. The Public Analyst points out that, although the average fine imposed by the magistrates has increased from Rs. 22 to Rs. 27 the fines continue to be, in a number of cases, too small to have any deterrent effect on the defaulters. On the other hand, from the financial point of view, he states that the enforcement of the Act is a sound proposition for the local bodies. Of the 90 local authorities enforcing the Act, 64 recovered through fines more than their contribution to the Government compared with 51 during the previous year. Six municipalities recovered thrice their contribution and 29 local bodies (25 municipalities and four panchayats) twice their contribution.

Adulteration of ghee is a problem presenting considerable difficulty in all parts of the country. On this question the Madras Public Analyst has made some interesting remarks. In that province the ghee merchants made representations to the Government that arrangements should be made for samples of ghee to be certified as genuine on nominal charges. While this is impossible in view of the fact that no simple tests are available for testing the genuineness of ghee, the Analyst points out that the main fault lies in the fact that ghee merchants do not generally make any efforts to ensure that the butter from which they make ghee is unadulterated. The price paid for the butter is in many cases too low to secure the genuine article. Secondly there is urgent need for the organisation of the trade on sound lines. Butter for the manufacture of ghee is generally purchased through agents who obtain

the supplies from the villages. Adequate supervision of the preparation of butter through reliable agents in the villages should be arranged by the Ghee Merchants' Association. Cooperative societies or groups of merchants can help towards the organisation of properly conducted dairies and production of clean milk and milk products in the rural areas adjoining cities. Such efforts are essential for supplementing the working of the Food Adulteration Act if an improvement of the existing condition is to be achieved. These remarks apply equally to other parts of India.

The public health laboratory in Assam examined, during 1938, 547 samples of different articles of food. Of these 56.5 per cent were found to be adulterated. The number of samples of ghee was 222, of milk 96 and butter two. Of the last both were adulterated, while the percentages of adulteration in ghee and milk samples were 72.1 and 53.9 respectively.

Housing.

37. Improvement of housing in urban and rural areas is one of the most urgent and difficult of the health problems of this country. The subject was discussed at some length in the 1936 report and the main lines of advance for improving housing conditions in cities, towns and in the rural areas were briefly indicated. Progressive industrial concerns have shown, within recent years, a desire to provide their employees with suitable quarters, although little or no progress has been made in the inauguration of comprehensive schemes in which the provincial Government, local authorities and employers of labour all participate as suggested by the Royal Commission on Labour in India. Brief notes regarding improvements in the housing of factory labour in the provinces are given later. As regards the general population mention may be made of a scheme for Delhi urban area which has recently been introduced by the Improvement Trust with financial assistance from the Government. In the following paragraphs is given such information as is available regarding housing in the provincial public health reports.

In the Punjab, it is reported that town planning schemes in unbuilt areas have been prepared for two towns, Lahore and Lyallpur, but that little progress has been made in their application. An Improvement Trust has been created in Lahore and standards have been established by that body for regulating and controlling the layout of areas and the construction of buildings in these areas. Model byelaws for the regulation of buildings have been issued by the provincial Government for adoption by the larger towns.

In Delhi province mention has already been made of a slum clearance scheme by which rehousing of the poor is to be effected. It is proposed that the dispossessed slum dwellers should be given the opportunity of acquiring their own houses on a system of instalment payments extended over a period of 20 years.

In the United Provinces, it is reported, that the Municipal Board of Cawnpore provided quarters for about 700 sweepers. In this city there are many insanitary and overcrowded areas known as *ahatas* which lack adequate lighting and ventilation and are unfit for habitation. Small rooms are let out on exorbitant rents and about 40,000 people reside in these *ahatas*. It is reported that the Municipal Board has a scheme for the gradual acquisition of the *ahatas* and for improving or re-modelling them on sanitary lines. A Slum Clearance Joint Committee has been set up by the Municipal Board and the Improvement Trust for the purpose of carrying out improvements in these areas. In 1932 there were 216 such *ahatas*, and, of these, it is stated, that 66 have so far been improved.

In regard to the rural areas it is reported that, through the combined efforts of the rural health staff and the rural development organisation, about 20,000 ventilators have been provided in village houses and that 108 houses have been rebuilt on modern lines.

In Bengal a little over three million people live in urban areas and the remaining 47 millions in rural areas. The Director of Public Health considers that the housing conditions in both these areas are extremely unsatisfactory and that the most important requirement is the provision of legislation for village planning and for small town planning. The results of an enquiry regarding the housing conditions in district board areas showed that no improvement trusts, building societies or organisations for promoting housing schemes for the industrial population existed in the rural areas of the province. The Director emphasized the necessity of all municipalities adopting suitable building byelaws and of enforcing them.

In Bombay Presidency small urban housing schemes were carried out in a number of places. Thus Manmad municipality demolished the insanitary houses of *Mahars* and *Mangs* and allotted to them new plots of land for the erection of quarters. In Bassein and Vile Parle sanitary *chawls* were provided for *Bhangis*. Barsi municipality provided Rs. 1,000 for improving the housing condition of the depressed classes. The Surat municipality is providing Rs. 8,000 every year for the construction of quarters for the employees of the municipality belonging to the depressed classes.

It is reported that, in the province, after the Town Planning Act was passed some years ago, 51 schemes relating to an area of nearly 16,000 acres have been prepared and 38 schemes involving about 7,766 acres have been carried out. Town planning schemes were prepared in Ahmedabad, Bombay Suburban district and Poona. Other activities in this field of health administration included the sanctioning of house sites, in a number of areas, to members of the backward classes.

Progress in regard to rural housing has been slow. There are 25 house reconstruction societies and all of them are stated to be in Ahmedabad district. Owing to the inability of the members, who are mostly agriculturists, to repay their loans, the activities of these societies have been restricted.

It is stated that no improvement trusts exist in any of the towns of Sind and that no industrial housing schemes are in progress. The Karachi Port Trust, the N. W. Railway and the Karachi Municipal Corporation have provided a number of quarters for their employees on the lower scales of pay. Karachi municipality has framed a set of building rules and it is reported that no plans for new buildings are approved unless they conform to these rules. It is also stated that a policy of opening up congested areas and improving narrow streets and roads has been followed by this municipality. Cooperative housing societies exist in Shikarpur and Dadu.

As regards the rural areas a special officer has been appointed by the Government for rural reconstruction and in every district committees have been formed with the Collector as chairman. These committees have prepared programmes for rural development, which include the building of model houses in selected areas.

The Madras Public Health Act of 1939 makes comprehensive provision for the improvement of housing conditions in the province. The following are some of the most important provisions : (i) reservation of areas for residential purposes, (ii) control over insanitary buildings, (iii) abatement of

overcrowding, (iv) prohibition of occupation, in urban areas, of new buildings until adequate water supply and sufficient means of drainage have been installed, and (v) enforcement of the provision of sanitary conveniences in buildings intended for human habitation.

The Government have framed rules for the control of building sites and for the construction of wells, house drains, cess pools, septic tanks and latrines connected with septic tanks. These rules are for the guidance of municipal authorities in regulating the construction of houses in their areas.

The Local Boards Act and the Madras Town Planning Act provide power to the provincial Government to extend any of the provisions of the Madras City Municipal Act, Madras District Municipalities Act, or the Madras Town Planning Act to any of the local areas, with or without such modifications as the Government may consider necessary. Advantage has been taken of these provisions and the Madras District Municipalities Act and Town Planning Act, in so far as they relate to buildings, have been extended to certain panchayats. During 1937-38 the Town Planning Act was enforced in 139 towns.

Many building cooperative societies exist in the province and the formation of new societies is being encouraged by the Government by advancing loans to them.

In Assam no building societies or cooperative schemes for the improvement of urban or rural housing existed during the year under review. On the other hand it is reported that in industrial centres housing conditions are improving. The Director of Public Health suggests that local bodies should demonstrate to the people in selected areas how, by simple experiments such as those of clearance of rank vegetation from the compound and keeping houses and their immediate surroundings clean, a great deal can be done by the people themselves to improve the existing state of affairs.

INDUSTRIAL HOUSING.

In the United Provinces 454 quarters (307 single and 147 double) were constructed during 1938 by factory owners for their employees. Sugar factories were responsible for the majority of these houses. In Madras it is reported that the owners of many textile mills and tea factories provided housing accommodation at a nominal rent to their employees. The Mettur Industries, Ltd., in Salem district constructed 720 quarters at very low rents, while Mettur Workshops in the same district also provided quarters for the workers. Houses for which the rent does not exceed 10 per cent of the salary of the individual have been provided for the use of the officers and staff of the South Indian Railway workshops at Trichinopoly. These quarters number 3,426. The Chittavalsa Jute Mills, Chittavalsa, have provided 515 houses for their workers, the Buckingham and Carnatic mills, Madras, 487, the Nellimerla Jute Mills 398, the Trichinopoly Mills, Ltd., 266, and the Madura Mills 166. A sum of Rs. 20,000 has been provided by the Basantha Mills, Singanellur, Coimbatore district, for the construction of quarters for their workers.

The industrial housing scheme of the Bombay Government in Bombay city consists of 207 *chawls* of reinforced cement construction, each of which contains 80 rooms. These have been provided at four different centres in the city. At each centre shops have been provided and arrangements have also been made for the provision of water taps in the rooms on payment by the tenants of an additional charge of Rs. 2 per month. It is reported that the sanitation of the *chawls* is well looked after. Maternity homes and creches have been provided by certain voluntary organisations. The Municipal Corporation has provided schools at all the centres and a dispensary at one of them.

The number of workers living in these *chawls* is stated to be over 63,000. In Ahmedabad it is reported that the municipality was building 156 quarters for industrial labour. The Asbestos Cement Factory carried out certain improvements in the housing schemes controlled by the factory.

It is stated that, in Bengal, no marked advance was made in the conditions under which factory labour lived during 1938 compared with the previous years, although in 20 factories additional accommodation was provided and in some cases unsatisfactory houses were replaced by more substantial ones and amenities such as tube wells, water hydrants and bathing places were provided.

In Assam the tendency during the past few years has been to replace the houses constructed of flimsy material by more permanent structures and this continued during the year. The Tarapore Tea Co., Cachar, reconstructed 423 thatch houses of an improved type for their workers. The Burma Oil Co. Ltd., has constructed improved types of houses for the different grades of their employees, drainage, water supply, sanitation and electric light also receiving attention.

Except for a few large factories housing conditions for industrial labour in the Punjab remained unsatisfactory and it is stated that no improvement can be expected until factory legislation has been extended to cover housing.

In Sind, the Dalmia Cement Works and the Sind Cement Works have provided a number of quarters for their employees.

In the Central Provinces, Delhi and the N.-W. F. Province, it is reported that no new housing schemes were undertaken by factory owners but that quarters already in existence were well looked after. No further progress in housing schemes was reported from Ajmer-Merwara, Bihar and Orissa.

Industrial Hygiene and Health of the Industrial Population.

38. The average number of operatives employed in the factories in British India increased from 1,675,869 in 1937 to 1,737,755 in 1938, which is the highest figure recorded so far. Marked increases took place in Bombay (43,896), Madras (7,705), the Punjab (2,795), Bihar (2,565), Assam (2,152), Sind (2,024) and U. P. (1,601). An increase in the number of women employed in factories was recorded during the year, the respective figures for 1937 and 1938 being 232,122 and 240,932. The percentage of women to the total factory population was 13·8, the same as in 1937. On the other hand, the percentage of children to the total factory population showed a slight decrease from 0·64 per cent to 0·62 per cent. Bombay was the only province in which there was an appreciable increase in the number of children employed, the figures being 943 in 1938 and 466 in 1937. In Bengal three prosecutions were instituted for the employment of children without the requisite medical certificates, and one for the employment of an under-aged child.

The number of accidents increased from 28,323 in 1937 to 33,494 in 1938. The incidence of all accidents per 100,000 operatives rose from 1,559 in 1937 to 1,927 in 1938. Generally speaking, it is stated that the increase was due to the influx of untrained men in the industries and to better reporting.

The health of factory employees in all the provinces is reported to have been generally good. No epidemics took place except in C. P. and U. P. where a few outbreaks of cholera were reported. The sanitary arrangements in the factories were on the whole satisfactory. In Bengal, in many factories controlled by the smaller municipalities drainage and sewerage

facilities were unsatisfactory. In Bombay Presidency the problem of a satisfactory disposal of trade waste in Ahmedabad municipality remained unsolved. Improvement in the sanitary condition of many mofussil concerns in the province is reported. In U. P., complaints regarding the disposal of the effluent from sugar factories were less numerous than in the previous year. The supply of drinking water to factories was generally adequate and of good quality.

Welfare works of various types were reported from the different provinces. These included the provision of extra hospital accommodation for employees, provision of amenities such as sports clubs, libraries and reading rooms, provision of canteens for the use of workers, the establishment of creches and the appointment of welfare officers for the investigation of complaints made by factory labour, the creation of a better understanding between workers and their employers, and other matters concerning the general welfare of the industrial population.

MINES.

The daily average number of persons working in and about the mines regulated by the Indian Mines Act during 1938 was 306,260 compared with 267,858 in the previous year. The former figure is the highest on record, an increase of 10·6 per cent over that for the previous year. Of the total number employed in mines, coal mines accounted for 201,093 or nearly 66 per cent. Women were excluded from working underground in the coal mines during the year. Brief remarks regarding the health and sanitation of the areas under the control of the Asansol Mines Board of Health and the Jharia Mines Board of Health are given below :—

Sickness amongst the miners in Asansol was, it is reported, at the lowest level in January and February and reached the maximum in July and August, declining thereafter till the end of the year. Of 387 attacks of cholera, 142 were reported from collieries, 37 from municipal towns and 208 from rural areas. The incidence rate in collieries was 2·0 per thousand, while that in the villages was 0·78. The higher rate of incidence in the collieries was due to the migration of labour from outside the mining settlement and constant movement of labour from mine to mine in search of work. It is reported that adequate control measures were taken under the Cholera Regulations, the total number of inoculations carried out being 35,382. The number of smallpox cases reported during the year was 87. During the past few years strenuous efforts have been made to get the population of the mining settlement protected by mass revaccination. The number of revaccinations performed during the previous five years was 308,777, while the number of children and adults primarily vaccinated was 77,086.

The number of maternity and infant welfare centres maintained by the Board of Health increased from 7 to 9. Each is in charge of a health visitor and a daily average of 235 infants and 136 toddlers attended the morning clinics at the centres. Of 121 *dais* trained during the year, 69 passed the examination conducted at the end of the course. A total of 1,494 cases of confinement received skilled attendance.

The medical arrangements which existed at the collieries were overhauled and unqualified men were replaced by registered practitioners. Provision for in-patients has been made at many collieries.

A considerable amount of antileprosy work was carried out during the year. The number of leprosy officers increased from four to five and 30 trained assistants were employed for survey, propaganda and home visiting. The Leprosy Relief Association organised the usual annual leprosy day and the collection made on that occasion amounted to Rs. 14,988 against Rs. 11,330 in 1937. It is reported that arrangements have been made to construct a leper settlement near Asansol for segregating leper beggars and highly infectious cases from collieries and villages. A survey made during the year revealed an incidence rate of 1·6 per cent among the general population and of 2·3 per cent among the students of primary schools.

Intensive antimalaria operations were carried out in four areas and a partial campaign was undertaken in six other areas with a view to stimulating local effort by the residents themselves. The measures adopted included cleansing of tanks before the malaria season, treatment of breeding places by spraying and filling in wherever possible, and a supply of larvicidal fish to private wells.

A tuberculosis survey extending over a period of six months was carried out among a group of miners and retired miners with a view to finding out the incidence and nature of the infection.

The estimated population of the settlement of the Jharia Mines Board of Health was 561,090 persons. The death rate was 16·3 per thousand compared with 16·5 during the previous year. There were 86 cases of cholera with 30 deaths of which five took place in the collieries. A total of 10,232 anticholera inoculations was performed. During the year 378 cases of smallpox took place with 19 deaths. Samples of food analysed in the Board's laboratories totalled 454 and prosecutions were ordered in respect of all cases of adulteration. The five year housing scheme started by the Board in 1937 continued to make progress. The Dhanbad and District Leprosy Relief Fund was in charge of antileprosy work in the settlement. A leper day was organised and a sum of Rs. 9,125 was realised. A new clinic was opened at Telmucho raising the total number of clinics to five. During the year 704 new patients were treated in the different clinics, the total number of treatments given being 30,259.

The Jharia Water Board functioned throughout the year, the total quantity of water supplied being 535,000,000 gallons.

A considerable amount of health propaganda was carried out in the year, the principle subjects being leprosy, maternity and child welfare, general hygiene, sanitation, dietetics, vitamins and temperance.

Railways.

39. The Central Advisory Board of Health had suggested the formation of local committees on which the civil, railway and military health authorities were represented, for the carrying out of cooperative measures in matters of common concern. Local committees have been formed in many places and it is reported that progress in the formulation of suitable schemes is being achieved. The periodical meetings of the Board, at which provincial Directors of Public Health and the representatives of the railway and military health administrations are present, provide valuable opportunities for mutual consultation while the Public Health Commissioner, in his capacity as the Secretary of the Board, is able to render help towards coordinating the efforts of these authorities in the pursuit of their common objects.

Railway health authorities have consistently shown a desire to cooperate with the civil health departments in the enforcement of sanitary measures in connection with fairs and festivals. Much of the success achieved during recent years in the prevention of outbreaks of cholera at largely attended festival centres must be attributed to such cooperation. Railway administrations have, in addition, shown increasing interest in antimalarial measures and in the development of maternity and child welfare work. Brief notes on the working of individual railway health departments are given below.

NORTH WESTERN RAILWAY.

The Railway administration maintained during 1938-39 seven divisional hospitals and 64 other hospitals and dispensaries with a total of 529 beds. Of the chief diseases treated 80,370 were cases of malaria, 12,481 trachoma, 10,154 influenza, 9,258 dysentery, 632 enteric fever, 476 tuberculosis of the lungs, 363 other forms of tuberculosis, 256 gonococcal infection, 243 smallpox, 214 syphilis, 143 cataract and 86 cholera. Three hundred and fortyone cases of normal and 47 cases of abnormal labour were conducted.

The average number of employees constantly absent from duty on medical certificate was 13 *per mille* of the average strength of the staff and the average number of days an employee was absent from duty was 4.6.

In connection with the Hardwar *Kumbh mela* in 1938, medical inspection posts were established in cooperation with the provincial and State health authorities at Khanalampura, Saharanpur, Ambala Cantonment, Delhi, Bhatinda, Ludhiana and Amritsar. Special sanitary arrangements were made at Saharanpur, including improvement of the water supply and the provision of additional latrine accommodation for passengers. Among the pilgrims returning from Hardwar 38 cases and five deaths from cholera were reported. Immediate action was taken to bring the disease under control. The total number of pilgrims who travelled by the N. W. Railway to Hardwar was approximately 355,000. Apart from this *mela* provision of medical and sanitary arrangements was made in connection with 18 other festivals in different places. The total number of pilgrims who visited these festival centres is estimated to be in the neighbourhood of 245,500.

As an antimalarial measure experimental spraying of selected staff quarters at certain stations was carried out with "Pyroicide 20". The results obtained are reported to have been encouraging.

Other activities included training in first aid of 515 candidates and of nine in home nursing under the auspices of the St. John Ambulance Association. Ambulance divisions were maintained at Moghalpura, Lahore and Ferozepore and a nursing division at Moghalpura. They are reported to have done good work in connection with accidents at workshops, railway stations, sports meetings and at Saharanpur in connection with the Hardwar *Kumbh mela*.

Eight child welfare centres and three subcentres were maintained during the year. The total expenditure was approximately 23,000.

An antirabic treatment centre was opened at the Lahore railway hospital on 1st September 1938. Supplies of antirabic vaccine were obtained from the Pasteur Institute, Kasauli. One hundred and sixtytwo cases consisting of employees and the members of their families were given antirabic treatment during the year.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY.

The total number of cases treated during 1938-39 by the Railway Medical Department was 378,449. These included 21 cases of enteric fever, 14,937 of influenza and 77 of rheumatic fever. Only one case of cholera took place during the year and plague was absent. Smallpox cases numbered 148 and deaths 11. The total number of working days lost during the year by the subordinate staff and menials, who numbered 62,224, was 399,107, and the average period covered by a certificate of sickness was 6·8 days.

Free dental service to menials and at a reduced cost to the subordinate staff was provided by granting facilities to six qualified dentists to work in railway hospitals and dispensaries and by giving them free passes for travelling on the Railway.

Antimalarial measures such as clearance of rank vegetation, regular inspection of potential breeding places and spraying with malariol, filling of pits and sealing of unused wells were carried out at a number of railway stations. The numbers of malaria cases among the staff during the past few years are shown below :—

	Primary cases.	Relapsing cases.
1936-37	7,900	8,900
1937-38	9,182	8,197
1938-39	8,512	8,693

It is stated that, during the past two years, oleander plants have been planted at several stations to absorb waste water and that the effect of this experiment on the breeding of mosquitoes is being investigated.

Thirtynine classes in first aid were held during the year against 32 during the previous year, and of 397 persons who underwent training, 207 obtained certificates, 24 vouchers, two medallions and five labels. A class in Mackenzie School course and three classes in home nursing were also held.

MADRAS AND SOUTHERN MAHRATTA RAILWAY.

During the year 1938-39 no case of plague occurred among the railway population while the numbers of attacks from cholera and smallpox were 27 and 100 respectively. The Chief Medical Officer points out that, of the 100 cases of smallpox, the majority took place among employees and their dependents living outside railway colonies. As the Railway runs through territories which have, in many places, wide prevalence of these three diseases the Chief Medical Officer claims that the preventive work of the railway medical staff is largely responsible for the low incidence of cholera and smallpox and for the absence of plague.

Antimalarial measures were carried out at 45 stations. With the cooperation of the Engineering Department most of the potential breeding places at many of these stations were either filled in or rendered easier to control by canalisation and other structural alterations. In several instances the help of local health officers and of other officials was obtained for the carrying out of antimalarial measures. Considerable success in the control of malaria appears to have been achieved by these measures. It is stated that the total number of malaria cases treated in the year just prior to the starting of the malaria operations was 9,246 and that the number of days lost by the staff on account of attacks of malaria was 11,209. In 1938-39 the corresponding figures were 845 and 3,022 respectively.

In regard to general sanitation and hygiene, constant supervision and inspection by the medical staff, travelling sanitary inspectors and sanitary inspectors at larger stations were carried out throughout the year, in order to maintain a desirable standard of efficiency.

A scheme for the medical examination of school children which was inaugurated in January 1938 worked satisfactorily. Parents however showed, in certain cases, inability or unwillingness to arrange for proper treatment. For instance, it is reported that parents pay more attention to advice regarding provision of spectacles than to advice regarding change of diet.

Training in first aid continued as in previous years and during 1938-39 the number of persons trained was 552 compared with 433 in 1937-38.

The leprosy clinic which was opened in 1936, continued to work during the year under review. Since the starting of the clinic 167 employees and 76 dependents have been treated for the disease. It is stated that about 51 per cent of the 167 employees have become non-infective as the result of treatment and that, as all the patients will continue to be under observation by the railway medical administration till the term of service of each employee is over, the risk of the spread of infection has been greatly minimised.

SOUTH INDIAN RAILWAY.

A total of 38,125 cases was treated in the hospitals and dispensaries of the railway during the year under review. The number of cases of infectious disease included in this total was 16,281. Influenza accounted for 5,980 cases, dengue for 54, rabies 54, cholera two, smallpox 12 and cerebrospinal fever three cases. Plague was absent.

Antimalarial work in the Shencottah Ghat section was extended for another year. The Travancore health authorities cooperated with the railway administration in these measures and it is reported that the scheme has been of great benefit to the staff there.

In regard to water supply the filters at Golden Rock in Trichinopoly were overhauled, a water works supervisor was appointed and it is reported that the quality of the water is satisfactory. The filtered water supply at Erode, which is also subsequently chlorinated, is stated to be of good quality. In regard to a number of stations whose supplies required improvement, negotiations were in progress with the Patterson Engineering Company regarding the feasibility of automatic chlorination.

As regards venereal disease a scheme of treatment has been working for some time in order to induce the patients to undergo treatment voluntarily while remaining at work. For syphilis the scheme has met with but limited success as the number of patients availing themselves of the treatment is smaller than had been expected. As regards gonorrhœa, treatment with M. and B. 693 appears to hold out the hope of getting the patients back to work in about 10 days instead of the previous period of two months.

The Chief Medical Officer's report summarises the results of an investigation for five years into the incidence of chronic bacillary and amœbic dysentery as a cause of persistent ill-health in that part of the country. It is stated that "a large proportion of the chronic illnesses, especially those with symptoms of any sort connected with the abdomen, are really dysenteric in nature". The majority of the cases which used to be diagnosed formerly as debility, indigestion, chronic diarrhœa, sprue, rheumatism, piles, etc., are stated to be

cases of chronic dysentery. Flatulence and a sore tongue may be attributed, it is stated, to a superadded streptococcal infection. In quite a number of cases the investigation showed that V W Y and X Z Flexner groups were present and sometimes a Shiga infection was also present. The position may be further complicated in some patients by an amœbic and a secondary streptococcal infection. The inadequacy of routine treatment for such patients is emphasised and certain methods of treatment are indicated which are stated to have produced good results.

GREAT INDIAN PENINSULA RAILWAY.

The number of patients among the employees treated at the medical institutions maintained by the Railway in 1938-39 was 1,26,348 and among the families of the employees 86,430. Corresponding figures for 1937-38 were 1,15,322 and 77,905 respectively. Increases in incidence were recorded under malaria and other fevers such as influenza and enteric fever. The prevalence of malaria was high during June to October, the highest incidence being reached in October (1,233 cases) while the smallest figure was reached in February (371 cases). The usual antimalarial measures for the systematic destruction of larvæ and for the prevention of mosquito breeding were carried out throughout the year. Special measures were undertaken in Bhusaval to control breeding on the outskirts of the railway colony. Influenza was prevalent on the line throughout the year and the total number of cases reported was 7,886 compared with 7,634 in the previous year. The number of employees treated for enteric fever was 119 and for tuberculosis of the lungs 164. Cholera was responsible for 179 cases, plague eight cases and smallpox 297 cases. The numbers of protective vaccinations carried out against cholera, plague and smallpox were 35,419, 638 and 52,238 respectively. The total number of persons given antirabic treatment at the railway centres was 360 compared with 340 during the previous year.

The Bhusaval infant welfare and maternity centre continued to do useful work. An additional centre was opened at Manmad in May 1938. The expenditure on these centres was met from the Staff Benefit Fund.

Forty first aid classes were held during 1938 and 280 persons obtained certificates, eight vouchers, three medallions and one obtained a label. A course of A. R. P. lectures was held in Bombay and a batch of six railway employees underwent training, of whom four obtained the instructor's certificate.

EAST INDIAN RAILWAY.

The total number of cases treated during the year under review was 95,939, a decrease of three per cent compared with the figure for the previous year. Sporadic cases of infectious diseases occurred at different places but no serious outbreak was recorded. Attention is drawn, in the report of the Chief Medical Officer, to the prevalence of tuberculosis among the staff and their families. For a limited number of persons assistance is given by grants from the Staff Benefit Fund for treatment in different sanatoria. For others long leave is granted in order to give them facilities for rest and adequate treatment.

The antimalarial campaigns conducted at Barwadih, Lillooah, Tatanagar and on the Lhaksar-Dehra Dun Section are stated to have reduced the incidence of the disease in these highly malarious areas.

Small clinical laboratories have been provided at several hospitals and dispensaries and, in addition, the Central Laboratory at Allahabad carries

out the examination of a large number of samples of water and articles of food as well as of pathological and bacteriological specimens from patients sent from different stations on the railway.

Since July 1938 the workshops at Lillooah and Jamalpur have each been placed under the charge of a workshop medical officer who is able to devote greater attention to the health and welfare of the labour population employed at these workshops.

EASTERN BENGAL RAILWAY.

The total number of railway employees treated during the year was 1,36,102 and of the members of their families 64,210. Of the total 7,299 cases were due to influenza, 13,182 malaria, 4,377 dysenteries, 98 enteric fever, 155 venereal disease, 76 smallpox, 21 cholera, 96 kala-azar, 81 tuberculosis, 20 leprosy and 237 helminthic infections. The average number of days of certified sickness was 6.7.

In 14 stations antilarval measures were carried out within a radius of half a mile around the railway colony while in 17 other stations these operations were confined to the railway limits. In seven other places quinine and the new synthetic drugs of atabrin and plasmochin were employed for controlling malaria. It is stated that various public bodies asked for the cooperation of the railway authorities for the institution of antimalarial measures in the areas adjacent to the railway colonies and that full cooperation was accorded in all such cases. Two monthly returns are maintained, *viz.*, (i) malaria parasitological record containing the name of every positive case of malaria and (ii) a return showing the number of malaria cases in every station. Weekly returns are also kept giving details of antilarval measures.

During the year first aid courses were arranged for 343 persons and home-nursing training for 19 women.

BENGAL AND NORTH WESTERN RAILWAY.

Malaria is reported to be the most important disease among the population of this railway, the sections most affected being Katarnianghat, Jarwa and Bhiknathoree. At the last place, where shingle quarrying was in progress, the incidence of epidemic malaria was so serious and the mortality so high that it was difficult to keep the labour population at their work. Distribution of quinine mixture and of cinchona febrifuge tablets was extensively carried out for prophylactic and curative purposes and similar measures were carried out at the other two places also. In Bihar the incidence of malaria was complicated by the presence of kala-azar infection also.

A large number of anticholera inoculations was carried out in connection with limited outbreaks in several places.

Owing to the prevalence of plague in Gorakhpur and Benares districts a number of stations in these districts became infected. Anti-plague inoculations were carried out as well as disinfection of houses and rat destruction by cyanogas, for which the district health staff of Gorakhpur cooperated with the railway authorities.

The average daily attendance at the railway maternity and child welfare centre was 38. A baby show was organised and 300 children competed in the show. The children of those railway employees who were drawing salaries below Rs. 50 per month were given milk, food and other nourishment, a total amount of Rs. 400 being spent for the purpose. The maternity staff conducted 18 cases in the colony and admitted 148 labour cases into hospital.

First aid training was given at Gorakhpur and Benares, three men having qualified themselves at the end of the course at the former and 26 at the latter.

ASSAM BENGAL RAILWAY.

The number of patients treated during 1938-39 in the hospitals and dispensaries maintained by the railway administration was 100,546. Including the dependents of the employees there occurred 12 cases of cholera and four cases of smallpox. Other infectious diseases which occurred were enteric fever (73 cases), mumps (70), chickenpox (61), measles (126), diphtheria (11) and kala-azar (70). Preventive vaccinations for cholera, smallpox and enteric fever numbered 5,921, 107 and 846 respectively. Antirabic treatment was given to 91 patients.

As regards malaria it is stated that some improvement in its incidence has been recorded in the controlled areas of Pahartali and Lumding. The Staff Benefit Fund continued to provide a midwife at each of the stations of Pahartali, Lumding and Badarpur. These midwives attended 150 cases.

Courses of lectures in first aid were given throughout the year and 163 persons passed the examination held during the year.

BENGAL NAGPUR RAILWAY.

The report on the health administration of this railway during 1938-39 records many improvements. All the sanitary inspectors were placed under the direct control of the Chief Medical Officer and refresher courses for these men were started in order to improve the standard of work in connection with environmental hygiene. A joint circular was issued by the Chief Engineer and the Chief Medical Officer to the executive officers of both departments with regard to the selection of sites for quarters and the execution of future developmental schemes. A chemist was appointed in order to carry out the analyses of water supplies and waste waters from railway settlements. A new type design for septic tank latrines was devised jointly by the Engineering and Medical Departments.

Malaria control operations were carried out during the year at 46 stations. Measures against *Stegomyia* were in progress throughout the year in Waltair near Vizagapatam, the monthly indices for the railway area ranging between 0.0 in November 1938 and 1.1 in April 1938.

An outbreak of cerebrospinal fever took place in the Tata mines at Noamundi during March 1939. It is reported that prompt measures were taken and that no cases occurred among the railway staff.

The number of in-patients treated in the railway hospitals during 1938-39 was 3,715. A qualified dentist visited the hospitals at Khargpur, Adra and Bilaspur and treated 135 patients.

The laboratory at Khargpur carried out a large amount of work, including the examination of clinical specimens from the hospitals and dispensaries maintained by the railway company, preparation of vaccines and water analysis.

Special arrangements were made for the *Rath Jatra* and *Dol Jatra* festivals at Puri.

SECTION V.

INTERNATIONAL HEALTH AND PORT HEALTH
ADMINISTRATION.**Office International d'Hygiene Publique, Paris.**

40. As usual two meetings of the Permanent Committee were held. The spring session, which was held from 9th to 18th May, was attended by Colonel A. J. H. Russell, C.B.E., K.H.S., I.M.S., as the delegate for India.

The usual procedure of transacting business through Commissions was followed and the delegate for India was appointed a member of five of these, *viz.*, the Quarantine, Air Navigation, Yellow fever, Cholera and Opium Commissions.

The Quarantine Commission examined several questions relating to (i) the application of Article 28 of the International Sanitary Convention, 1926, which provides for the six monthly deratisation of ships, (ii) measures applicable in the case of cholera, (iii) vaccination and measures against smallpox, (iv) sanitary declarations on the arrival of ships and the point raised by the delegate for India in respect of the interpretation of Article 100 of the International Sanitary Convention regarding pilgrim ships. The observations of the Commission in regard to these are contained in the following subparagraphs (i)-(iv) :—

(i) As regards the application of Article 28 of the International Sanitary Convention, 1926, the Commission supported the recommendation of the Consultative Council of the Singapore Bureau that "strict attention should be paid to the application of Article 28". This recommendation was based on the fact that a considerable number of ships arrived in Eastern ports with deratisation certificates dated more than seven months previously.

The Commission emphasised the importance of the inspection of ships and of periodical deratisations being carried out efficiently. The Commission also pointed out that the certificates issued should be as full and explicit as possible. An enquiry carried out in British ports showed that the proportion of ships which were found to have some degree of rat infestation did not exceed ten per cent and that only about one per cent were heavily and persistently rat infested.

This enquiry revealed that some of the causes of rat infestation were controllable, such as rat harbourage in wharves and inefficient deratisations. In regard to ships in which the results of deratisation were unsatisfactory the Commission suggested an increase in the concentration of gas and, within the limits prescribed by Article 28 of the Convention, in the period of exposure. As regards the deratisation of loaded vessels the Commission remarked :—

"Even in cases where the ship, at the expiration of the regulation period, calls at a port where it is not discharging its cargo, or only discharged a necessary part, and does not proceed at once to its 'home port', it would appear preferable (in the absence of special circumstances pointing to a contrary course) to allow it to continue its voyage to a port where, after unloading, inspection and, if necessary, deratisation, can best be carried out; a note to this effect should be entered on the certificate carried by the ship."

The Commission reiterated its view that periodical deratisation should not, save in exceptional circumstances, be imposed more often than is required by the Convention.

(ii) The question of measures against cholera arose from the fact that extraordinary measures were taken by the Mexican Government against Japanese ships on the ground that cholera existed in Japan and that there was danger of its spread to Mexico. The Commission expressed the opinion that whatever measures were adopted, they should not be maintained after the disappearance of the disease in the country of origin and that "in any case it seems that a strict and rational application of the precautions prescribed against cholera in the Convention affords an effective protection against the disease without having recourse to additional measures, due regard, naturally, having been paid to local requirements in ports authorised for disembarkation, etc."

(iii) The Commission considered a recommendation of the Consultative Council of the Singapore Bureau, *viz.*, that all passengers embarking in a port infected with smallpox should be required to produce proofs of immunity against smallpox before being able to obtain a ticket. The Commission held that, although it would be in the interests of the passengers to be vaccinated before leaving a port infected with smallpox, it was not necessary to lay down general rules of practice and that any precautions which might be considered justified should preferably be based on local conditions.

(iv) The delegate for India raised the question whether the provisions of Article 100 of the International Sanitary Convention, 1926, which provides minimum accommodation standards for pilgrims on board ship, were applicable to very young children. The Commission, subject to any final opinion which might be pronounced by the Pilgrimage Commission at the October 1938 Session, expressed the view:—

- (1) that as regards the application of the International Sanitary Convention, children, irrespective of their age, making the pilgrimage, are pilgrims; and
- (2) that they need the same cubic space of air on board as adults, the more so since they cannot move about in the open air as adults can, and that it seems to be necessary to allot them all the space required by the Convention.

The Quarantine Commission for Aerial Navigation considered *inter alia* the question of declaration of origin for passengers coming from regions infected by, or suspected of, yellow fever. The Commission, having studied a form of declaration prepared by the Pan-American Sanitary Bureau for air passengers by which they furnish information regarding the place of origin of their voyage and the places where they have stayed during the six days preceding embarkation, considered that, since the International Sanitary Convention, 1933, provides that passengers can be subjected to medical examination, air navigation companies would be acting wisely in providing passengers with forms of this kind at the time of embarkation.

The Commission was informed by the delegate for India of the arrangements made with the Egyptian Sanitary, Maritime and Quarantine Board to send telegraphic communication to the Air Port Health Officer at Karachi concerning all passengers proceeding to India from infected or suspected yellow fever areas, and a notification by radio from arriving aircraft to the Air Port Health Officer at least two hours prior to its arrival at Karachi. He further informed the Commission of the reciprocal arrangement made between

the health authorities in India, Iraq and Egypt by which the health authorities in India are informed of the carriage by aircraft of any suspected passengers coming from a yellow fever area, and those of Iraq and Egypt are appraised by the Indian public health authorities of any passengers leaving India by aircraft from areas infected with cholera and smallpox.

The Yellow Fever Commission considered (1) the value of the mouse protection test for the diagnosis of yellow fever, (2) the risk of persons recently vaccinated passing on the amaryl virus, (3) the use of prophylactic vaccination against jungle yellow fever, and (4) control of the vitality of yellow fever vaccine, post vaccination immunity and the duration of this immunity. In regard to the use of the test for retrospective diagnosis the following points were stressed by the Commission, (1) it has value when a positive reaction is obtained on patients, after recovery and after a sufficient interval has elapsed, provided these patients gave negative results before the illness, (2) for diagnosing an epidemic of doubtful nature the test is valuable only "if the number of cases giving a positive reaction is definitely greater than the average of positive cases in the surrounding population". As regards the risk of recently vaccinated persons passing on the virus, the available evidence shows that the strain 17D used in Brazil is a very much attenuated form of the virus, that it is stable and non-reversible and that it has not been possible to transmit the virus by mosquito bites. This virus, which is cultivated on embryonic tissue, does not require the addition of immune serum.

For jungle yellow fever the Commission considered that vaccination *en masse* with the new vaccine, 17D, appeared to be the only practical method of prophylaxis.

As regards vaccination the Commission recorded that it agreed with the Rockefeller Foundation "in recommending that each lot of vaccine, before being used, should be subjected to the vitality test and its virulence should be graded". The Commission also recommended that, as far as possible, vaccinated people should be tested for immunity after the lapse of a month at the earliest. The Commission was unable to give a ruling regarding the duration of immunity.

The Cholera Commission considered the following communications :—

- (1) A note by Colonel J. Taylor, Director, Central Research Institute, Kasauli, entitled "Further observations on the value of 'O' agglutination in the diagnosis of the *V. cholerae*".
- (2) A paper by the President of the Commission on laboratory experiments on the comparative agglutination reaction and the properties of sixty culture vibrios, including a certain number of El Tor cultures, in the presence of antisera prepared with pure antigen 'O' of the strains Ogawa, Inaba and Napoli.
- (3) Three communications by Dr. De Vogel regarding a cholera epidemic in the Dutch East Indies which was apparently caused by the El Tor vibrio.

Colonel Taylor's note emphasised the fact that the "H" antigen of the cholera vibrio was common to all types of vibrios found in water and that no vibrio of a type other than an "O" group I can be held responsible for a cholera epidemic. However, as regards the application of the appropriate preventive measures, Colonel Taylor stated that action should be taken as soon as suspected cases of cholera appear without waiting for the isolation of a typical 'O' agglutinable vibrio.

The President of the Permanent Committee gave details regarding the laboratory experiments carried out under his guidance for finding out the best method of preparing a pure 'O' antigen of the cholera vibrio. Four methods were tried on three known strains of the organism, Inaba, Ogawa and Napoli. The methods were heating, 0.5 per cent lithium chloride, 0.01 per cent phenol and 0.5 per cent alcohol. It is stated that the lithium chloride method was shown to be superior to the other methods in the elimination of the "H" antigen.

Dr. De Vogel described an epidemic of clinical cholera which had occurred in the Celebes Islands in the Netherlands Indies. From 80 typical cases of cholera a vibrio was isolated which belonged to the El Tor type. This was confirmed by the Central Research Institute, Kasauli, in respect of certain cultures which were sent to that Institute. These findings are of great importance to health authorities as the El Tor vibrio has not hitherto been recognised as a choleraogenic organism and a comparative study of the epidemic and of the bacteriological observations is expected to yield valuable results.

The delegate for India presented the following papers at this session :—

- (1) Colonel J. Taylor's note on "Further observations on the value of 'O' agglutination in the diagnosis of *V. cholerae*".
- (2) Dr. A. C. Ukil's note on "Tuberculosis in India".
- (3) A note on the work on kala-azar in India during the last three years, by Lt.-Col. H. E. Shortt, I.M.S.
- (4) A note on "The rôle of the sandfly in the transmission of kala-azar" by the Director, School of Tropical Medicine, Calcutta.
- (5) Colonel Russell's note on "The distribution of quinine in India".
- (6) A note on "Bacillary dysentery in and around Calcutta", by Bt.-Col. R. N. Chopra, I.M.S.
- (7) A note on "History of a case of post vaccinal encephalitis in the Punjab", by Lt.-Col. C. M. Nicol, I.M.S.
- (8) Colonel Russell's note on "Mental hygiene in India".
- (9) Dr. K. C. K. E. Raja's paper on "A forecast of population in India at the census of 1941".
- (10) A paper on "The population problem in India", by Lt.-Col. A. J. H. Russell, I.M.S. and Dr. K. C. K. E. Raja.
- (11) A note on "The progress of nutrition work in India", by Dr. W. R. Aykroyd.

The autumn session of the Permanent Committee was held from 17th to 26th October and was attended by Lt.-Col. C. M. Nicol, I.M.S., as the delegate for India.

The delegate for India was appointed a member of the Quarantine Aerial Navigation, Pilgrimage, Yellow Fever, Cholera and Opium Commissions.

The Quarantine Commission for Aerial Navigation considered a proposal made by the Director, Eastern Bureau, League of Nations, Singapore, that aircraft might be required to send a wireless message before their arrival in the first airport of a country giving information regarding the sanitary condition of the crew and passengers. The Commission felt doubtful whether the principle that aircraft should send such a message could be accepted unreservedly and observed that in any case there could be no question of an obligation to do so. The Commission drew attention to Article 15 of the

International Sanitary Convention for Aerial Navigation, 1933, which lays down that the Commander of the aircraft should, as far as he is able, notify the aerodrome of arrival if he wishes to disembark a sick person. At a previous session the Commission had considered the question of the "declaration of origin" which passengers coming from specified regions in America and South Africa fill up before their departure and which must be presented by them at the airport of arrival. The Commission considered that some procedure of this kind, which does not interfere in any way with air travel, might be recommended in the circumstances in question.

The Cholera Commission, having studied the communications from the delegates of British India and the Dutch East Indies on the vibrio of the El Tor type which was regarded as the cause of an epidemic exhibiting the clinical characteristics of cholera which occurred in the Celebes, expressed the opinion that neither the El Tor vibrio nor the non-agglutinable vibrios can be considered to have the same significance as the true cholera vibrio of Koch. However, the Commission considered that "Where epidemiological information or clinical symptoms cause a choleraform syndrome to be suspected and still more when such a diagnosis can be made, steps should be taken to apply the sanitary measures prescribed. In particular, the pilgrimage should be declared infected even if Koch's vibrio is not found in carriers or patients, but only the El Tor vibrio or non-agglutinable vibrios". On the other hand the mere discovery of the El Tor vibrio or non-agglutinable vibrio, without epidemiological evidence or the clinical symptoms of cholera, does not justify the application of sanitary measures and the pilgrimage should be declared clean. The presence of Koch's vibrio in a healthy carrier and more particularly in a sick person requires the immediate enforcement of sanitary measures and the declaration of the pilgrimage as infected.

The Yellow Fever Commission approved of the relaxation of sanitary measures in respect of persons vaccinated against the disease. While the immunity following an attack of yellow fever was recognised to be of long duration the Commission considered that no definite conclusions can be reached regarding the duration of immunity resulting from vaccination against the disease. With regard to the immunity shown to exist in certain domestic animals which had not suffered from yellow fever or been exposed to the infection, the Commission considered that "for practical purposes no conclusion can be drawn from these experimental tests as regards the specificity of tests on man".

The delegate for India presented seven papers including three on cholera vibrios isolated from water and other non-human sources, from the Central Research Institute, Kasauli, the Pasteur Institute, Shillong, and the School of Tropical Medicine, Calcutta; one entitled "Epidemiological note on cholera in India during 1938" by Dr. K. C. K. E. Raja; a note by Colonel J. Taylor, I.M.S., suggesting that further information should be collected regarding the cases of clinical cholera reported from the Celebes in which the El Tor vibrio was regarded as the causal organism, one on rheumatism in India, by Col. Stott, I.M.S., and one on cancer in India.

Singapore Bureau, League of Nations, Health Organisation.

41. The work of the Eastern Bureau in 1938 was mainly concerned with the collection and dissemination of epidemiological information, the distribution of documents relating to health matters received from various sources to the health administrations of the countries adhering to the Bureau, participation

in the work of promoting the health measures recommended by the Rural Hygiene Conference, Bandoeng, in August 1937, such as health surveys, anti-tuberculosis campaigns and nutrition research, and the holding of an international course in malariology.

Arrangements were made by the Bureau with Eastern health administrations to have particulars supplied to the Bureau of the quarantine measures to be applied by each country against the ports which it declares infected with a specific disease. This information is transmitted by air mail and through broadcasts to the authorities of the countries concerned.

The fifth international course in malariology started in Singapore on 25th April and was completed on 20th May 1938. Eighteen medical graduates representing the countries of Australia, British India, Indo-China, Malaya, Netherlands India, Philippine Islands and Thailand attended the course. The programme of studies at Singapore was followed by a field study for a period of ten days, in the State of Selangor, of the practical application of control measures.

Health Organisation of the League of Nations, Geneva.

42. The work of the special Commissions appointed by the Health Organisation to investigate the problems of nutrition, housing and physical education was briefly reviewed in the 1937 report. The work accomplished by these Commissions in 1938 is briefly summarised below.

* The programme of studies for the Technical Commission on Nutrition for 1938 and 1939 included the investigation of nutrition in Asia and tropical countries generally and the formulation of the methods to be employed for quantitative and qualitative surveys of the nutritional state among the people. While recognising that the standards laid down by the Commission regarding the physiological basis of human nutrition were universally applicable it was felt that these standards might represent the ultimate goal and that the obvious necessity was to raise the existing diets to a level "not beyond the limits of practical possibility, but, at the same time less remote from the optimum standard". In regard to the Far East and tropical countries, there was need for fuller information regarding dietary habits, the nutritional value of local foods and the incidence of diseases associated with dietary deficiencies. In order to coordinate the activities of various institutions concerned with nutrition research in the East it was decided to negotiate for the services of the Coonoor Nutritional Research Laboratories of the Indian Research Fund Association as a liaison centre between these institutions and the Technical Commission.

A valuable contribution to the study of nutrition in human communities has been made by a book published under the auspices of the Health Organisation, which is entitled "Guiding Principles for Studies on the Nutrition of Populations". It was prepared by Professor E. J. Bigwood of the University of Brussels and was examined in detail by a special committee which met in August 1938. Four types of diet survey are described and three different forms of enquiry into the state of nutrition of populations, which were recommended by a group of experts in December 1936, are also included in this book. In addition a considerable amount of useful information has been incorporated, such as the factors to be taken into consideration in establishing the physiological value of the diet, the computation of energy value and protective principles in the diet and the statistical significance to be attached

to the results of surveys since the investigations would necessarily cover only a portion of the community. The author also devotes attention to methods dealing with latent hypovitaminoses and iron deficiency.

The Housing Commission mainly concerned itself with the problem of insolation and illumination and with rural housing and planning. A committee of experts called by the Commission to investigate the questions relating to insolation and illumination met in August 1937 and again in June 1938. The report of the experts is a valuable document * bringing together all the available knowledge on the subject. "It sums up the results of research into the thermal, visual, physiological, psychological and bactericidal effects of radiation from the sun and the sky and defines human needs in this respect in the light of present knowledge". The report also deals with the methods of utilising this knowledge for the insolation and illumination of human dwellings by paying attention to "the orientation of buildings, fenestration, the space between buildings, building materials and the necessity for open spaces in the shape of gardens, recreation grounds, playing-fields, swimming-pools etc."

In regard to rural housing and planning an important contribution has been made by a report prepared by M. M. Vignerot, Chief Engineer of the Service du Genie rural of the French Ministry of Agriculture. This report is entitled "Rural Housing and Planning" and it deals with the construction of rural dwellings and their outhouses with due regard to the requirements of health, comfort and convenience to the work of the agriculturist and his wife. It also deals with the organisation of communal life in the village, and questions of water supply, electricity, gas and disposal of sewage and refuse in rural communities and on isolated farms are also discussed.

As regards physical education the Health Committee called together, in July 1938, a Committee of Rapporteurs for examining the results of the research work so far carried out on the physiological effects of physical exercise for the purpose of formulating rational bases of physical education, for planning a further programme of research and for preparing a list of tests for physical fitness based on bodily measurements and functional efficiency. The Rapporteurs emphasised the desirability of physical exercise being taken under medical supervision and expressed the opinion that the aim of physical education "should not be to develop champions but to benefit the whole community". Suggestions were also made regarding the proper distribution of physical exercise during the day, during the week and in relation to meals. A programme of research was drawn up in order to provide information in regard to various aspects of the problem. This programme included physiological, anthropometric and psychological research so as to throw light on such questions as the effects of physical exercise on the functions of the body, the specific effects of different types of exercise at different ages, the characteristics of athletic types in different countries and the relationship between intellectual and physical development.

In order to standardise medical examination in different countries a provisional form was drawn up by the Committee and was forwarded to health administrations and various institutions interested in physical education for their comments.

* Bulletin, Health Organisation, 1938, Vol. VII, 581.

Indian delegation to the 19th (Ordinary) Session of the Assembly of the League of Nations held from the 12th to the 30th September, 1938.

43. The Indian delegation consisted of Sir Nripendra Nath Sircar, K.C.S.I. (Member of the Executive Council of the Governor-General), Leader of the Delegation, Sir Sultan Ahmed and Sir Shanmukhan Chetty, K.C.I.E., (Dewan of Cochin State). Mr. W. D. Croft, C.I.E., C.V.O. (Secretary Economic and Overseas Department, India Office) acted as substitute delegate.

The main work of the assembly was distributed as usual among seven committees. The Indian delegation was represented on all these committees. The Seventh Committee considered questions relating to health such as housing and nutrition.

Sir Sultan Ahmed drew a comprehensive picture of the work being done in India in connection with nutrition. His remarks are summarised in the following extracts from the Report of the Indian Delegation :—

“ The question had been elaborately considered by the Royal Commission on Agriculture presided over by the Marquess of Linlithgow a few years ago, and nutrition in the East was examined in detail by the first Inter-Governmental Conference held under the auspices of the League in 1937 at Java. The Conference emphasised the great severity of the problem of nutrition in the East. Most of the general recommendations of the Conference had been anticipated by the Government of India. The two main recommendations were the establishment in each country of (a) a National Nutrition Committee, and (b) a Central Nutrition and Research Institute.

Such recommendations were unnecessary for India because the Nutrition Advisory Committee of the Indian Research Fund Association, established some time before, was to all intents and purposes a National Nutrition Committee, and the well-staffed nutrition laboratories at Coonoor, which were financed by the Indian Research Fund Association and had been in existence for many years, constituted a central institute for nutritional studies.

The Health Organisation Technical Commission on Nutrition had undertaken, at the request of the Assembly, to devote a large part of its attention from 1938 onwards to the problem in Eastern countries. To assist in the programme of work, the Health Committee had proposed that the Nutrition Research Laboratory at Coonoor should act as a coordinating liaison centre for Eastern countries, and it was understood that the suggestion had been taken up direct with the Indian Research Fund Association.

The Health Committee at its Twentyseventh Session also recommended that the Technical Commission should be increased by the addition of two new members representing the East, Dr. Aykroyd, Director of the Nutrition Research Laboratory, Coonoor, and Professor Van Veen of the Netherlands Indies.

In accordance with a recommendation by the Assembly of 1935, the Government of India had called for information on measures taken by local Governments to obtain improved nutrition. The replies had been collated by Dr. Aykroyd and forwarded to the League.

At the research laboratory at Coonoor, under Dr. Aykroyd, data had been collected on deficiency diseases, vitamin standards and analyses of foodstuffs. Other aspects of the problem were being tackled in coordination with the Coonoor laboratory by Dr. Wilson of Calcutta. Such work was of the highest importance not only for India but for Eastern countries as a whole. It included research into the nutritional state of the people and into available foodstuffs and practical application of the results; experiments on the value of milk as a supplement to diets; special training classes for provincial workers at Coonoor; coordination of agricultural research and the requirements of human nutrition (a liaison officer had already been appointed in India as a result of Sir John Russell's recent Report); and the issue of health bulletins and propaganda in other forms.

The problem was essentially one which each country must solve for itself; but the opportunities afforded by Geneva of comparing results and achievement in the different countries were an inestimable advantage which he hoped would be exploited to the full.”

“ The Government of India attaches the greatest importance to health questions. Indeed, no Government worth the name could overlook the necessity of taking every possible step to improve the health and welfare of one-fifth of the population of the whole

world. Sir Sultan Ahmed trusted that the Committee would appreciate that great progress had been made in the theoretical study of health questions and, what was more, that practical effect had been given to all decisions arrived at after mature consideration to improve the health of the vast population in India by all possible means, in rural as well as urban areas.

In so saying, he was under no delusion. An advance had been made, but it was only a beginning. The problem was vast. But given goodwill and cooperation on the part of all concerned, the expectations aroused by initial success might, he hoped, in time be fully justified."

First International Congress of Leprosy.

44. This Congress was held in Cairo (Egypt) from the 21st to the 27th March 1938. Arrangements were made for holding the Congress by the Egyptian Government on the initiative of the International Leprosy Association.

Colonel Russell attended this Congress as the delegate of the Government of India whilst Drs. J. Lowe and Isaac Santra attended as the representatives of the Indian Council of the British Empire Leprosy Relief Association and Dr. R. Row represented the Bombay Branch of the British Empire Leprosy Relief Association. Other delegates from India included (1) Dr. R. G. Cochrane of the Lady Willingdon Leper Settlement, Chingleput, South India, (2) Dr. H. H. Gass of the Leper Asylum, Chandkuri, C. P. and (3) Mr. A. D. Miller, Secretary for India of the Mission to Lepers. Altogether 60 countries were officially represented.

Four sub-Committees were appointed to deal with and report on (1) the classification of leprosy, (2) the treatment of leprosy, (3) the epidemiology and control of leprosy, (4) in vitro cultivation of *M. Leprae*. Of the delegates from India Dr. Lowe was appointed a member of the first, Dr. Gass of the second, Colonel Russell, Dr. Santra and Mr. A. D. Miller of the third, Dr. R. G. Cochrane being the secretary of this Committee.

The following papers were read by delegates from India :—

- (1) A preliminary report of a statistical survey of leprosy in a rural area of Bengal, by Dr. J. Lowe.
- (2) A clinical study of leprosy in South India, with special reference to children, by Dr. R. G. Cochrane and Dr. M. Paul Raj.
- (3) Observations on the results of the medical and surgical treatment of the complications in leprosy by Dr. H. H. Gass.
- (4) Propaganda, treatment and survey method of antileprosy campaign in India, by Dr. I. Santra.
- (5) Complement fixation test in the treatment of leprosy and its significance in the pathogenesis and treatment of the disease; by Dr. R. Row.

The plenary session of the Congress adopted the following resolution :—

"That the Congress, while appreciating to the full the work of voluntary organisations in antileprosy work, wishes to emphasise strongly its opinion that the control of leprosy is essentially the responsibility of the Governments of the countries where the disease is common and that antileprosy work should form an important integral part of the public health programmes of such countries. It is also urged that Governments should do everything possible to initiate and encourage research with a view to improving methods of leprosy control."

Third International Congress of Tropical Medicine and Malaria.

45. This congress which was held at Amsterdam (Holland) from 24th September to 1st October 1938, was attended by Lt.-Col. G. R. McRobert, I. M. S. and Dr. I. M. Puri as the delegates of the Government of India. It was arranged between them that whilst Dr. Puri would attend the malaria section, Lt.-Col. McRobert would devote attention to the other sections of the Congress.

Sir Robert McCarrison, late Director of Nutrition Research, Coonoor (India) opened the discussion on nutrition and deficiency disease by reading a paper entitled "A general historic survey and account of deficiency diseases in the tropics". During the discussion the desirability of studies on mineral deficiencies in the tropics was stressed. In view of the fact that, in some parts of the tropics the indigenous population is fed entirely on the vegetable products of a limited area, it was suggested that more attention should be paid to studies in mineral metabolism. The delegate for India, Lt.-Col. McRobert, mentioned the occurrence of endemic fluorosis in the Madras Presidency as an example of a disease caused by abnormal amounts of minerals in the food and drink and explained that this disease, although it must have existed from the beginning of time, had only been recently recognised and fully described.

The new chemistry and isolation of Vitamin B₁, and the control of beri-beri were also discussed, and the possibility of having legal enactments made to compel the addition of the new and cheap synthetic vitamin B₁ to vitamin deficient articles of diet in beri-beri areas, was considered. Lt.-Col. McRobert suggested that before governments were approached in the matter, some of the major commercial firms might be invited to try out the effect of the synthetic commercial vitamin B₁ on a mass scale. Dr. Aykroyd's paper which emphasised the serious deficiency of calcium in South Indian diets was well received.

The U. S. A. delegate made an important contribution on the rôle of nicotinic acid in human nutrition. He explained how following the administration of sufficient quantities of nicotinic acid to a pellagra patient in relapse there was a spectacular healing of the mucous membrane lesions, blanching of the skin lesions, clearing of the mental symptoms and improvement in general wellbeing.

In the Filaria Section, much interest was shown in the *Filaria malayi* and in the peculiar methods of control required for the elimination of *Mansonioides* which depends on the presence of the growth of *Pistia*.

The contribution of Dr. F. L. Soper of the Rockefeller Foundation in Brazil on vaccination against yellow fever with virus 17 D was received with great interest. Reference was made in this paper to over half a million persons inoculated in Brazil with a modified yellow fever virus.

Dr. Puri concludes his report as follows :—

"Prof. Swellengrebel, the President of the Third International Malaria Congress in winding up the deliberations on the morning of Friday, 30th September, remarked that in spite of very strong distractions a fair amount of work had been achieved during the present Congress. We had, he said, come to the definite conclusion that (1) an extra cellular stage in the life history of the malaria parasite did exist; (2) that anti-adult and antilarval measures should both be carried out to effect proper malaria control. He deplored that house-spraying as an antimosquito measure had not been tried in other countries besides South Africa and India and remarked that this was most probably because this measure was still in an experimental stage."

Port Health Administration.**PORT OF BOMBAY.**

46. Vessels totalling 928 (117 incoming and 811 outgoing) were examined by the Port Health Department. Of the incoming vessels 65 were infected whilst one was declared infected while in the harbour. There were 28 cases of chickenpox on these incoming infected vessels and one case on a vessel lying in the harbour, 14 of jigger, three each of acute pneumonia, mumps and scarlet fever. Fourteen intending passengers and members of the crew were not allowed to sail as eight of them were found to be suffering from chickenpox and six from measles. Twentytwo passenger contacts of these cases were also prevented from sailing. In addition two cases of leprosy, 15 of undiagnosed fever, four of scabies, one of whooping cough and one of influenza amongst passengers and three cases of venereal disease among the crew were rejected by the ships' surgeons. Necessary precautions were taken in respect of all passengers. The numbers of persons inspected were, on incoming vessels 53,120, on outgoing vessels 110,079 and on vessels in harbour 28. The clothing, bedding and other personal effects of 50,711 members of the crew and passengers in outgoing and incoming vessels and of members of the crews of vessels lying in port were disinfected. In addition, 43,668 coolies and stevedores were inspected before being allowed to go on board ship to work cargo.

The Haverø Trading Co. entered into a contract with the Government of India in April, 1938, for a period of two years for the fumigation of vessels with hydrogen cyanide. The inspection and, if necessary, fumigation of coastal vessels and harbour and country craft was initiated. Twentythree coastal vessels and 169 harbour and country craft were inspected. Of these 142 were granted exemption certificates and 50 were fumigated.

Seventyfour deratisation and deratisation exemption certificates were issued, the numbers of ships deratised by sulphur and cyanide fumigation being 40 and 18 respectively whilst the number of ships which qualified for exemption certificates was 16.

Measures to prevent the ingress of rats to vessels in the harbour were taken by the Bombay Port Trust.

The inspection of provisions for lascar crew was carried out by the Port Health Department. During the year 1938, 540 such inspections were carried out.

The sanitation of the port area was supervised by an administrative medical officer employed by the Bombay Port Trust. Antirat and anti-mosquito measures were also carried out by this medical officer.

During the pilgrim season of 1937-38, thirteen pilgrim ships carrying 7,131 pilgrims sailed from Bombay. Before embarkation, all pilgrims were medically examined as usual and all dirty bedding and clothing likely to have been exposed to infection or infested with body vermin were disinfected before embarkation. Vaccinations against smallpox and inoculations against cholera were carried out. As regards inward pilgrim traffic, 19 pilgrim ships with 7,495 pilgrims on board arrived, and on three of these, six cases of infectious diseases were found on arrival. All pilgrim ships were inspected on arrival.

PORT OF KARACHI.

A total of 108 vessels including 16 pilgrim ships and 3 country craft arrived in quarantine. The total number of passengers and crew examined on them

was 24,743. There were ten cases of chickenpox, one of measles, three deaths from acute pneumonia and 29 deaths from non-infectious diseases reported on these vessels. Outgoing vessels which were granted bills of health totalled 877. Altogether 52,852 passengers and crew sailing by steamers and 6,048 passengers and crew sailing by country craft were inspected. In the course of medical examination seven cases of smallpox, four of chickenpox and two of measles were detected.

It is reported that during 1938 no outbreak of epidemic disease of a serious nature occurred on any vessel entering or leaving the Port of Karachi or during its stay there. Karachi city was free from cholera and plague during the year while smallpox occurred in a sporadic form, the highest number recorded in one week being six.

Antimosquito measures were carried out under the supervision of the Port Health Officer in the harbour area and in the adjoining Port Trust estate, by a medical officer trained in antimosquito work and a staff who are maintained by the Port Trust for this purpose. A total of 14,129 vessels were inspected including fishing craft, lighters, launches and other harbour vessels.

Rat destruction operations were carried out throughout the year on the barges and jetties. A total number of 4,233 rats is reported to have been killed by trapping and baiting. None of the rats examined during the year are reported to have been found infected with plague. Eight ships were granted deratisation certificates and 12 ships were granted deratisation exemption certificates.

During the pilgrim season of 1937-38, 14 pilgrim ships sailed from Karachi. Of these, five sailed direct from Karachi and the remainder called at Karachi *en route* from Bombay and, after embarking passengers from Karachi, sailed for Jeddah. A total of 11,821 pilgrims embarked at Karachi. As regards inward pilgrim traffic 16 ships arrived at this port and disembarked 12,095 pilgrims. The total number of deaths on these incoming pilgrim vessels was 32 and all were from non-infectious diseases. All pilgrims were inoculated against cholera and smallpox before they set out on their pilgrimage and no case of these diseases occurred among them.

The provision and stores for the use of the Asiatic crew of 36 ships were inspected. Of the 90 samples of ghee examined only three were reported to be non-genuine.

KARACHI AIRPORT.

All east-bound aeroplanes are inspected on arrival by the Health Officer. The number of these aeroplanes during 1938 was 317 and they carried 1,234 passengers and 1,323 members of the crew. During the year, the Quarantine Board in Egypt, cooperated in sending telegraphic messages in the case of all passengers coming from yellow fever infected areas. All these passengers, however landed in India after having completed nine days from the date of departure from such places. It was found during the year that east-bound aeroplanes were not always regular in sending the Sanitary Code message as laid down in the Government of India's notice to airmen No. 39 of 1938.

The number of west-bound planes which left the airport was 308 and they carried 1,372 passengers and 1,277 members of the crew. Certificates of health were given to all these aircraft.

The general sanitation of the airport was satisfactory. All springs around the airport were reduced in size and oiled regularly to prevent mosquito breeding. All seepage areas were drained off by the construction of temporary

drains. As far as possible, burrow pits were filled in. The area beside the railway lines was canalized so that all water from the pits might drain away into various nalas. All wells not in regular use were either oiled or treated with petrol. A large number of soakage pits located in the wireless station area at Malir were found breeding mosquitoes and were properly dealt with. The Dalmia Cement Factory area which was formerly a great source of mosquito-breeding round the airport was kept well under control. The airport and the surrounding villages were regularly searched every month for adult mosquitoes. No new houses were allowed to be constructed in the villages surrounding the airport and the number of wells in these villages was reduced to the absolute minimum.

The construction of a dispensary for government servants was started. It will include a bacteriological laboratory and an out-patients dispensary for the airport staff. The isolation hospital was completed and furnished and a disinfection chamber added to it. No suspected cases of yellow fever were admitted to this hospital.

• Antirat measures were carried out.

PORT OF CALCUTTA.

A total of 1,324 vessels entered the port during 1938 of which 31 were inspected, while out of 1,317 out-going vessels, 1,229 were inspected. Twenty-three members of the crew and 148 passengers, including contacts, were prevented from sailing on these vessels for various reasons.

• Six infected vessels arrived during the year under review. Each of these had one or two cases of chickenpox on board. All the necessary preventive measures were taken. Three cases of cholera, one of smallpox and another of measles were removed to hospital from sea going vessels while they were lying in this port. Disinfection was carried out in all cases and vaccination was also carried out, where necessary.

The sanitation of the port area was carried out as before by a staff of the Calcutta Port Commissioners. The Port Health Department carried out periodical inspections and brought defects to the notice of the Port Commissioners. Antirat operations were carried out throughout the year. None of the rats sent for bacteriological examination was found to be infected with plague. For antimosquito measures close cooperation was maintained by the port health authorities and the Garden Reach Antimalaria Association and measures were taken on ships and on the shore throughout the year.

During 1938 the provisions of 857 ships were inspected and 29 samples of ghee and one of lime-juice were collected for analysis at the Bengal Public Health Laboratory. Three samples of ghee were reported as adulterated and the shipping companies concerned were asked to replace these stocks. In four vessels condensed milk manufactured by firms other than those approved by the Government of India was found and was replaced by approved brands. On four vessels articles of food such as biscuits, sugar and rice were found to be unwholesome and were either replaced or destroyed.

Two ships carrying pilgrims to the Hedjaz sailed from this port. The prospective pilgrims were both vaccinated against smallpox and inoculated

against cholera during their stay in Calcutta. The pilgrims were medically examined by the Port Health Department at the time of embarkation.

CALCUTTA MARINE AIRPORT.

At the marine airport located at Bally Bridge within the limits of the Port of Calcutta, east-bound flying boats were inspected at the time of departure and west-bound flying boats on arrival, with effect from February 1938. During the period, February—December, a total of 115 flying boats with 576 passengers and 601 members of the crew entered the port and 119 boats with 457 passengers and 600 members of the crew left the port.

PORT OF MADRAS.

All the vessels which arrived in the port, totalling 688, were inspected. The number of passengers and crew, who underwent inspection was 84,491 and 61,425 respectively. Three cases of chickenpox and one case of cholera were removed from the vessels and sent to the Infectious Diseases Hospital, Madras.

Outgoing vessels numbered 688. A total of 48,705 passengers and 60,489 members of the crew was inspected.

Antimosquito measures were carried out by a special staff employed by the Port Trust.

PORT OF CHITTAGONG.

During 1938, 174 incoming vessels with 68,699 passengers and 15,957 members of the crew were inspected. No case of infectious disease was discovered on any of these vessels.

During the year, 148 vessels left for foreign ports and 37,382 passengers and 13,435 members of the crew were examined medically before embarkation.

One case of smallpox occurred among the crew of a vessel while in the harbour. The patient was removed to hospital and necessary preventive measures were taken. One deck passenger of a vessel from Rangoon was found suffering from chickenpox. He was sent to hospital and the infected part of the vessel was disinfected.

Lascar's provisions in 39 ships were inspected.

The general sanitation of the port was satisfactory.

PORT OF COCHIN.

The Port Health Officer in Cochin is a part-time officer, his main duties being those of the civil surgeon in British Cochin. He has at present no staff

working under him and therefore no measures for mosquito control, rat destruction or food control were carried out as in the case of the other major ports, whose activities have been summarised in this report.

PORT OF VIZAGAPATAM.

The number of incoming foreign passenger vessels during the year was 52. They carried 18,057 passengers and 6,058 members of the crew. In addition, 192 cargo vessels called at this port. Of these twelve came from the east coast of Africa within the limits of Port Sudan and Durban. All were inspected before their entry into the harbour and no case of infectious disease was discovered.

Outgoing vessels numbered 52 and had on board 290 passengers and 5,927 members of the crew. Of the 192 cargo vessels which left this port, 39 sailed for foreign ports. Owing to the declaration of this port as infected with chicken-pox from 14th February to 3rd June 1938, the disinfection of the personal effects of the passengers of the outgoing passenger vessels was carried out during that period.

Lascar's provisions and drugs were examined.

SECTION VI.

VACCINATION AGAINST SMALLPOX.

Vaccination and Revaccination Statistics.

47. The statistics of vaccination in British India and the provinces for 1938-39 are given in the appendix to this section (page 229). Unlike the other figures contained in this report, the figures presented in the appendix and in the tables set out in this section relate to the financial year and not to the calendar year.

Table VI (i) sets out the numbers of primary vaccinations and revaccinations performed during 1938-39 in the provinces. The increase or decrease, as the case may be, in comparison with the corresponding figure for 1937-38, is also shown.

TABLE VI (i).

	Primary Vaccination.		Revaccination.		Total.	
	No. of vaccinations performed during 1938-39.	Increase (+) or decrease (-) from last year.	No. of revaccinations performed during 1938-39.	Increase (+) or decrease (-) from last year.	Total. 1938-39.	Increase (+) or decrease (-) from last year.
British India . . .	10,204,648	-215,338	13,488,906	-1,424,491	23,693,554	-1,639,829
N.-W. F. P. . . .	143,848	-36,832	145,827	-48,711	289,675	-85,543
Punjab	1,057,097	-8,118	3,572,230	-1,136,685	4,629,327	-1,144,803
Delhi	32,857	+8,579	131,784	+68,776	164,641	+77,355
U. P.	1,606,335	-12,155	309,094	+42,478	1,915,429	+30,323
Bihar	994,795	+4,015	505,969	+127,000	1,500,764	+131,015
Orissa	238,023	+7,827	402,668	-22,095	640,691	-14,268
Bengal	2,876,619	-198,200	4,972,453	-551,809	7,849,072	-750,009
C. P.	514,752	-5,901	118,236	+8,232	632,988	+2,331
Bombay	628,183	-13,296	255,042	-292,110	883,225	-305,406
Sind	137,013	-1,557	83,162	-22,825	220,175	-24,382
Madras	1,481,847	+15,344	2,590,449	+397,230	4,072,296	+412,574
Coorg	2,521	-720	3,483	-708	6,004	-1,428
Assam	463,800	+25,783	391,234	+3,344	855,034	+29,127
Ajmer-Merwara	26,958	-107	7,275	+3,392	34,233	+3,285

For British India as a whole there has been a fall both in respect of primary and revaccinations. The same is the case with regard to the provinces of the N.-W. F. Province, the Punjab, Bengal, Bombay, Sind and Coorg.

On the other hand Delhi, Bihar, Madras and Assam recorded increases in both primary vaccinations and revaccinations. In the other provinces increases were shown only for one of the two.

Table VI (ii) gives, for the past eight years, the numbers of live births and of primary vaccinations performed each year. The last column shows the proportion of primary vaccinations to 100 live births.

TABLE VI (ii).

Year.	No. of live births.	No. of primary vaccinations.	Rate of primary vaccinations per 100 live births.
1931-32	8,814,836	9,012,950	102
1932-33	8,718,620	9,365,226	107
1933-34	9,317,918	9,284,821	100
1934-35	8,923,169	9,506,666	107
1935-36	9,299,021	10,022,554	108
1936-37	9,566,379	10,404,125	109
1937-38	9,388,457	10,419,986	111
1938-39	9,398,011	10,204,648	109
Annual average, 1933-34 to 1937-38.	9,298,989	9,927,630	108

In comparison with 1931-32 the increase in the number of primary vaccinations performed during the year under review was nearly 1,200,000 and the rate of these vaccinations per 100 live births rose from 102 to 109. Compared with 1937-38, however, 1938-39 showed a fall of two in this rate and the increase over the average for the previous five years was only one.

In the discussion on the incidence of smallpox in the provinces (page 35) it was pointed out that a high proportion of mortality from this disease among infants and children was prevalent all over the country. Primary vaccination should confer a considerable degree of protection on this section of the population and any relaxation of effort such as is indicated in many provinces by the figures presented in table VI (i) is to be deprecated.

Table VI (iii) sets out revaccination figures over a period of eight years ending with the year under review. The total number of revaccinations done during 1938-39 was less by about a million and a half than that carried out during the previous year.

TABLE VI (iii).

Year.	No. of revaccinations.
1931-32	5,334,148
1932-33	10,082,421
1933-34	11,604,663
1934-35	12,413,590
1935-36	14,011,904
1936-37	12,805,764
1937-38	14,913,397
1938-39	13,488,906
Annual average, 1933-34 to 1937-38	13,155,860

Success rates for primary vaccinations and for revaccinations during 1938-39 are set out in table VI (iv) for British India and the different provinces.

VACCINATION CHART SHOWING PERCENTAGES OF
 SUCCESSFUL CASES TO TOTAL OPERATIONS
 DURING 1938-39

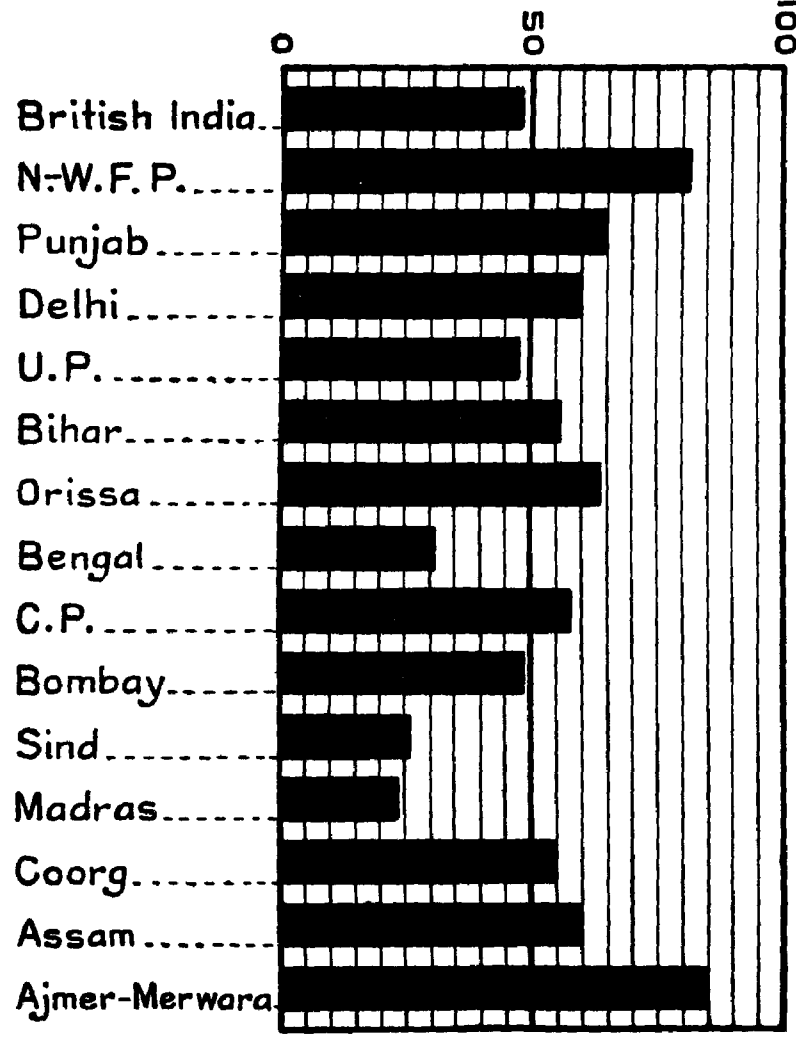
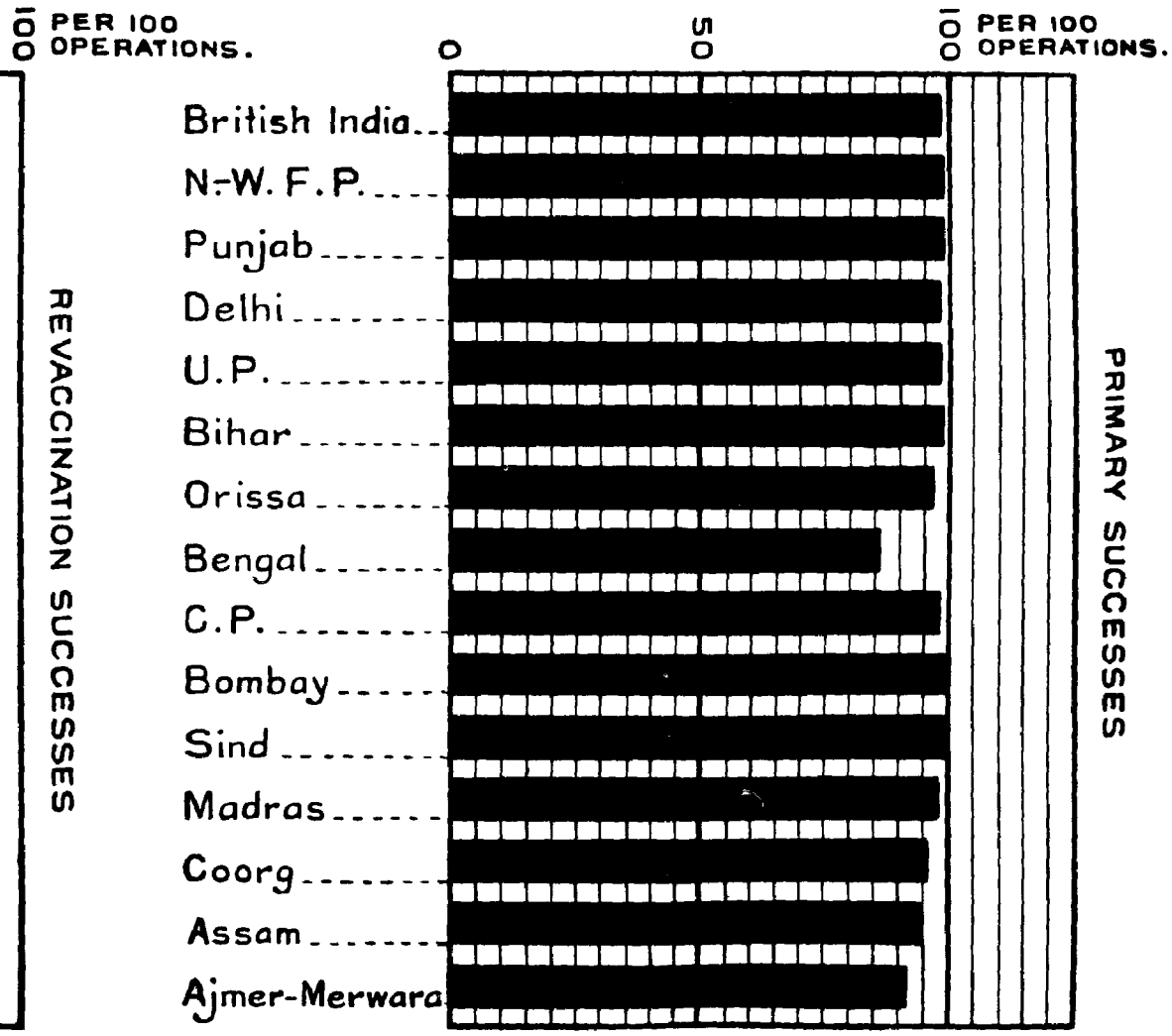


TABLE VI (iv).

	Percentage of success.	
	Primary.	Revaccination.
British India	98	48
N.-W. F. P.	98	82
Punjab	99	65
Delhi	98	60
U. P.	98	48
Bihar	99	56
Orissa	97	64
Bengal	86	31
C. P.	98	58
Bombay	100	49
Sind	100	26
Madras	98	24
Coorg	96	55
Assam	95	60
Ajmer-Merwara	92	85

The percentages of success for primary vaccination in the provinces vary widely, from 86 per cent in Bengal to 100 per cent in Bombay and Sind. Provided the vaccine lymph is of high quality and the conditions under which primary vaccination is carried out are satisfactory the percentage of success should not be so low as 86. It is therefore desirable that the reason for this rate in Bengal should be investigated by the health authorities of that province.

In regard to revaccination no such deductions can be drawn from the varying rates for the different provinces, because success depends on the extent of immunity present in the individual who is revaccinated.

The average number of vaccinations carried out by a vaccinator in British India was 2,809 during the year under review. In last year's report it was pointed out that the corresponding figure of 3,099 was not satisfactory and that a vaccinator should be able to produce a higher record of work. A further fall of 290 makes the position even worse. A comparison of the figures for individual provinces in table VI (v) shows that the range of variation is high, from 1,001 in Coorg to 7,720 in the Punjab. In the latter the average figure for a vaccinator is more than two and a half times that of British India and this should stimulate efforts for getting more work out of vaccinators in those provinces where the figures are low.

TABLE VI (v).

British India	2,809
N.-W. F. P.	6,294
Punjab	7,720
Delhi	4,658
U. P.	1,995
Bihar	1,242
Orissa	2,245
Bengal	3,008
C. P.	1,705
Bombay	2,395
Sind	2,661
Madras	3,025
Coorg	1,001
Assam	1,645
Ajmer-Merwara	2,140

Compulsory Vaccination.

48. Table VI (vi) gives the numbers of towns and districts in the different provinces in which compulsory primary vaccination is in force.

TABLE VI (vi).

	Towns.			Districts excluding towns.		
	Total No.	No. in which Vaccination Act is in force.	No. to which the Act has not yet been extended.	Total No.	No. in which Vaccination Act is in force.	No. to which the Act has not yet been extended.
British India	1,535	1,245	290	222	110	112
N.-W. F. P.	17	10	7	6	..	6
Punjab	258	248	10	29	27*	2
Delhi	6	6	..	1	1	..
U. P.	440	262	178	48	..	48
Bihar	53	53	..	16	11	5
Orissa	8	8	..	8	2	6
Bengal	119	119	..	27	27	..
C. P.	113	93	20	19	7†	12
Bombay	130	76	54	20	1†	19
Sind	26	12	14	8	..	8
Madras	323	323	..	24	24	..
Coorg	5	5	..	1	1	..
Assam	32	26	6	14	9‡	5
Ajmer-Merwara	5	4	1	1	..	1

In British India in 81 per cent of the towns and in approximately 50 per cent of the rural districts primary vaccination is compulsory. In the provinces of Delhi, Bihar, Orissa, Bengal, Madras and Coorg vaccination is compulsory in all the urban areas. A total number of 290 towns in British India has not yet introduced compulsory vaccination and of these the large majority are in the United Provinces (178) followed by Bombay (54), the Central Provinces (20) and Sind (14). In the other provinces the numbers of such towns are small.

As regards rural areas, compulsory primary vaccination is being enforced throughout the provinces of Bengal, Madras, Delhi and Coorg. In the N.-W. F. Province, the United Provinces, Sind and Ajmer-Merwara compulsion has not yet been introduced into any rural area. Bombay Presidency falls practically into the same category while, in the other provinces, varying numbers of rural districts have been brought within the range of the compulsory law.

*Including nine districts to which the Vaccination Act is extended in a part of the district only.

†Partly.

‡Towns only.

Vaccine Institutes and Supply of Vaccine.

49. Vaccine institutes exist in the provinces of the Punjab, the United Provinces, Bihar, Bengal, the Central Provinces, Bombay, Madras and Assam. Of the remaining provinces, the N.-W. F. Province and Delhi receive their supply from the Punjab Vaccine Institute, Orissa from Bihar and Sind from the Bombay Government's Vaccine Institute at Belgaum. Table VI (vii) gives details of the lymph produced by and issued from provincial institutes :—

TABLE VI (vii).

Vaccine institutes.	Output in doses.	Issues in doses.
Punjab	8,058,075	8,809,875
U. P.	3,078,450	3,072,425
Bihar	2,542,745	3,070,958
Bengal	8,755,720	8,546,096
C. P.	801,440	666,760
Bombay	1,838,075	1,560,985
Madras	4,294,530	2,820,435
Assam	994,679	1,026,373

The figures for the yield of pulp per buffalo and cow calf respectively reported from the different provincial institutes vary widely. For instance, in the Punjab, the average yield of a buffalo calf was 120.4 grammes, in the United Provinces 72.8, the Central Provinces 70.1, Bengal 47.7, Bombay 46.6 and Madras 24.3. As regards cow calves, the average yields were 44.5 grammes in the Central Provinces, 38.1 in the Punjab, 35.5 in Assam, 34.0 in the United Provinces, 31.2 in Bihar, 28.4 in Madras, 28.3 in Bengal and 23.4 in Bombay.

It is reported that the quality of the vaccine lymph issued from these provincial institutes was high and that all samples of lymph were tested with regard to purity and potency. In the United Provinces it is stated that field tests on samples of vaccine lymph are carried out by performing primary vaccination on six children in each of ten municipalities situated in different parts of the province. It was only on obtaining fairly uniform case success and insertion success rates in all these places that the lymph was issued for use among the general population.

The period required for a satisfactory reduction in the number of organisms in the vaccine lymph by the action of glycerine at 32° F. was investigated. Samples of lymph prepared in September and October were found to contain a large number of organisms and to require a longer period for the reduction of their number than vaccine lymph prepared during the cooler months, November to February. The effect of chloroform on vaccine lymph was also investigated. Four samples were chloroformed on the day of preparation (February and March, 1936) and later again after a period of seven months in October of the same year. The samples retained their potency and yielded good results on vaccination after periods varying between 15 and 24 months from the date of preparation.

In the King Institute, Guindy, a considerable amount of research work was carried out for the purpose of comparing variola virus with vaccinia virus. A strain of smallpox virus, after an initial passage in a monkey, was stabilised by 42 passages in calves and was then compared with vaccinia virus. It is stated that "cross agglutination, cross precipitation and cross complement fixation tests reveal no differences between the passaged variola strain and vaccinia virus. Protection tests also confirm the above finding".

It has been shown recently by workers in other countries that the vaccinia virus consists of two parts, namely, elementary bodies and a specific soluble substance. It has also been shown that the elementary bodies and specific soluble substance consist, in each case, of a heat-stable and a heat-labile constituent, which produce specific antisera. Tests with regard to the heat-stable and heat-labile fractions of the passaged variola virus are in progress.

In the previous annual reports details were given of the numbers of persons trained in vaccination in certain provinces as well as of provincial vaccination staff. From year to year there is but little change in respect of such details and these have therefore been left out in the present report.

Indian States.

50. In the previous annual reports figures relating to the vaccinations carried out in a few Indian States were included. For 1938 similar information has been obtained from a much larger number of States and is presented in the table below. Brief notes regarding the organisation for carrying out vaccination in some of the larger States are also given.

TABLE VI (viii).

State.	Population.	Total number of vaccinations performed.			Percentage of successful vaccinations to total vaccinations performed.		Children successfully vaccinated.	
		Primary.	Re-vaccination.	Total.	Primary.	Re-vaccination.	Under 1 year.	1-6 years.
Mysore	6,839,022	181,990	68,790	250,780	88.3	31.4	63,016	76,177
Jaipur	2,631,775	94,897	3,754	98,651	97.2	67.2	71,568	9,874
Marwar	2,125,982	83,192	61,728	144,920	87.4	100.0	Not available.	Not available.
Mewar	1,566,910	34,156	26	34,182	99.9	100.0	20,923	11,246
Bikaner	936,218	26,493	17,871	44,364	99.1	58.5	16,902	7,959
Kotah	685,804	15,973	..	15,973	100.0	..	15,533	404
Alwar	749,751	26,429	2,101	28,530	95.9	84.3	15,073	2,927
Bharatpur	486,954	22,518	1,312	23,830	96.9	58.4	11,377	7,034
Dholpur	254,986	9,657	347	10,004	96.4	100.0	6,556	2,646
Dungarpur	227,544	1,993	..	1,993	100.0	..	462	1,181
Banswara	225,106	2,926	..	2,926	100.0	..	964	1,697
Bundi	216,722	5,090	..	5,090	100.0	..	3,265	1,378
Sirohi	216,528	5,101	..	5,101	97.2	..	4,702	255
Palanpur	264,179	8,100	1,207	9,307	84.1	100.0	5,756	644
Hyderabad	14,436,148	389,721	7,987	397,708	89.4	53.7	95,686	189,739
Jammu and Kashmir	3,646,243	118,162	87,040	205,202	97.5	78.9	65,181	40,857
Kolhapur	957,137	32,407	3,439	35,846	99.9	98.9	24,289	2,527
Akalkot	92,605	2,821	100	2,921	99.7	100.0	2,102	698
Aundh	76,507	1,713	2,589	4,302	99.7	10.6	1,138	485
Bhor	141,546	4,177	738	4,915	99.0	23.0	2,830	1,137
Janjira	98,296	3,054	1,233	4,287	100.0	80.0	1,396	1,480

State.	Population.	Total number of vaccinations performed.			Percentage of successful vaccinations to total vaccinations performed.		Children successfully vaccinated.	
		Primary.	Re-vaccination.	Total.	Primary.	Re-vaccination.	Under 1 year.	1-6 years.
Jamkhandi	114,282	3,995	92	4,087	99·8	28·3	3,910	774
Jath	91,099	2,770	977	3,747	100·0	12·7	1,851	917
Karbhari	44,204	1,814	2,141	3,955	95·0	25·0	1,321	385
Kurundwad	39,583	1,661	282	1,943	99·3	28·7	1,363	277
Miraj Senior	93,938	3,637	174	3,811	100·0	100·0	2,821	799
Miraj Junior	40,684	1,351	309	1,660	100·0	72·6	1,000	351
Mudhol	62,832	2,150	431	2,581	100·0	15·0	1,806	339
Ramdurg	35,401	1,113	458	1,571	100·0	51·2	864	249
Sangli	258,442	10,110	10,220	20,330	99·1	12·9	7,477	2,416
Savanur	20,320	848	354	1,202	99·1	90·1	713	135
Sawantwadi	230,589	6,977	324	7,301	99·8	78·4	4,990	1,946
Wadi	1,704	41	..	41	100·0	..	13	28
Travancore	5,095,973	204,582	738,704	943,286	91·4	36·6	28,090	139,606
Cochin	1,205,016	51,102	53,633	104,735	92·9	17·3	1,755	25,892
Pudukkottai	400,694	14,782	6,503	21,285	96·6	82·1	4,176	7,590
Bamra	151,047	4,505	31,031	35,536	100·0	85·8	1,166	3,303
Baudh	135,248	5,276	12,726	18,002	85·9	63·2	257	4,196
Dhenkanal	284,326	322	4,340	4,662	88·3	62·1	36	329
Gangpur	356,674	11,662	24,873	36,535	87·0	85·0	5,259	4,827
Keonjhar	460,609	23,168	26,172	49,340	91·2	85·7	388	7,543
								18,714

State.	Population.	Total number of vaccinations performed.			Percentage of successful vaccinations to total vaccinations performed.		Children successfully vaccinated.	
		Primary.	Re-vaccination.	Total.	Primary.	Re-vaccination.	Under 1 year.	1-6 years.
Nayagarh	142,406	5,525	19,222	24,747	94·0	67·2	233	5,292
Seraikela	143,525	7,529	1,614	9,143	99·7	67·4	2,580	4,605
Sonepur	237,920	7,589	18,093	25,682	99·4	56·1	4,768	2,719
Talcher	69,702	1,734	3,067	4,801	93·8	56·3	453	721
Mayurbhanj	889,603	46,407	43,140	89,547	98·7	98·8	9,817	16,876
Cooch Behar	590,866	18,021	35,271	53,292	80·8	71·1	Unknown.	Unknown.
Tripura	382,450	9,012	4,714	13,726	88·1	82·3	1,786	4,477
Bastar	524,721	24,662	18,583	43,245	98·0	74·0	5,835	17,701
Jashpur	193,698	5,779	20,014	25,793	77·0	48·0	2,233	2,210
Kalahandi	513,716	27,050	21,034	48,084	96·8	95·5	2,113	21,175
Kanker	136,101	5,007	1,963	6,970	98·6	90·1	3,850	933
Khairagarh	157,400	6,590	7,007	13,597	95·5	41·7	4,321	3,327
Korea	90,886	2,262	199	2,461	68·3	11·1	1,439	642
Nandgaon	182,380	6,582	4,955	11,537	99·4	78·0	5,823	557
Patna	566,924	21,050	60,922	81,972	98·9	95·6	1,194	19,544
Raigarh	277,569	8,293	1,044	9,337	93·4	71·1	4,079	2,866
Sarangarh	128,967	3,422	182	3,604	95·3	8·2	2,201	152
Surguja	501,939	8,488	8,748	17,236	79·5	90·6	2,326	3,349
Tehri (Gahrwal)	470,109	11,558	801	12,359	98·8	72·4	4,587	6,026
Benares	391,165	8,147	2,718	10,865	100·0	100·0	2,608	3,562
Rampur	464,919	18,105	5,195	23,300	96·8	66·0	10,733	4,640
Indore	1,318,237	47,638	9,442	57,080	77·0	18·0	26,923	8,952
Dhar	187,304	4,954	309	5,263	94·3	5·7	2,884	2,120
Ratlam	107,321	2,710	128	2,838	96·2	100·0	1,612	788
Sitamau	28,422	297	159	456	43·9	34·9	387	69
Alirajpur	101,963	2,489	..	2,489	82·7	..	98	1,713
Sailana	35,223	554	..	554	100·0	..	141	413
Jhabua (for Khalsa area only).	96,417	*	*	*2,735	99·9	..	649	1,370
Barwani	141,110	4,833	..	4,833	100·0	..	3,913	920
Jaora	100,166	2,456	..	2,456	100·0	..	2,163	383

*Separate figures for primary vaccination and revaccination are not available.

State.	Population.	Total number of vaccinations performed.			Percentage of successful vaccinations to total vaccinations performed.		Children successfully vaccinated.	
		Primary.	Re-vaccination.	Total.	Primary.	Re-vaccination.	Under 1 year. 1-6 years.	
Bhopal	729,955	24,960	11	24,971	92.5	100.0	16,165	6,944
Dewas senior branch	83,321	2,277	..	2,277	..	..	919	1,358
Dewas junior branch	70,513	2,413	10	2,423	94.8	0.4	1,088	1,193
Rajgarh	134,891	3,180	276	3,456	91.3	100.0	2,054	1,402
Narsingarh	113,873	4,469	..	4,469	95.7	..	3,065	1,217
Khilchipur	45,583	587	6	593	99.5	100.0	360	230
Orchha	314,661	9,913	1,463	11,376	97.5	91.3	7,343	989
Datia	158,834	5,234	124	5,358	98.1	100	4,568	508
Samthar	33,307	1,223	..	1,223	99.1	..	1,000	212
Panna	212,130	5,770	34	5,804	94.1	82.4	3,477	461
Charkhari	120,351	6,307	..	6,307	98.6	..	3,010	2,533
Ajaigarh	85,895	2,056	..	2,056	90.4	..	1,266	360
Bijawar	115,852	5,136	..	5,136	83.8	..	4,303	..
Baoni	19,132	503	3	506	99.4	100.0	326	129
Chhatarpur	161,267	5,070	..	5,070	98.4	..	3,878	581
Nagod	74,589	2,846	52	2,898	88.3	..	1,966	79
Maihar	68,991	1,953	48	2,001	95.0	100.0	1,049	714
Phaltan	68,731	1,696	1,776	3,472	87.0	81.0	1,258	438
Rewa	1,596,971	57,467	71	57,538	98.0	73.2	33,045	20,706

In the Hyderabad State primary vaccination of infants between six months and one year of age was made compulsory in 1925. As this order does not cover children beyond the age of one, a draft Vaccination Act is reported to be under consideration, which, when approved by H. E. H. the Nizam's Government, will make both primary and revaccinations compulsory in the State.

It is reported that, since the reorganisation of the State Public Health Department in 1934, greater supervision has been exercised over the work of the vaccination staff and that the mortality from smallpox has begun to show a tendency to decrease. The State manufactures its own vaccine lymph, over 400,000 doses being distributed to the various vaccinating agencies in the State. It is stated that the vaccine is subjected to the routine potency and bacteriological tests before issue and that careful records are being maintained. A total number of 397,708 vaccinations was performed during 1938, primary vaccinations producing a success rate of 89·4 per cent and revaccinations of 53·7 per cent.

In Mysore State the incidence of smallpox in 1938 is stated to have been low. However, as a routine preventive measure, 250,780 vaccinations were performed, of which 22·0 per cent were among infants under one year of age, 36·5 among children between one and five years and 20·3 per cent among children aged five to ten years while the remaining 21·2 per cent were among persons aged ten years and over.

In Kashmir smallpox is stated to have occurred in a mild form in several tehsils and vaccination of the people on a large scale is stated to have been carried out. A compulsory Vaccination Regulation is stated to be in force in the cities of Jammu and Srinagar and the possibility of its being extended throughout the State is being considered. During 1938 the total number of vaccinations performed was 205,202, the success rates for primary and revaccinations being 95·1 per cent and 57·9 per cent respectively.

In Travancore vaccination is compulsory in all the municipalities, which number 17. In the rural areas, it was made compulsory in 1932 by the issue of temporary regulations and since then these have been renewed from year to year. The total strength of the vaccination staff is reported to be 118, of whom four are women. The minimum for each vaccinator is 50 vaccinations per day. During 1938, the total number of vaccinations performed was 943,286. Primary vaccinations gave a success rate of 91·4 per cent and revaccinations 36·6 per cent.

The Director of Public Health, Cochin State, reports that his is one of the very few Indian States in which primary and revaccination are both compulsory. Vaccination is carried out throughout the year. A total of 104,735 vaccinations was carried out in 1938, the success rates achieved for primary and revaccinations being 92·9 per cent and 17·3 per cent respectively.

In Indore it is reported that primary vaccination is compulsory and that little difficulty is experienced in enforcing it. Revaccination is not yet popular, although its number is gradually increasing in recent years. During 1938 the numbers of primary and revaccinations performed were 47,638 and 9,442 giving a total of 57,080, the success rates being 77 per cent and 18 per cent respectively.

SECTION VII.

PUBLIC HEALTH WORKS.

51. During 1938, the municipalities of British India spent, out of a total income of nearly 1,535·22 lakhs, a sum of Rs. 443·76 lakhs or approximately 28·9 per cent on public health activities and, of the latter amount, 74·2 per cent was spent on conservancy, water supply and drainage. The corresponding figures for district boards were 1,867·04 lakhs, 133·70 lakhs (7·2 per cent of the total income) and 25·4 per cent respectively. The figures for expenditure under these heads for British India and the provinces are shown in tables VII (i) and (ii).

TABLE VII (i).

EXPENDITURE BY MUNICIPALITIES.

	Income.	Public health expenditure.	Percentage of total income expended on public health.	Expenditure on			Percentage of the total of Cols. (4), (5) and (6) to Col. (2).
				Conser-vancy.	Water-supply.	Drainage.	
	1	2	3	4	5	6	7
	Rs.	Rs.		Rs.	Rs.	Rs.	
BRITISH INDIA	15,35,21,678	4,43,75,667	28·9	1,64,16,173	1,15,65,151	49,29,651	74·2
N.-W. F. P.	25,75,683	5,31,080	20·6	2,39,644	1,33,629	41,173	78·0
Punjab	2,10,02,308	46,31,810	22·1	16,68,032	13,74,614	8,78,606	84·7
Delhi	89,12,281	22,03,769	24·7	6,49,883	9,35,063	2,77,748	84·5
U. P.	2,35,32,604	1,00,80,652	42·8	27,83,094	26,02,253	8,91,302	62·3
Bihar	61,70,950	19,04,198	30·8	10,74,071	3,98,295	2,85,048	92·2
Orissa	9,65,196	3,43,721	35·6	2,14,661	24,181	18,876	75·0
Bengal	1,01,39,004	54,09,142	53·3	24,84,783	14,65,984	4,48,294	81·3
C. P.	95,73,250	23,65,622	24·7	11,82,291	5,89,061	2,23,857	84·3
Bombay	2,44,18,770	59,65,258	24·4	26,42,759	17,44,880	7,00,678	85·3
Sind	1,27,12,123	28,87,205	22·7	9,08,020	7,50,643	4,30,795	72·4
Madras	3,19,19,074	74,74,049	23·4	22,60,869	13,48,816	7,01,568	57·7
Assam	16,00,435	5,79,161	36·2	3,08,066	1,97,732	31,706	92·8

TABLE VII (ii).

EXPENDITURE BY DISTRICT BOARDS.

	Income.	Public health expenditure.	Percentage of total income expended on public health.	Expenditure on			Percentage of the total of Cols. (4), (5) and (6) to Col. (2).
				Conser-vancy.	Water-supply.	Drainage.	
	1	2	3	4	5	6	7
	Rs.	Rs.		Rs.	Rs.	Rs.	
BRITISH INDIA	18,67,03,840	1,33,70,306	7·2	11,13,987	21,45,548	1,41,836	25·4
N.-W. F. P.	21,84,842	77,026	3·5	6,635	12,361	2,343	27·7
Punjab	2,46,56,373	8,30,358	3·4	*	*	*	*
Delhi	3,56,228	45,737	12·8	14,193	...	...	31·0
U. P.	2,26,93,072	3,09,021	1·4	8,361	12,584	4,739	8·3
Bihar	1,82,25,131	6,43,408	3·5	2,58,027	2,18,827	32,074	80·0
Orissa	27,61,489	2,11,657	7·7	18,220	50,187	1,404	32·9
Bengal	1,61,88,346	50,27,297	31·1	...	9,06,992	97,526	20·0
C. P.	1,05,09,533	5,50,712	5·2	...	82,191	...	14·9
Bombay	2,28,70,818	8,19,303	3·6	...	4,79,082	1,345	58·6
Sind	49,90,061	2,96,211	5·9	11,023	34,478	...	15·4
Madras	5,69,96,113	44,30,557	7·8	7,97,528	2,66,239†	†	24·0
Assam	42,71,834‡	1,29,019	3·0	...	82,607	2,405	65·9

* Information not available.

† Includes expenditure on drainage as well.

‡ Included under expenditure on water-supply

The rates of expenditure by rural health authorities on public health activity as a whole and on such essential services for the maintenance of environmental hygiene as conservancy, water-supply and drainage, were much less than those of municipal authorities. The percentages of income spent on public health measures in municipalities ranged between 20·6 per cent in N.-W. F. P. and 53·3 per cent in Bengal while, in rural districts, the lowest and highest rates of expenditure were 1·4 per cent in the United Provinces and 31·1 per cent in Bengal. Apart from this disparity between urban and rural areas in respect of the money spent on public health, the proportions of this amount in each province spent on conservancy, water-supply and drainage are relatively less in the villages than in towns. Even in urban areas the state of environmental sanitation is far from satisfactory and the much smaller amounts spent in rural areas must therefore be regarded as altogether inadequate to meet their needs.

An improvement of sanitation, particularly in the rural areas, can be accomplished only by the adoption of methods which are suited to local conditions. Costly schemes of water-supply and drainage are definitely ruled out. The necessity for securing the interest and co-operation of the people in measures designed for their own welfare demands that they should be encouraged to participate in the execution of such measures. In this connection it may not be out of place to quote the following extract from the Report of the Inter-Governmental Conference of Far Eastern Countries on Rural Hygiene held at Bandoeng (Java) in August 1937 :—

“ It was the custom in India—a custom which still fortunately exists in certain parts—for villagers to carry out certain duties without any remuneration. Free labour was their contribution for communal works. In this way, roads were made or repaired, the village was cleaned and pits filled up. If this custom could be revived or introduced where it does not exist, the amenities of village life could be vastly improved, for the villager himself is unable to pay for hired labour, and it is hardly likely that the Government can fully provide either the men or the finance for such works.

“ All people in the area should be induced to participate in the programme—the poorest and the more prosperous, all castes and creeds, men and women, adults and children—all sections helping and all being helped by it.”

The brief notes on individual provinces, which are given in the later paragraphs, indicate that attempts are being made, with partial success in some areas, to induce the people to participate in the improvement of village sanitation by giving help through free labour and through monetary contributions. The rate of progress is, however, bound to be slow. The minimum requirements for sanitation in villages may be stated to be the provision of a safe water-supply adequately protected against contamination, of drains to remove sullage from the inhabited area and of a satisfactory system of night soil and refuse disposal. While for the creation of such services voluntary gifts and free labour are valuable, their maintenance on an organised basis necessitates the provision of recurring funds by the taxation of the people through Village Panchayats or Union Boards. An essential condition of success is the development of a sense of civic responsibility in the rural population which, in its turn, is dependent on education and the promotion of a corporate life. The task of provincial Governments is that of stimulating local effort by suitable grants and of directing it on proper lines through technical advice and guidance. Provincial Governments and the public are now taking an increasing interest in the health of the rural population and this gives room for the hope that the rate of progress in this field of public health administration will be accelerated in the coming years.

The provision of protected water supplies is a reasonable criterion by which the level of sanitary improvement attained by a community can be judged. Table VII (iii) gives data regarding water-supplies in towns in British India in 1938. The corresponding figures for 1937 are also given for comparison.

TABLE VII (iii).

	Percentage of towns having protected water-supply.		Percentage of urban population.	
	1938	1937	1938	1937
British India	20	19	53	54
N.-W. F. P.	47	47	69	69
Punjab	22	22	48	54
Delhi	83	83	98	98
U. P.	6	6	34	33
Bihar	15	14	51	51
Orissa	25	25	35	35
Bengal	44	39	63	62
C. P.	8	8	33	33
Bombay	22	23	66	67
Sind	19	15	67	64
Madras	52	51	71	71
Coorg	50	50	61	61
Assam	32	32	49	49
Ajmer-Merwara	20	20	12	12

There appears to have been little or no change in most provinces, the exceptions being Bengal and Sind with 5 and 4 per cent increases respectively in the proportions of towns with protected water-supplies.

Further information regarding the provision of protected water-supplies in towns is available in Appendix VI in which towns with protected water-supplies are shown distributed according to the strength of their populations. Of a total number of 1,229 towns of all sizes, 19.6 per cent possess protected water-supplies. As is to be expected, towns with larger populations show a higher proportion among them of those with piped supplies. Thus, among a total of 76 towns with populations of 50,000 and over, nearly 78 per cent fall into this category and of those with populations ranging between 30,000 and 50,000 about 56 per cent belong to this group while, of towns with populations below 30,000, the proportion is as low as 13 per cent.

Brief notes regarding the public health works carried out in the provinces during 1938 are given below.

North-West Frontier Province.

52. As was pointed out in last year's report, the arrangements for the collection and removal of human excreta and street sweepings are still primitive in all the towns of the province. A slight improvement was, however stated to have been recorded in 1938 in Peshawar. As regards the rural areas it is reported that no arrangements have been provided for these purposes by district boards or by other agencies.

Slaughter-houses exist in 24 towns of the province but most of them are lacking in modern sanitary requirements and they are therefore in urgent need of improvement. There are no proper markets for the sale of food in the province and it is stated that the control of food supply on sanitary lines is not being carried out.

As regards congestion and overcrowding in towns, the Director of Public Health quotes the following remarks from the report for 1935 and states that these conditions still hold good: "There is considerable congestion and overcrowding in certain areas of towns, especially those enclosed in walls and barbed wire like Peshawar and Kohat. The expansion which has been thus limited artificially in lateral directions tends to go upwards and tall houses of many storeys in height on narrow lanes is the result." It is essential that the question of overcrowding and congestion in these towns should receive more attention.

The Government grants-in-aid to municipalities and notified area committees for public health purposes amounted to Rs. 4,060, the greater part of which was spent on sanitary improvements and on the maintenance of existing conservancy arrangements. Government grants to district boards amounted to Rs. 20,722 and of this sum, Rs. 19,722 were spent in connection with water-supply schemes. The balance was spent on anti-malarial measures in villages around Kohat Cantonment. A sum of Rs. 31,125 was also sanctioned from the Government of India's special grant for rural reconstruction to meet the cost of water-supply, drainage and rural reconstruction schemes in five districts. The district boards spent from their own funds a sum of Rs. 21,339 on water-supply and on conservancy. It is stated that no piped water-supply exists in any of the rural areas.

Punjab.

53. The Director of Public Health states that there are 1,275 Village Panchayats in the province and, in addition, 2,889 Village Sanitary Committees formed under the provisions of the provincial District Boards Act. The functions of these local bodies include the control of sanitation in their areas but it is reported that these authorities have shown little initiative in the improvement of sanitation or in the maintenance of sanitary works. It is stated that an important cause for this state of affairs is that the strength of the supervising health staff is quite inadequate for the task entrusted to them, because for a district with an average of about 1,200 villages, the public health staff consists of a medical officer of health, a sanitary inspector, a dispenser and some 20 vaccinators. In spite of this it is claimed that some measure of success has been achieved in the improvement of rural sanitation and that the amount of work accomplished has tended to increase from year to year.

The Director of Public Health has suggested that a village may be called "sanitated" when the water-supply has been adequately protected from surface contamination, main drains have been constructed for the removal of waste water and filth and refuse are regularly removed from the village to a place prepared for their reception. On the basis of these standards he states that the number of such villages was 382 in 1936, 1,962 in 1937 and 2,522 in 1938. It is also reported that sanitary work of some kind was carried out in 14,571 additional villages, although these villages did not attain to the minimum sanitary requirements indicated above.

As regards rural water-supplies, 1,407 new wells are stated to have been constructed during the last three years, 523 of them during 1938. In addition a steadily increasing number of wells has been repaired every year. The introduction of hand pumps to wells has proved popular, 6,243 having been installed in 1938. In order to demonstrate to the villagers the value of properly constructed wells provision was made, from the special Development Fund for rural areas, for the construction of 232 demonstration wells in villages. It is stated that this measure has resulted in making the villagers more willing to undertake themselves similar improvement of the remaining wells in their villages.

The paving of streets and the provision of drains and of refuse pits in villages are stated to be making steady progress. The special rural development scheme covers a period of five years and it has been proposed to make provision, under this scheme, for the supply of skilled labour for drainage and paving works in villages in specially selected tahsils. During the year the supply of skilled labour was made available to 286 villages.

Delhi.

54. The report of the Chief Health Officer records progress in many directions. A welcome feature of the measures adopted is that successful attempts were made to secure the active co-operation of the villagers in the betterment of their living conditions.

Two noteworthy advances in the sphere of rural health administration were the inauguration of the Central Officers' Board, which has as its function the co-ordination of all welfare activities in the villages, and the formation of Village Committees to which are entrusted local responsibility for the improvement of existing conditions and for the maintenance of such improvements. The Village Committees report to the Central Officers' Board the progress achieved and ask for assistance from the Board for the carrying out of their schemes.

In order to provide an object lesson to the villagers in environmental hygiene a scheme was started for improving rural housing on the understanding that financial assistance was given by the owners according to their means. "Cooking places with smoke flues have been introduced, improved cattle standings have been made, bathing places have been installed, bore-hole latrines and sullage bore-holes have been built, rat-proof food storage has been provided and small vegetable gardens fed from waste water have been planted in the house courtyards." It is stated that these improvements have made an excellent impression on the minds of the villagers. Special mention may be made of an increase in the cultivation of vegetables during the year to the extent of over 1,000 acres of land. The extension of such cultivation is bound to have an increasingly beneficent effect on the health and well-being of the rural population.

Another direction in which progress was achieved was in respect of village water-supplies. The original idea was that the villagers should be asked to contribute 50 per cent of the cost in cash or kind, but the failure of crops resulting from the absence of rains made it impossible to secure any substantial assistance from the people. Nevertheless, 78 wells were repaired, 26 tube wells were provided and one well costing over Rs. 24,000 was constructed. It is stated that a grant of Rs. 10,000 will be required to meet the needs of all

the villages in the province. An annual grant for the repair and maintenance of at least those wells which belong to the sweeper and *chamar* class, who are not able to pay for themselves, is also considered essential.

A "best village competition" was held in the province under the auspices of the newly created Central Officers' Board and all departments interested in village welfare took part in the competition. The period over which judging was carried out extended to six months, so that the efforts at improvement had to be sustained and not spasmodic.

A serious problem which the Health Department had to tackle during the year was that of the nuisance caused by fly breeding in the sludge of the Okla Sewage Works. Suitable action was taken and the nuisance was stopped. The Chief Health Officer draws attention to a similar problem of fly breeding at the City Refuse Dump at Badli and points out that, although different methods were tried, no substantial improvement was recorded.

The improvements carried out in New Delhi included the cleaning up of a number of dairies in and around Connaught Place, the enforcement of stricter sanitary control over the hotels and restaurants catering for all classes of the population and the improvement of the municipal markets by minor alterations and more efficient supervision.

In Delhi city slum clearance is of great importance. The decision taken during the year by the Delhi Improvement Trust not only to clear the slums but to provide facilities for the rehousing of the dispossessed population on hygienic lines and to afford financial assistance to those needing it, constitutes therefore an important contribution to the solution of a difficult problem.

United Provinces.

54. Grants sanctioned for rural public health works during 1938-39 totalled Rs. 59,739 against Rs. 50,158 for 1937-38. The satisfactory maintenance of sanitary works carried out in villages presents much difficulty and it was decided that grants for smaller public health works in villages should be given only to places "where a better-living society or a panchayat or some rural development association exists" so that the maintenance of the works may be entrusted to some such responsible body.

It is stated that, in 1938, over 3,900 wells were made sanitary and that a special grant of Rs. 30,000 was made for water-supply to *Harijans*. The total amount spent on rural water-supplies amounted to Rs. 2,24,540.

The popularisation of urinals and latrines in villages also received attention. It is reported that a large number of bore-hole latrines was constructed in the rural areas and that the better class village population has begun to appreciate its use. The Medical Officer of Health of the Partabgarh Health Unit, as the result of field experiments carried out in that area, drew up plans and specifications of a bore-hole type of pit for receiving house sullage. It has been shown that this is particularly suited for village schools, markets and fairs. When provided with foot-rests, it can also serve as a urinal. Its plans and specifications have been circulated to the health authorities of the province for adoption in their areas.

As regards towns, the Director of Public Health states that "the sanitation of municipalities and notified areas cannot be said to be satisfactory". This is partly due to lack of funds for the execution of public health works. Nevertheless, it is pointed out that improvements were carried out, as far as funds

permitted, in many towns. These improvements included the provision of drains, the paving of streets and construction of latrines and urinals, markets and slaughter-houses and repair of wells in different places.

Municipal water-supplies were examined from time to time by medical officers of health in municipal laboratories. For the purpose of checking their results, samples were also examined periodically at the Provincial Hygiene Institute. From the table of the results of analyses given by the Director of Public Health, the proportions of samples giving unsatisfactory results with bacteriological analysis were appreciably large in many towns. An extreme example in this connection is the water-supply of Cawnpore, where 59 per cent of the samples examined bacteriologically were found to be defective.

Orissa.

56. In only two municipalities, namely, Puri and Berhampur, has a piped water-supply been provided. In the others water for drinking purposes is derived mainly from unsatisfactory sources, such as rivers and shallow ring wells, although a few masonry wells and tube wells also exist in some towns. The percentages of total income expended on conservancy, on drainage and on water-supplies in 1938 were 26·2, 1·6 and 3·6 respectively.

In the rural areas conservancy, drainage and water-supply services received only 0·4, 0·22 and 1·2 per cent respectively of the total income of the district boards.

Bengal.

57. In Bengal the expenditure on sanitary works by municipalities during 1937-38 was over Rs. 54 lakhs, or 37·5 per cent of the total income of these municipalities. Compared with 1936-37 the percentage of expenditure decreased by 1·9. Of the total amount spent, conservancy accounted for nearly Rs. 24·85 lakhs, water-supply for Rs. 14·66 lakhs and drainage for Rs. 4·48 lakhs.

In the Union Boards of the province, which numbered 5,044 in 1937-38, a sum of nearly Rs. 9·95 lakhs was spent in 1937-38 on water-supplies, Rs. 96,708 on drainage and Rs. 83,816 on conservancy.

As regards the rural water-supplies, the provincial Government initiated a policy of rapid improvement and for this purpose provided in the budget for 1938-39 a recurring grant of Rs. 7,50,000 and a non-recurring grant of Rs. 5,00,000. Thana, Divisional and District Committees were formed consisting of representatives of the Revenue, Co-operative, Public Health, Educational and Engineering Departments as well as of local bodies. To these committees was entrusted the task of formulating water-supply schemes for villages, the latter being arranged on a priority list in accordance with the following conditions:—

- (1) prevalence of cholera,
- (2) shortage of drinking water,
- (3) income of the locality, and
- (4) other things being equal, preference should be given to areas offering substantial contributions in money or in labour.

The Government felt that the principle of encouraging local contributions was sound as these stimulated the spirit of self-help. At the same time Government gave instructions that exemptions should be liberally granted to deserving cases in view of the fact that the poorer localities, with perhaps a greater need for adequate water-supplies, might be deprived of grants. Special emphasis was laid on contributions in kind, for instance labour from such villages.

Provision has also been made in the scheme for ensuring that technical supervision will be carried out by the district engineering staff and that the district health staff will have opportunities of reporting on the progress of the works from time to time and of bringing to the notice of the engineering staff such defects as may require rectification.

Central Provinces.

58. In this province it is reported that the improvement of rural sanitation has been slow. During 1938 the amounts expended in rural areas on the improvement of water-supplies, cleaning of village sites and drainage works were Rs. 12,684, 41,564 and 4,582 respectively.

In 1936, a sum of Rs. 99,828 was made available to district councils by the provincial Government for the improvement of water-supplies in rural areas out of the Government of India subsidy for rural reconstruction. The district councils could not utilise the grant in full, a few of the works sanctioned remaining incomplete even in 1938. A further sum of rupees three lakhs was earmarked for rural water-supplies from the Government of India grant. A sum of Rs. 50,000 out of this amount was included in the budget estimates of 1938-39. Of this amount, however, the district councils utilised only Rs. 3,330.

Bombay.

59. A sum of Rs. 9,64,500 was placed by the Government at the disposal of Commissioners of Divisions for the improvement of village water-supplies. A further grant of Rs. 15,500 was made to the Rural Reconstruction Association, Poona, for water-supply works in Satara district. Another sum of Rs. 20,000 was made to Manjri village for the installation of a piped water-supply. It is also stated that 718 new draw wells were constructed and that 270 step wells were converted into draw wells.

The money spent on public health works by the local bodies in the province amounted to Rs. 21,20,944 or 12.5 per cent of their total income during 1937-38.

Village improvement work is carried out under the auspices of District Village Improvement Committees, which function in all the districts. Assistant Directors of Public Health attend their meetings, whenever possible, and help them with advice on matters relating to public health and sanitation. In addition to this it is reported that 145 sanitary committees and 650 panchayats were functioning in different villages during the year. The activities of these organisations are stated to be of a varied nature such as removal of manure heaps, repairs to surface drains and construction of latrines and wells. It is also stated that meetings and classes are held and that lectures on the importance of sanitation and hygiene are delivered.

Sind.

60. The expenditure on public health measures per head of the population of Karachi city was approximately Rs. 2-5-9 and Rs. 1-12-4 for the remaining municipalities which employ subsidised health staff. The Director of Public Health states that municipal authorities are very slow in carrying out the recommendations contained in the sanitary inspection reports of the Public Health Department and that, with the exception of towns with qualified health staff, the sanitation of urban areas is far from satisfactory.

It is reported that, in Sukkur municipality, certain improvements in connection with the water-supply were carried out during the year, consisting of the provision of a new rapid gravity filter at a cost of Rs. 8,000 and of settling tank for Rs. 15,000 and the renewal of cast iron water mains at a total cost of Rs. 2,00,000.

As regards rural water-supplies, the Government placed, at the disposal of the Revenue Commissioner for Sind, a sum of Rs. 18,000 for their improvement. This amount was used for the construction of 44 new wells in various districts.

The expenditure of local bodies on public health measures varied from 7 per cent of the income in Larkana district to 3 per cent in Dadu district. The average expenditure per head of the population in rural areas varied from two annas in Larkana district to six pies in Sukkur district.

Madras.

61. In Madras Presidency there are six rural sanitation units, four permanent and two temporary, which are maintained for the purpose of popularising the use of latrines in rural areas and of thus preventing soil pollution. As an ancillary activity a campaign against hookworm infection is also conducted through examinations of samples of stools of the population, mass treatment and propaganda. It is stated that the districts of Coimbatore, East Godavari and West Godavari have shown great interest in the prevention of soil pollution. As an instance may be quoted the fact that the local boards in East Godavari spent Rs. 14,795 on this work during 1938. The total amount spent by local bodies in the province on rural sanitation was Rs. 1,32,342. Public latrines were constructed in the districts in 1935-36 and 1936-37 from the Government of India grant for rural development and the Director of Public Health states that they were satisfactorily maintained by the local bodies in all except eight districts.

In last year's report reference was made to the comprehensive scheme of rural water-supplies which the provincial Government introduced for the purpose of giving a protected water supply to every village in the course of ten years. A priority list of villages in each district was prepared for the purpose of sanctioning grants. Orders were passed in 1938 approving the programme in respect of five districts, *viz.*, Tanjore, Trichinopoly, West Godavari, Ramnad and Anantapore. A disturbing feature in respect of the water-supply of certain central districts, notably Nellore, is the presence of fluorides in water over wide areas. The question has been under investigation since 1936 by the health authorities of the province.

Assam.

62. A sum of Rs. 5,79,735 or 44·5 per cent of their income was spent by the municipal boards and town committees in the province on original and recurring sanitary works compared with 45·3 per cent during 1937. The expenditure on the maintenance of water-supplies, drainage and town improvement by the Public Works Department amounted to Rs. 7,080. It is stated that, in regard to sanitary conditions, there is much room for improvement in the different municipalities.

The sanitary arrangements in rural areas are stated to be unsatisfactory. The water-supplies are liable to gross pollution both during the rainy weather and during the dry summer months.

SECTION VIII

LABORATORIES AND MEDICAL RESEARCH

Central Research Institute, Kasauli.*

63. The Institute has continued to function as the bacteriological laboratory and medical research institute of the Government of India. The routine work has consisted mainly of the manufacture of vaccines and antivenom serum to meet the requirements of the Army in India and of provinces and States, mainly in Northern India. Typhoid-paratyphoid (T. A. B.) vaccine is mainly issued for the use of the Army and demands are fairly constant from year to year. Cholera vaccine is issued in large quantities for civil use and in most years on a very large scale. Other prophylactic vaccines are manufactured and issued in smaller quantities. The Institute is the only centre in India manufacturing antivenene in large quantities and supplies all civil and military hospitals and dispensaries as well as non-official purchasers. The serum manufactured is bivalent against the venoms of the Indian cobra and Russell's viper, the snakes responsible for the majority of deaths from snakebite. Other curative or prophylactic sera are not manufactured but the Institute receives, stocks, and issues all imported sera, such as tetanus antitoxin, diphtheria antitoxin, anti-dysentery serum, etc., required by the Army in India and maintains large reserves for the purpose.

The Institute carries out the routine bacteriological examination required by the departments of the Government of India. The principal examinations are those of disinfectants for the Indian Stores Department, all samples submitted for contracts being tested for their carbolic-acid coefficient by the Rideal Walker test. Other bacteriological and serological examinations are made for certain hospitals and special examinations are done for non-Government Institutes and private practitioners on terms laid down by the Government of India.

The Institute acts as a centre of reference in regard to bacteriological and immunological problems and its extensive library is of high value for this purpose. Many requests are received for information and advice on medical and public health subjects and it is usually possible to provide the assistance required. The facilities of the library are open to all medical workers and are much utilised.

The Institute staff has continued to carry out research, from its own resources, in relation to the work in which it is ordinarily engaged and chiefly in relation to immunological problems and snake venoms. In addition the Institute has taken a leading part in the cholera researches carried out during the past five years under the Indian Research Fund Association. This work has been conducted in collaboration with some other laboratories in different parts of India and in close association with connected investigations in the laboratories of the Medical Research Council of England. Details concerning the cholera and plague researches carried out in the Institute have been incorporated in the paragraphs on these respective diseases in section II of this report.

The Director as usual continued to act as the Editor of the Indian Journal of Medical Research and Indian Medical Research Memoirs.

* Annual Report of the Central Research Institute, Kasauli, for 1938. Manager of Publications, Civil Lines, Delhi. Price Rs. 2 and annas 14 or 4s. 9d.

All-India Institute of Hygiene and Public Health, Calcutta.*

64. The Institute continued to perform its dual functions as a training centre for public health students and as a centre for research. Thirty students were trained for the public health diploma while in each of the three courses for D.Sc. (Public Health), diploma in maternity and child welfare and special post-graduate course for health officers, there was one student.

In addition to these courses a special post-graduate training class for tuberculosis lasting four weeks was organised at the Institute under the auspices of the King George Thanksgiving (Anti-Tuberculosis) Fund and thirty doctors from different parts of the country underwent training. Since the inception of the Institute in 1934, 108 students have qualified for public health work. Information has been collected regarding the manner in which these persons have subsequently been employed. Information was available for 96 students and of these, 37 were occupying public health posts, 14 held charge of medical institutions and 5 were employed in research. It will thus be seen that 58 per cent of those trained by the Institute were able to secure employment and that the proportion absorbed into public health service, including research, was about 44 per cent.

The different departments of the Institute carried out a number of researches, most of which were financed by the Indian Research Fund Association. Brief notes on important researches are given below:—

Cholera.—These researches are described on pages 31 to 33 in the section of the report devoted to cholera.

Epidemic dropsy.—It was pointed out last year that epidemiological and experimental evidence indicated that the causative factor in epidemic dropsy was some toxic substance ingested through mustard oil used in cooking food. It has been shown that the poisonous substance in the oil is derived from the seeds of a weed *Argemone mexicana*, which resembles the dark brown variety of mustard seed. Contamination of mustard seeds with argemone seeds appears to be accidental as the latter grows wild in many parts of the country. Human experiments with mustard oil containing a proportion of argemone oil, have shown that a clinical condition develops which is indistinguishable from mild epidemic dropsy. Chemical tests have been devised for detecting the presence of small proportions of argemone oil in mustard oil. Further, a white crystalline organic substance, which responds to these tests, has been isolated from argemone oil.

Blackwater fever and malaria.—It was mentioned last year that the treatment of seven cases of blackwater fever with glucose, ascorbic acid and cortin was uniformly successful. During the year under review five more cases were successfully treated on the same lines. No failures have so far been reported from this treatment.

An investigation for determining the excretion of vitamin C and its saturation in normal and malarial subjects resident in a hyperendemic malarial village in Bengal indicated that (1) 65 to 95 per cent of healthy children between the ages of two and ten had normal vitamin C saturation, (2) 60 to 87 per cent of malarial patients showed a condition of hypovitaminosis C, (3) during an acute attack of malaria an increased excretion of ascorbic acid in the urine

*Annual Report of the All-India Institute of Hygiene and Public Health, Calcutta, for 1938. Obtainable free of cost from the Director, All-India Institute of Hygiene and Public Health, Calcutta.

took place, the excretion being markedly less during the afebrile interval and (4) in chronic malaria patients a condition bordering on scurvy existed, which was rendered more and more intense by repeated attacks of the fever.

A study of the causes for the periodic appearance of malaria in the field malaria centre of the Institute in Burdwan district of Bengal seems to suggest that unusual rainfall during the hot dry months, March to June, leads to a progressive increase in the carrier anophelines and this in its turn to an increase in the number of new cases. Another interesting finding has also been recorded. All the three species of the malaria parasite occur in the area. In an on-epidemic year the prevailing species throughout the year is the quartan while, during an epidemic year, the predominating species is the malignant tertian. The malaria season is from July to October and, from a study of the figures for rainfall and of the relative incidence of the two species of the parasite during the earlier months of the year, it is claimed that it is possible to forecast an epidemic rise of the disease during the malaria season.

A study of the chemical and biological qualities of the water in the tanks breeding *A. philippinensis*, the carrier species, and those which did not breed this mosquito, suggested that a high proportion of carbon dioxide to oxygen favours breeding and that a low ratio is inimical to its breeding. This condition is exactly the reverse of that affecting the breeding of *A. culicifacies*. Another finding is that in tanks where large numbers of *Euglena* or *Macrocystis* are present *A. philippinensis* larvæ are absent. It is also interesting to note that, although *A. philippinensis* breeds profusely in tanks, dobas and burrow pits, systematic larval catches during the past three years have failed to show the larvæ of this species in any of the rice fields examined.

Tuberculosis.—These studies include, (1) an investigation into tuberculosis in relation to the jute industry at the Angus Jute Mills, about 23 miles from Calcutta, (2) a survey of tuberculosis in home contacts and (3) typing of tubercle bacilli from pathological material from various sources.

The jute mill investigation includes an intensive study of sample workers from different departments of the mill by physical and radiological examinations, graded tuberculin testing of all workers, a survey of home conditions to correlate them with the incidence of the disease and the assessment of the dust hazards of the industry. In regard to the last it is stated that, although the different processes through which the jute fibre passes emit such a large amount of dust as to suggest the production of harmful effects on the workers "it is remarkable that no case of physical disability, as evidenced by shortness of breath or disabling recurrent chest complaints, could be detected."

The survey of children who were contacts of cases of tuberculosis has been in progress for a few years and, in all, 839 children have been examined. While the percentages of positive reactors and of detectable X-ray lesions increase with the prolongation of the duration of contact with "open cases", it has been noticed that the maximum incidence of enlarged tracheal and bronchial glands occurs after 3-4 years of contact with "open cases" and in the 5-10 year age period. The highest incidence of tuberculin reaction also occurs in this age group.

As regards the typing of strains of the organism, 200 strains among the 220 isolated have already been typed out. They have all been shown to be of the human type. They were derived from such widely different sources as cervical, tracheo-bronchial, axillary, inguinal and mesenteric glands, tonsils, cold abscess pus, urine, skin, stool, stomach wash, pleural fluid, sputum and the lungs.

Maternity and Child Welfare.—There is a maternity and child welfare centre attached to the All-India Institute of Hygiene. An idea of the nature of the work done in that centre may be gained from the fact that, during the year, the total attendance at the clinic was 8,456. Further 7,500 home visits were paid by two health visitors attached to the centre and 202 ante-natal visits by the midwives. Ante-natal care was given to 541 pregnant women. Of these 541 ante-natal cases 330 were delivered in the district and three of them died, one from puerperal sepsis, another from post partum hæmorrhage and the third from tuberculosis. None of these fatal cases was delivered by the clinic staff. Postnatal care was given by midwives for ten days to the cases delivered by them. After delivery the health visitor visits the patient three times during this period of ten days. Later, monthly visits are paid by the health visitor until the infant is one year old.

Including the infants carried over from 1937, 858 infants were under the care of the centre; out of these 45 per cent attended the centre and others received monthly visits.

Group teaching on health subjects was carried out by the health visitors throughout the year except during the hot weather. Twentysix classes were held and the average attendance was eight.

Researches included a study of the records of infants' diseases, the working out of the normal weight curve of infants and the assessment of the nutritional condition of infants by a special marking method in cooperation with the Professor of Nutrition.

Nutrition studies.—The nutritional state in regard to vitamin A of prisoners in a Calcutta jail was studied with a locally modified Birch-Hirschfield visual photometer. It was shown that vitamin A deficiency existed in as many as 43 per cent of the prisoners on a low diet and in 17 per cent of those on better diet. It was further shown that an appreciable proportion of those showing vitamin A deficiency would have been missed, particularly in the group with the low diet, if the ordinary clinical signs such as dryness of the conjunctiva and Bitot's spots were taken as the criteria. In most cases, the deficiency could be removed within a week by the administration of vitamin A concentrate in suitable doses.

Another condition which was investigated amongst the prisoners was that of angular stomatitis. An examination of the records for the years 1935-38 showed that 1,520 cases took place in this period and that this condition had a seasonal variation, with increasing incidence during the winter months from November to February and a lower prevalence in the summer months. Administration of vitamin A concentrate to 11 typical cases of angular stomatitis produced no effect on the condition. Further, in view of the fact that the composition of the jail diet was practically constant throughout the year, it is difficult to explain why there should be a seasonal variation in the incidence of this condition.

Deficiency of calcium is recognized as common in Indian diets, and a study has been made of the effects on bone and teeth of three types of Indian diets, namely good North Indian, lacto-vegetarian and poor Indian diets. These diets represent different levels of calcium intake in a descending order and groups of rats were fed on them. The results were compared with a control group fed on a well balanced diet. One observation of importance that emerged from this study is that even the North Indian diet seems to be inferior to the well balanced diet.

In Bengal, where fish forms an important item of the diet, a study of the vitamin A content of fish oils merits attention. Some 15 varieties of local fish were examined by spectrophotometric assay for determining the vitamin content in terms of international units. Three types of oils, *viz.*, body oil, depot oil and liver oil were examined separately. The body and depot oils were poor sources of vitamin A, while liver oil contained more vitamin A than that present in an ordinary brand of Norwegian cod liver oil. The liver oils of two varieties of fish, "Air" and "Boal", have a vitamin A content nearly half of that in halibut liver oil, while liver oils from "Dhain" and "Shole" were nearly equal to halibut liver oil.

Other researches in the department of Bio-Chemistry and Nutrition included investigation of the efficiency of the intradermal test for vitamin C deficiency introduced by Rotter, determination of the limits of normality for the diameter of red blood corpuscles, studies on hæmoglobin in anæmia and investigation of the absorption spectra of various samples of mustard oil in connection with the inquiry into the causation of epidemic dropsy.

School of Tropical Medicine, Calcutta*.

65. The researches carried out are briefly summarised below :—

Department of Tropical Medicine.—A number of fractional gastric analyses has been carried out and the results obtained show that in Indians suffering from gastro-intestinal disturbances, hyperchlorhydria is a more common "error" than achlorhydria or hypochlorhydria. A study of the blood picture in acute malaria has indicated that there is a tendency for the size of the blood cells to be larger than normal, but that the Van den Bergh test (indirect) is by no means constantly positive, it being within normal limits in 79 per cent of the cases. An investigation of the blood picture in kala-azar has suggested that while there is some anæmia, this condition does not seem to progress beyond a certain point and that there is little association between the degree of anæmia and the duration of the disease. Further observations of the value of sternal puncture in the diagnosis of kala-azar show that the method is not as efficient as spleen puncture.

Department of Protozoology.—During recent years considerable attention has been devoted to the study of leptospiral jaundice, including investigations with respect to immunisation with vaccines and the production of antileptospiral serum. In addition to these studies investigations have also been carried out regarding the value of certain synthetic substances for the treatment of malaria. It has been found that soluseptasine and prontosil have definite antimalarial action at least on *P. knowlesi* infections in rhesus monkeys, when administered in disproportionately large doses as compared with the dosage for human beings, but that they do not possess any advantage over the drugs already in use. Another synthetic compound, cilonal or certuna, was also investigated.

The possibility of extraerythrocytic development of the malarial parasite in the monkey is being investigated with bone-marrow obtained by tibial puncture during life and smears from the spleen and liver taken shortly after death.

Department of Pharmacology.—The main researches carried out in this department have been summarised under "The Indigenous Drugs Enquiry" on page 153 in the section relating to the Indian Research Fund Association.

*Annual Report of the Calcutta School of Tropical Medicine and the Carmichael Hospital for Tropical Diseases, 1938. Available, without payment, from the Director, School of Tropical Medicine, Calcutta.

Department of Bacteriology and Pathology.—The main research work of the department related to cholera and a summary of this work is given on page 32. Standardisation work on the testing of prophylactic cholera vaccines was completed and the results obtained indicate the necessity for proper control of such products in India.

In connection with epidemic dropsy the rôle of argemone oil in the causation of the disease was investigated and an important finding was recorded that, by heating an adulterated oil until it fumed, it can be rendered non-toxic to animals.

Department of Entomology.—Malaria was the chief subject of research in this department. In regard to the coastal malaria of Bengal and Orissa, the conclusion reached is that the coastal lagoons are malariagenic inversely to the stage of their development and that the shutting off by bunds of the flood water from the brackish rivers saves the people from malaria. In Ambootia Tea Estate near Kurseong control of malaria by the shading of breeding places with jungle cover has proved a remarkable success and the spleen index, which was previously 55 per cent, has now been reduced to 5 per cent. Other studies included work on the bionomics of *A. stephensi*, some interesting observations on the use of fish in the control of malaria in Bengal and a study of the habits of domestic flies in relation to disease.

Department of Chemistry.—Eleven Indian medicinal plants were under investigation during the year. The chemical data relating to 780 plants for the projected book "Poisonous Plants of India," were also collected.

Department of Public Health Laboratory Practice.—This department took an active part in the investigations carried out at the School regarding the rôle of argemone oil in the causation of epidemic dropsy.

Department of Anæmia Research.—A relationship has been shown to exist between the hæmolytic type of tropical macrocytic anæmia, chronic malarial infection and dietary deficiency. Different liver fractions are being used in the treatment of this macrocytic anæmia with the object of identifying the deficient factors.

An investigation on anæmia in Assam has shown that the diet of the anæmic coolies was deficient in calcium and vitamin C amongst other things. So far it has not been found that the addition of calcium to the diet of anæmic patients will cause any improvement in the blood picture or even help to increase the response to other hæmatinics. The ascorbic acid saturation of both anæmic and other patients admitted to the hospital was investigated.

A unit from this department also investigated pneumonia in a manganese mine at Shivarajpur in Bombay Presidency. There was evidence that a high incidence of malaria played some part in the causation of pneumonia.

Department of Helminthology.—It has been shown that a dose of two to three grains of santonin is as effective as the usually recognised dose of five grains, so that it is possible to reduce the cost of the treatment by one half.

An interesting filarial parasite from a human being was received for identification and study. It proved to be a new parasite as far as human beings are concerned but, in the absence of male specimens, an exact classification was not possible.

Other important researches carried out in this institution have been described under the various heads in the section relating to the Indian Research Fund Association.

Haffkine Institute, Bombay.*

66. The manufacture of a large quantity of prophylactic vaccines such as cholera vaccine, typhoid vaccine and antirabic vaccine, and diagnostic work for hospitals largely monopolised the attention of the Institute. As the only medical research laboratory for the province, the Director stressed the importance of associating the Institute with the conduct of field epidemiological studies in collaboration with the Provincial Public Health Department. How valuable such association can be was demonstrated during the year by an enquiry into the incidence of typhoid fever in the city of Bombay in which the municipal health authorities and the Institute cooperated. Facilities for the laboratory diagnosis of suspected typhoid cases were made available, free of charge, to all medical practitioners. One of the consequences of this was that notification of the disease in the city showed considerable improvement. For the previous five years the number of reported cases and deaths from typhoid fever were 1,959 and 1,349 respectively, with a case mortality rate of 69 per cent. This unduly high rate suggests that many mild cases of typhoid failed to be notified; on the other hand, during the year under review, because of the increased notification of cases, the mortality rate fell to 9·3 per cent, which is in agreement with the experience elsewhere.

Further light was also thrown on the mode of spread of the disease. The city water supply was excluded as the source of infection. The basket privies in the unsewered parts of the city, combined with a large increase of flies in the area, were considered to be responsible for the largest number of cases. The results of this cooperation between the laboratory and the health authorities in Bombay were so gratifying that it is reported that the Government of Bombay have under contemplation a permanent scheme for making available to medical practitioners laboratory aid in the diagnosis of cases of infectious disease free of charge.

The main researches carried out at the Institute related to plague. They have been summarised at page 35 of this report. The studies on the anti-malarial drugs, plasmochin and atabrin are given on page 158.

Other researches included studies on the average hæmoglobin content of the blood of normal Indian subjects, and these show that the averages among Indians are similar to those obtained in America for white American subjects. An investigation of the blood urea content in Indians showed that while it lies within the same limits as those of American subjects, the normal excretion of urea of Indians is only about half of that of Americans. This subject is under investigation.

The antirabic department of the Institute has shown increased activity, the number of treatments issued during 1938 being 11,479 against 9,750 in 1937.

*Report of the Haffkine Institute, Bombay, for the year 1938. Obtainable from the Superintendent, Government Printing and Stationery, Bombay, or through the High Commissioner for India, India House, Aldwych, London, W. C. 2, or through any recognised bookseller. Price As. 3 or 4d.

King Institute of Preventive Medicine, Guindy.*

67. The Institute continued to be the main centre of medical and public health research in Madras Presidency, in addition to its general function as a bacteriological laboratory for the purpose of clinical, bacteriological, serological and pathological diagnoses for all Government hospitals.

The research work carried out at the Institute included investigations on cholera, filterable viruses including vaccinia and sandfly fever viruses, endemic fluorosis and the different species of algæ met with in the various types of water supplies of the province.

The researches on cholera are described on pages 32 and 33 of the report, while the other researches which were carried out under the auspices of the Indian Research Fund Association have been described in the section relating to that body, page 148.

Vaccine lymph.—During the year, 23,135 grammes of crude lymph were manufactured, the average yield per calf being 28.6 grammes compared with 27.6 grammes last year. Details regarding vaccine lymph and vaccinations will be found in section VI of this report.

Bacterial vaccines.—The total issue of cholera vaccine amounted to 1,373,488 doses compared with 2,389,071 issued during the previous year. The reduction was due to the absence of severe epidemics of the disease in the province.

In regard to T. A. B. vaccine the Provincial Government sanctioned concession rates of purchase to municipalities and educational institutions and, in consequence, the total issue increased from 55,594 doses in 1937 to 61,536 doses during the present year. There was also an increase in the issue of therapeutic sera from 96,066 doses in 1937 to 170,614 in 1938.

The Public Health Section.—The public health section is concerned with the examination of water supplies. The number of samples examined during the year was 9,890, an increase of 1,200 samples over that of the previous year. In addition, this section did the chemical examinations in connection with enquiries on endemic fluorosis and algal problems. Another important investigation was the large scale experiment carried out at Trichinopoly in 1937 and 1938 for the chlorination of water using a uniform minimum dose of 0.1 parts per million all the year round with vigorous agitation of the water immediately after the addition of chlorine. It has been found that with this method samples drawn from several points in the town distribution system consistently showed the absence of lactose fermenters in 60 c.cs. of water. The quantity of chlorine used is minimal and this method eliminates the necessity for frequent laboratory control of the dose required for sterilisation. The method is also economical as the cost of chlorine is reduced by 40 to 80 per cent.

Another important advance in regard to water supplies was the inauguration of a scheme by which District Health Officers could have samples from rural supplies examined at the Institute expeditiously, telegraphic reports being sent to these officers within 24 hours of the receipt of the samples at the Institute.

*Report of the King Institute of Preventive Medicine, Guindy, for the year ending 30th September 1938. Obtainable from the Superintendent, Government Press, Madras. Price 8 annas.

**King Edward VII Memorial Pasteur Institute and Medical Research Institute,
Shillong.***

68. Details concerning the antirabic section of the Institute are given on page 164.

As in former years research on cholera continued to be one of the most important activities of this Institute. A brief description of the work accomplished during the year is given on page 32.

Vaccine Section.—During the year 1,968,568 c.cs. of cholera vaccine were issued. This amount is more than double that of the previous year and resulted from a cholera epidemic in Sylhet district. Twelve thousand three hundred and nine c.cs. of T. A. B. vaccine and 1,160 c.cs. of influenza vaccine were also issued during the year.

Bacteriophage Section.—The total issue of bacteriophage during the year amounted to 495,872 ampoules of 2 c.c. each. An interesting feature is the increased supply to other Governments, the supply during 1938 being double that of 1937.

Assam Medical Research Society.—The work of this society has been reviewed in a later paragraph relating to researches under the Indian Research Fund Association at page 149.

INDIAN RESEARCH FUND ASSOCIATION

69. The following is a brief summary of the investigations financed during 1938. Full details will be found in the Report† of the Scientific Advisory Board, in papers published in the Indian Journal of Medical Research and its Memoirs, in the Journal of the Malaria Institute of India, the Indian Medical Gazette and other journals. A detailed list is given in the appendix to this section (page 235).

Cholera.

70. For all researches on cholera reference may be made to pages 31 to 33 where they are described in the section dealing with that disease.

Malaria.

71. *Malaria Institute of India, Kasauli*‡.—The old name of the “Malaria Survey of India” was changed to “Malaria Institute of India” and that of the “Records of the Malaria Survey of India” to “Journal of the Malaria Institute of India” with effect from 1st April 1938.

*King Edward VII Memorial Pasteur Institute and Medical Research Institute, Shillong.—The Twenty-Second Annual Report for the year ending 31st December 1938. Assam Government Press, Shillong.

†Report of the Scientific Advisory Board for 1938, obtainable from the Secretary, Indian Research Fund Association, New Delhi, Price. Re. 1.

‡Annual Report of the Malaria Institute of India, Kasauli, for the year 1938. Manager of Publications, Civil Lines, Delhi. Price Re. 1 as. 6 or 2s.

(a) *Classes and instructional work.*—The annual malaria class held at Karnal was attended by 20 students of whom 17 passed the examination. A course on malaria control was conducted for sanitary inspectors and on insect collection for unpaid apprentices. Four numbers of the Journal of the Malaria Institute of India and five health bulletins were published during the year.

(b) *Routine entomological work.*—Expert identification of mosquitoes and sandflies was carried out as in previous years.

(c) *Antimalarial operations in Delhi.*—These operations were supervised by the officers of this Institute. An important advance has been the employment of various forms of oil booms in the Western Jumna Canal and Najafgarh Cut. The reduction in malaria was marked but its permanency cannot be proved until the antimalarial measures have been subjected to the test of a normal or excessive monsoon. The rains in 1938 were well below average.

(d) *Field researches.*—These included observations on the bionomics of *A. culicifacies* at Karnal, the incrimination of *A. stephensi* as the principal and probably sole carrier in Bahrein Islands and investigations in the Wynaad, in the United Provinces Terai and in Delhi. In the Wynaad *A. fluviatilis* has been shown to be the principal vector. Every aspect of the malaria problem in this area is being studied for the purpose of formulating practical control measures. In the Terai a study of malaria among the indigenous and immigrant population has been in progress together with detailed observations on the bionomics of the carrier species of mosquitoes. Investigations in Delhi included the experimental spraying of dwellings to destroy adult mosquitoes. While the low level of transmission of infection owing to the failure of the monsoon prevents a correct assessment of the beneficial effect of this measure, the practicability of its application under rural conditions in this part of India has been demonstrated and this measure is likely to prove a valuable weapon in dealing with epidemics.

(e) *Laboratory researches.*—These included a study of monkey malaria, using the extra-abdominal spleen technique, for the purpose of elucidating the factors influencing the numerical increase and decrease of parasites; a series of precipitin tests by Barber's technique to determine the blood preferences of mosquitoes collected during field investigations in U. P., Madras Presidency, Karnal and Delhi; tests to determine the efficacy of certain drugs claimed to be of value in the treatment of malaria and examination of the value of a number of proprietary insecticides.

Malaria transmission enquiry at the School of Tropical Medicine, Calcutta.—Experiments were carried out to study the longevity of *A. annularis* and its power of transmitting infection under varying conditions of temperature and relative humidity. The effect of various antimalarial drugs upon the infectivity of man to mosquitoes was under investigation. The chemotherapy of antimalarial drugs in general in relation to human and monkey malaria was also studied. A new species of bird malaria (*P. heroni*) was described.

Assam Medical Research Society (Malaria Section).—The main activities of the Society included (i) an eight weeks' training class in malariology for medical licentiates and a four weeks' course for malaria inspectors; (ii) three malaria surveys; (iii) supervision of a number of antilarval control centres;

(iv) the continuance of the Doom Dooma cinchona-plasmodium treatment experiment for the sixth year; in 1932-33, spleen and parasite rates of children between two and ten years old were 56.5 and 40 per cent respectively while in 1937-38, the corresponding figures were 14.6 and 13.5, and (v) further studies of the cold weather bionomics of *A. minimus* in the plains of Assam.

Blackwater fever enquiry; vitamin C and malaria at the All-India Institute of Hygiene and Public Health.—This has been described at page 141 under the enquiries at the All-India Institute of Hygiene and Public Health, Calcutta.

Nutrition

72. *Nutrition Research Laboratories, Coonoor.*—The systematic survey of Indian foodstuffs was continued and by using electrocardiographic methods the vitamin B content of a number of foodstuffs was investigated. The biological value of the proteins of some 30 common foodstuffs was determined. Methods of improving Indian diets continued to be investigated, special attention being given to diets largely composed of tapioca, such as are consumed in certain parts of South India. The effect on monkeys of long continued feeding on diets resembling certain types of Indian diets was studied. Investigations were also continued on the pathology of the skin and nervous system in relation to dietary deficiency. Other researches included a study of the changes in the unaffected parts of the stomach and duodenum occurring in human cases of peptic ulcer and an investigation into the relation between vitamins and enzyme activity during the processes of oxidation and reduction in the tissues. A number of dietary surveys was carried out in different parts of India and the information collected should prove to be of great value to public health and agricultural departments. Controlled diet experiments carried out in two schools have shown that the addition of calcium lactate definitely improves the poor South Indian diet. A study of the rice problem showed that the consumption of highly milled rice was rapidly spreading. A considerable amount of information on the subject was collected by means of questionnaires and field enquiries.

Additional nutrition enquiry at the Imperial Agricultural Research Institute, New Delhi.—The programme of work of the Liaison Officer between human nutrition and agricultural research at the Imperial Agricultural Research Institute, New Delhi, included (a) collection of evidence from medical and public health workers regarding the state of nutrition of villagers and townspeople, (b) survey of the quantities of food produced in various provinces in relation to the dietary requirements of the population, (c) animal experiments on the nutritive value of pulses as supplement to a diet based largely on cereals and (d) animal experiments on the value of calcium and phosphorus as supplements to the poor South Indian diet.

Enquiry on cheap well balanced diets under the Bombay Presidency Baby and Health Week Association.—The enquiry into cheap well balanced diets was continued on groups of boys at different ages, two types of diets being used. Growth tests on albino rats were carried out with various foodstuffs and in different combinations, the conclusion arrived at being that fresh whole milk gave the best result. The foodstuffs studied were whole milk, skimmed milk powder, red palm oil, soyabeans, butter and vitamin D.

Investigation of basal metabolism in children and adults in the Bombay Presidency at the Seth G. S. Medical College, Bombay.—The basal metabolism of 24 men and 52 women in Bombay was investigated. On the basis of the results obtained the daily average caloric requirements for men and women were found to be 2,600 and 1,900 calories respectively.

Ascorbic acid enquiry at the University College of Science and Technology, Calcutta.—The investigations on vitamin C included the following :—

- (i) its effect on toxins ;
- (ii) the effect of minute amounts of the vitamin on the growth of certain bacteria and fungi ;
- (iii) a comparison of the relative efficiency of two methods of assessment of vitamin C subnutrition, the saturation test of Harris and Ray and an intra-dermal skin test with 2 : 6 dichlorophenol indophenol.
- (iv) isolation of ascorbigen or combined ascorbic acid in plant and animal tissue ;
- (v) development of a method of estimating total vitamin C comprising free ascorbic acid, dehydro-ascorbic acid and ascorbigen ; and
- (vi) a study of the relationship between vitamin C and luteinising and follicular hormones which showed that luteinising and follicular hormones, on injection into normal guineapigs, do not alter appreciably the vitamin C content of tissues like the liver, spleen, kidney and small intestine.

Studies in human metabolism at the Dacca University.—The physiology of human nutrition, with special reference to the requirements of proteins, calcium and phosphorus for the metabolism of Indians, was under investigation.

Enquiry into the etiology and pathology of peptic ulcer in South India.—The main conclusions of this enquiry are (1) that the condition is 60 times more common in South India than in North India, (2) that the highest incidence in South India is in the centre and north of Travancore and (3) that lack of proteins and of vitamins A and B in the South Indian diet is the direct cause of the high incidence of peptic ulcer. It is suggested that these deficiencies in the diet affect the nutrition of the intra-mural ganglia which control the movements of the stomach and the secretions and maintain the balance between sympathetic and vagal influence. The failure of the myenteric plexus to perform its normal function leads to a condition of vagal preponderance resulting in pylorospasm, hyperperistalsis and hypersecretion, while the dietetic deficiency lowers the resistance of the gastric mucosa to infection, leading to lymphocytic infiltration and follicular hypertrophy. In the more advanced cases the follicles become abscesses which rupture on to the mucosal surface and become minute ulcers. Healing of these ulcers is prevented by hypersecretion, hyperperistalsis and pylorospasm and, in course of time, the minute ulcers coalesce to form a large chronic ulcer.

Other researches included (a) an investigation of the working efficiency of Indian labourers at the King George Medical College, Lucknow, (b) an enquiry into malnutrition among Bengalee boys with regard to vitamins B and C at the Presidency College, Calcutta, (c) researches on calcium deficiency in the Kangra Valley (Punjab), (d) an investigation regarding protein, fat, ionisable iron

content and total mineral content of 30 different varieties of fish at the University College of Science and Technology, Calcutta and (e) an enquiry into calcium metabolism in health and disease at the Seth G. S. Medical College, Bombay.

Leprosy and Plague.

73. Researches on leprosy and plague have been briefly summarised on pages 61 and 35.

Rabies

74. *Antirabic vaccine enquiry at the Pasteur Institute of India, Kasauli.*—The investigation into the value of antirabic serum as an adjunct to treatment with a carbolised dead vaccine was continued. At the Pasteur Institute, Kasauli, 1,405 cases were treated with serum and vaccine and 716 cases with vaccine alone. The numbers of deaths corresponding to these cases were 23 and 17, giving rates of 1.64 and 2.37 per cent. Among 2,234 cases treated with serum and vaccine in certain selected centres in the Punjab and the United Provinces the death rate was 1.79 per cent and among 4,971 cases treated with vaccine alone the rate was 1.25 per cent. In Kasauli, the death rate for the cases receiving vaccine alone was slightly higher than among those receiving both vaccine and serum while, at the selected centres in the two provinces, the higher percentage of mortality was among those receiving serum in addition to the vaccine. It may, however, be pointed out that, in respect of both, the differences in the mortality rates are not statistically significant. No evidence has therefore been produced in favour of the serum as an adjunct to treatment. Other researches included unsuccessful attempts to culture the fixed rabies virus on embryonic chick brain, experiments to test the value of monkey brain vaccine, which showed that carbolised vaccine of this type is not superior to carbolised sheep vaccine and experiments to determine the duration of immunity after a course of antirabic inoculations. Periods of 7½, 8½ and 9½ months after treatment were tested, monkeys being used for the experiments. None of the treated animals developed rabies while 33½ per cent of the controls developed the disease.

Tuberculosis

75. *Tuberculosis enquiry at the All-India Institute of Hygiene and Public Health, Calcutta.*—The enquiry has been described at page 142 under the researches carried out at the All-India Institute of Hygiene and Public Health, Calcutta.

Enquiry into the incidence of positive Mantoux reactors and latent tuberculosis in medical students, nurses and others at Lahore.—1. A positive Mantoux reaction was obtained in 53 per cent of 434 medical students at Lahore, the figure rising to 70 per cent and 80 per cent in the 4th and 5th year students.

2. Mantoux positive reactions were found in 77 per cent of the 53 nurses examined.

3. Of the 400 skiagrams taken of students, 18 or 4.5 per cent showed evidence of healing or healed adult phthisis. These cases are being observed clinically and radiologically, but none of them have developed into the active "open" case with positive sputum. It is hoped to observe these "latent" cases over a number of years.

Tuberculin survey of school children and young adults in Amritsar.—A group of 2,451 school children and young adults was investigated. An examination of the results when classified according to age groups and

into two community groups, Mohammadans and Hindus and Sikhs (the two latter being a combined group) shows that the proportions of the positive reactors in the two community groups closely corresponds at individual age periods and that the proportion steadily rises as age advances. Total positive reactors among Mohammadans were 57·3 per cent and among Hindus and Sikhs 55·7 per cent. Among Mohammadans the percentage of positives at different age periods rose from 39·7 in 1—5 years to 80·7 in 20—25 while for Hindus and Sikhs, the corresponding figures were 33·3 and 81·6. A similar investigation among the members of 462 families in Amritsar city showed that, for Hindus and Sikhs, the percentage of positive reactors increased from 27·3 per cent at 2—3 years of age to 100·0 per cent in the age group 20-25. For Mohammadans the corresponding percentages were 17·0 and 76·1.

Indigenous Drugs

76. *Indigenous drugs enquiry at the School of Tropical Medicine, Calcutta.*—The chemical composition and pharmacological action of the glucosides, alkaloids or other active principles isolated from a number of medicinal plants were under investigation. These plants included *Periploca aphylla*, *Tylophora asthmatica*, *Holarrhena antidysenterica* and *Rauwolfia serpentina*, *Antiaris toxicaria*, *Cerbera odallum*, *Hemidesmus indicus*, *Entada scandens*, *Barringtonia acutangula*, *Lasiosiphon eriocephalus*, *Solanum trilobatum*, *Bambusa arundinacea*, *Hydrocotyl asiatica* and *Phodomytus tomentosa*.

A herbarium of medicinal plants growing in India is being collected and it now comprises about 5,000 specimens relating to 1,500 species of plants. This herbarium, when completed, will be a unique collection and will be of immense value for obtaining authentic specimens of plants for chemical and pharmacological studies.

Another investigation relates to the study of poisonous plants in India. Much useful information, botanical, chemical and pharmacological, has already been collected and is now ready for publication.

Investigations, both therapeutic and biochemical, have been carried out on the snake venoms which are used in the indigenous systems of medicine. It has been shown that cobra venom is useful for the relief of pain of malignant disease, of rheumatic origin and of nerve leprosy. Daboia venom by intramuscular injection appears to have some effect in controlling internal hæmorrhage. A comparative biochemical study has been carried out of the venoms of the cobra and Russell's viper. The viper venom has a higher proteolytic power than cobra venom. An active lecithinase is present in both venoms. Cobra venom is hæmolytic in varying degrees for susceptible varieties of red blood corpuscles but viper venom is hæmolytic only to a limited extent.

Other studies included an enquiry into the prevalence of opium smoking in India. The habit of opium smoking has greatly declined in the country during the past 30 years, although it is still widely prevalent in Assam and the Central Provinces and to a smaller extent in many of the larger towns of India. The main causes of addiction were association with other addicts, disease or minor ailments, hard work or worry. In a series of 300 cases the dose of opium ranged from 1 to 180 grains daily. Various chemotherapeutic and pharmacological investigations were pursued. Among the chemotherapeutic substances investigated was a series of dextro-rotatory derivatives of cinchona alkaloids, which were synthesised in this laboratory and were being studied in regard to their pharmacological action. The effects of varying doses

of different antimalarial drugs on the infectivity of the patient to the mosquito were also investigated. The drugs used were cinchona febrifuge, quinine sulphate, malarcan, tebetren, atebirin, plasmochin, gametochin and cilional (certuna). Plasmochin in a dose of 0.02 gm. prevents the development of crescents in *A. stephensi* and cilional in a dose of 0.36 gm. The other substances had no effect.

Indigenous drugs enquiry at the K. E. Medical College, Lahore.—Investigations were carried out on *Rasaut, Mamiri, Hing, Cassia Tora, Rasna, Aruni* and *Centauria Behen*.

Maternal Mortality

77. *Urban statistical enquiry into maternal mortality and morbidity in child birth, Bombay.*—Three hundred and forty deaths directly due to childbearing were investigated in Bombay. Sepsis was found to account for more than one third of the total and was the major cause of deaths. Anæmia stood second in importance. Toxæmias of pregnancy were responsible for the next largest number of deaths, followed by puerperal hæmorrhage.

Anæmia and eclampsia enquiry in Calcutta.—Cases of anæmia in pregnancy were examined and followed up till their blood picture returned to within normal limits. Bloods of normal pregnant women as well as of non-pregnant girls and women were also examined for comparison.

Enquiry into anæmia of women in Assam at the School of Tropical Medicine, Calcutta.—The results of an investigation into the anæmia of pregnant tea-garden coolie women in Assam show that they have on the whole a low level of hæmoglobin associated with a small pale red blood cell. Iron deficiency brought about by continuous blood loss from hookworm infection in the presence of a low iron intake, is stated to account for this in part, but not altogether. It is considered possible that a low calcium and/or a low vitamin C intake may be associated factors.

The anæmia amongst pregnant women can be divided into two groups, characteristically microcytic hypochromic and macrocytic hyperchromic respectively. The former is an exaggeration of the anæmia in the normal population brought about by the extra demands of pregnancy, but the factors concerned in the latter are not quite so evident, though the response to treatment suggests—and a dietary survey does not negative the suggestion—that there is a relative deficiency in important food factors probably associated with the vitamin B₂ complex. Other observations indicate that this deficiency is conditioned by the presence of the foetus with its extra demands for substances essential for hæmopoiesis (or less probably its toxic influence) and/or by a state of chronic malaria.

Whilst characteristic examples of each type of anæmia are seen, they seldom occur in the 'pure' state and in the vast majority of cases deficiencies of both groups are evident.

An experimental study on monkeys was started for the purpose of investigating the anæmia produced by repeated losses of blood, the counterpart of hookworm anæmia, by nutritional deficiency and by malaria severally and in different combinations. Work has been in progress in order to establish normals for comparison and particularly to watch the effects of captivity on the blood picture. Further, an attempt was made to produce, by the administration of the faulty diet that Dr. Lucy Wills advocated, the typical macrocytic picture which she claimed to have produced. There was no success.

Enquiry into toxæmias of pregnancy at the Seth G. S. Medical College, Bombay.—A detailed clinical and biochemical study of eclampsia cases was in progress during the year.

Investigation of the biochemical and dietetic factors concerned in the toxæmia of pregnancy at the K. E. Medical College, Lahore.—Twentyone cases of toxæmia of pregnancy were studied, seven of which were clinically eclamptic. The diets of these patients and of 25 controls were also investigated. Hypoprotei-næmia was present in all the cases studied, a greater diminution being present in eclamptics than in cases of nephritic toxæmia. Blood cholesterol was higher in the toxæmia cases than in the normal pregnant controls. Hæmoglobin was consistantly low in all toxæmic cases, as compared with the controls. There was no significant alteration of blood sugar in the toxæmic cases. Sub-normal urea clearance with oliguria was present in cases of eclampsia only during the acute phases of the disease. Blood calcium was lower in the eclamp-tics as compared with the normals.

Enquiry into the hæmatological standard of healthy Indian women at the Lady Hardinge Medical College, New Delhi.—Specimens of blood from a hundred healthy females, who were residents of Delhi, were examined for the purpose of establishing hæmatological standards for Indian women. The mean values for red cell count, hæmoglobin content and cell volume were 4,560,000 per c. mms., 13·11 gms. per 100 c.cs. and 39·04 c.cs. per 100 c.cs. of blood respectively.

A preliminary survey for the investigation of the bacteriology of the genital tract at the Lady Willingdon Hospital, Lahore.—This investigation was carried out during the stage of pregnancy and the puerperium in all emergency cases admitted to hospital and was confined to the identification of streptococci. Work was also done in connection with throat swabbing and isolation of Beta hæmolytic streptococci, throat swabbing of the staff and students, blood culturing of cases of post-partum pyrexia and investigation of the methods of isolation of anaerobic streptococci.

Miscellaneous

78. *Helminthological enquiry at the School of Tropical Medicine, Calcutta.*—

(i) Intestinal worms from 100 stray dogs were collected in Calcutta with a view to finding the extent to which *Taenia ovis* is present in dogs in India.

(ii) A new substance was discovered for the preservation of hookworm eggs in stools and a prolonged trial of its value was being carried out.

(iii) The curative effect of large doses of iron on trichuris infection as reported by other workers was under investigation.

(iv) The life history of *gnathostoma spinigerum* was found to follow the same lines as reported from Thailand. The immunity of certain species of fish in Bengal to this infection may explain the rarity of human infection here.

Medical mycology enquiry at the School of Tropical Medicine, Calcutta.—The main lines of investigation were as follows :—

(i) Work on the testing of fungicides was continued.

(ii) An outbreak of microsporon infection in the hair of children in a boarding school was investigated.

(iii) The aetiology of cheiropompholyx of the hands was studied in order to decide its connection with ringworm of the feet.

- (iv) Three supposed virus diseases of the skin, herpes, molluscum contagiosum and infective warts were studied from the point of view of preparation of the specific antigen for each disease and of investigation of the formation of specific antibodies in cured cases.

Dracontiasis and filariasis enquiry at the School of Tropical Medicine, Calcutta.—Field work on dracontiasis was carried out in the endemic areas of the districts of Vizianagram, Trichinopoly, Ramnad and Madura. An antigen was prepared by a special technique for the complement-fixation test in guinea-worm infection and a limited trial has shown that persons harbouring the worms gave uniformly positive results while persons, who did not harbour the worm or from whom the worm had been removed by extraction, gave negative results. This guinea-worm antigen gave negative results with complement-fixation tests on a series of carriers of *W. bancrofti* infection and of cases of elephantiasis.

As regards filariasis, a survey was carried out in Patnagarh (Orissa), an area with a high incidence of *M. malayi* infection. All attempts to obtain the adult worm were without success. Sternal punctures carried out on *W. bancrofti* carriers showed that the microfilariae occurred in the bone marrow only during the night and was absent from it during day time. Pectine, a well-known coagulant, has been found to be very useful in the treatment of chyluria, the urine in all the cases treated becoming clear in two or three days. Several new drugs, cuprion, surfen, cilonal and sdt-561 of Bayer, Synthalin B, May & Baker 693 and Ext. rawalfia liq., were used on cases with *W. bancrofti* infection. None of them had any lethal effect on the parasite.

Protozoal parasites enquiry at King Institute, Guindy, Madras.—The main lines of research were:—

- (i) the development of *Babesia gibsoni* in *Hæmaphysalis hispinosa* ;
- (ii) investigations on the toxoplasma of the sparrow ;
- (iii) investigations on the hæmogregarine of *Calotes sp.* and of the Gecko *Hemidactylus gleadowii* ;
- (iv) studies on the infectivity of *Leishmania donovani*.
- (v) introduction of *Trypanosoma lewisi* infection in albino rats ; and
- (vi) miscellaneous work such as the breeding and supply of specimens of the tick *Hæmaphysalis hispinosa* to workers in India and abroad, collection of various ticks and sandflies in Madras and their identification and the maintenance of the cultures of various blood flagellates.

Typhus enquiry at the Pasteur Institute of India, Kasauli.—The three typhus strains, two of the XK and one of the X19 serological types, which were being maintained were in their 65th, and 166th generations. It was reported last year that the tropical rat-mite *Liponyssus bacoti*, the tick *Hyalomma aegyptium* and the flea *Xenopsylla cheopis* can transmit typhus XK under experimental conditions. In view of these findings and of the fact that *T. deliensis*, which is already suspected as the vector in Malaya is found to attack man in the Simla Hills, a thorough study of this tick was undertaken. Its life history was successfully worked out for the first time in India and transmission experiments with laboratory bred larvae were undertaken. Other studies included the possible rôle of *cimex lactularius* in the transmission of typhus X19 (murine). The results were negative. Hares, birds and rats

were studied as possible reservoirs of typhus XK infection. In regard to rats there is evidence to suggest that, in India as in Malaya, these may serve as reservoirs of infection.

Enquiry on filterable viruses at the King Institute, Guindy.—Researches were continued on the dengue fever virus and on vaccinia virus. As regards dengue fever, the virus has already been cultivated in this laboratory on the chorioallantoic membrane. The virus was found to persist in the blood of convalescents for 40 days and the presence of neutralising antibodies was also demonstrated. Dengue fever convalescent serum does not neutralise the sandfly fever virus.

A strain of variola virus, which after initial passage in monkeys had been stabilised by 42 passages in calves, was chosen for comparison with vaccinia virus. Cross agglutination, cross precipitation and cross complement fixation tests revealed no differences between the passaged variola strain and vaccinia virus. Protection tests also confirmed the above findings.

Epidemic Dropsy enquiry (laboratory section) at the School of Tropical Medicine, Calcutta.—Experiments were carried out on human volunteers to establish the association between the presence of argemone oil in mustard oil and the occurrence of epidemic dropsy. It is stated that the consumption of this adulterated mustard oil produces symptoms which cannot be distinguished from those occurring in epidemic dropsy. Animal feeding experiments were also in progress. The toxic effects of protopine, which was isolated from *Argemone mexicana* plants, were under investigation.

Epidemic Dropsy enquiry (field section) at the All-India Institute of Hygiene and Public Health, Calcutta.—Samples of mustard oil, which were incriminated on epidemiological grounds were collected from seven different centres in Bengal. Biological, chemical and physical experiments were carried out and simple differential tests have been developed for the presence of argemone oil in mustard oil. A white crystalline substance has been isolated from argemone oil and it satisfies, in high dilution, all the differential physical and chemical tests for this oil.

Kala-azar enquiry at the School of Tropical Medicine, Calcutta.—Studies in the bionomics of sandflies were continued in a village near Calcutta and data were collected regarding the incidence and survival rate of these flies. Therapeutic trials were carried out with solustibosan and a new pentavalent compound from Messrs. Parke Davis & Co. Sternum puncture was found to be a reliable method of diagnosis, although falling just short of spleen puncture in respect of accuracy.

Investigations of toxicological and medicolegal importance at the Medical College, Calcutta.—Postmortem investigations were carried out on the lead content of normal human tissues. Lead was found to be absent in the ovaries of six healthy women while in respect of another woman, with a history of exposure to lead poisoning, the ovaries contained 0.17 mg. of the substance.

The lead content of the common foodstuffs and of water supplies was also investigated. The lead content of Calcutta tap water and of wells and tanks in the suburbs of the city does not exceed 0.002 mg. while that of Glasgow is about 15 times higher (0.03). An outbreak of cattle poisoning was studied and hydrocyanic acid was detected in the stomach contents and viscera of some of these animals. The source of this poison was traced to feeding on the

flowering tops of the common linseed plant. Another investigation was that into the copper content of normal human tissues. It would appear that foetal tissues show a special affinity for copper.

Studies on bone-marrow, etc., at the Carmichael Medical College, Calcutta.—Postmortem specimens of bone-marrow were studied by histological examination. These specimens related to persons dying from various diseases.

Enquiry into secondary anæmias at the Carmichael Medical College, Calcutta.—Complete hæmatological examinations were carried out in cases of anæmia of various causes and types. Further, the euglobulin and pseudoglobulin as well as the ester and free cholesterol fractions in the blood of cases of idiopathic anæmia of pregnancy and of normal pregnancy were determined. Therapeutic investigations based on the biochemical findings were also carried out on white rats.

Enquiry into thrombo-angeitis obliterans at the Seth G. S. Hospital, Parel, Bombay.—With the object of studying the clinical manifestations of the disease, of assessing the importance of various exciting factors and of estimating the extent of arterial damage 29 cases were studied in detail. The pathological investigations included a detailed study of the various arteries of the body in a case that died and a routine examination of the arteries, veins, lymphatics and nerves of amputated limbs. The blood chlorides and excretion of chlorides in the urine were also investigated. Blood cholesterol and blood sedimentation rate were also studied. Hypertonic saline is stated to have a definite beneficial effect because, even after a single injection, there is considerable relief of pain.

Pharmacological investigation of oroxylin at the Seth G. S. Medical College, Bombay.—Oroxylin was extracted from the root bark of *Oroxylum Indicum* Vent., which is a root used in the ayurvedic system of medicine. It was found that the drug possesses only a slight depressant action on plain and voluntary muscular tissue.

Pharmacological enquiry at the Haffkine Institute, Bombay.—It has been shown that when plasmochin is administered, in doses equivalent to therapeutic doses in man, to female guineapigs at different stages of pregnancy, the placenta acts as a barrier and prevents the drug from passing through to the foetus except in very small quantities. The offspring of these pregnant guineapigs were kept under observation for two months and their growth and health did not differ from those of normals. These experiments suggest that therapeutic doses of plasmochin to the mother would probably cause no harm to the foetus. Investigations on the action of atebirin on the uterine movements of non-pregnant rabbits showed that therapeutic doses of this drug had very little effect on the movements of the uterus. On the other hand it was shown that atebirin could pass the placental barrier more easily than plasmochin.

Algæ enquiry at the King Institute, Guindy.—This investigation has been started with the object of studying (1) the seasonal changes occurring in the algal flora of water supplies and their relationship to the chemical constituent of the water and the meteorological conditions of the locality and (2) the influence of algal growths on modern methods of water purification. For this purpose representative samples were studied from the four chief sources of water supply in Madras Presidency, namely, (a) impounded reservoirs on the plains (b) upland surface water (c) rivers and (d) ground waters (for instance, spring or well) both from the point of view of their chemical composition and of the algal growths present in such waters.

Sandfly fever enquiry at the King Institute, Guindy.—The field work included sandfly surveys at Peshawar, field experiments to determine the minimum wind speed against which a sandfly could fly (1.6 to 1.7 miles per hour) and soil disinfestation work at Nowshera. An attempt was made to reduce the number of sandflies in an isolated building by intensive larvicidal measures. A 15 per cent solution of naphthalene in kerosene was liberally used for soil disinfection and the treatment was repeated after six weeks. Thereafter weekly catches of sandflies were made by collectors from this area and from a control area and the results showed no appreciable reduction in the number of flies in the experimental area. The most satisfactory preventive method appears to be the obliteration of all places likely to shelter the developing fly. Work on these lines has been carried out at Landi Kotal and Peshawar for many years past and has resulted in a marked decrease both in the number of sandflies and in the number of cases of the fever.

Experiments carried out by spraying rooms with a 5 per cent "Lethane" solution by means of a "Phantomyst" atomiser showed that the solution is definitely insecticidal.

Laboratory work included the examination of 180 specimens of serum from sandfly fever patients during both the febrile and convalescent stages. The virus was present in the blood regularly for 7 days and in a few cases even up to five weeks. Serial intraperitoneal and intracerebral passages of the virus through mice failed to increase its virulence. The virus was found to be non-pathogenic to monkeys. The cultured virus was used as a vaccine on human volunteers in order to determine its value as a prophylactic against sandfly fever. The results were inconclusive.

Endemic fluorosis enquiry at the King Institute, Guindy.—The incidence of mottled enamel in the teeth of children and of bone affections in adults was investigated in certain parts of Nellore and Bellary districts in Madras Presidency. Water samples from these areas were examined for their fluoride content. The toxic level of fluorine at which mottling of teeth occurs appears to be in the neighbourhood of one part of fluorine per million parts of water. Seventyfour per cent of the children in the area surveyed showed mottling of enamel, of whom 23 per cent were mild, 20 per cent moderate and 31 per cent severe mottling. Among adults 74.4 per cent showed bone affections, the sex incidence being 75.2 per cent in men and 73.6 per cent in women. Men engaged in pursuits involving light manual labour (clerks, teachers, merchants etc.) showed a smaller incidence of bone lesions than agriculturists and others doing hard manual labour. Judged by length of residence, the incidence of bone affections appeared to be higher in adults who had resided in the area for over 15 years than in those who had resided for a shorter period.

Laboratory experiments were carried out with various chemicals for the removal of fluorides from water. Tricalcium phosphate and defluorite alone appeared to be promising in this respect and further work is in progress.

Snake venom enquiry at the University College of Science and Technology, Calcutta.—Investigations were carried out on (i) enzymes in snake venom (ii) isolation of the toxic constituents of snake venom (iii) action of reducing agents on snake venom and (iv) diffusion and cataphoresis of snake venom.

Investigation into the ætiology of infantile biliary cirrhosis with special reference to anæmia at the Medical College, Madras.—Twentyone infants between the ages of six months and two and a half years with hepatic and splenic

enlargement were examined. As there is no single test for differentiating the disease from many other diseases in the tropics causing enlargement of the liver and spleen in children, the study was carried out on a wide basis including blood tests, cultural and microscopic examination of urine and fæces, treatment with insulin and glucose or acetyl-choline or zinc salts etc., on selected patients, attempts to isolate a virus as the etiological factor and investigation of the possible rôle of castor oil in the production of the disease. No findings of importance were reported.

Researches on flies at the School of Tropical Medicine, Calcutta.—The natural and seasonal breeding habits of domestic flies were studied in Calcutta and its immediate outskirts.

Research work in Medical Colleges.

79. A considerable amount of research work was carried out in the different medical colleges of the country and the following paragraph gives a brief summary of these activities.

Seth Gordhandas Sunderdas Medical College, Bombay.—The investigations carried out included (1) a study of balanced diets, (2) basal metabolism in children and adults in Bombay Presidency, (3) pharmacological investigations of oroxylin, (4) thrombo-angeitis obliterans (5) calcium metabolism in health and disease, (6) the toxæmias of pregnancy, (7) the incidence of the different types of pneumococcal infection in Bombay, (8) virulence of *M. tuberculosis* (9) diet surveys in Bombay and (10) a study of spirochætal jaundice and some others.

Medical College, Patna.—The researches carried out at this college included (1) an investigation into the incidence of syphilis in Bihar and its varied clinical manifestations, (2) a study of the chemical structure and pharmacological action of sympathetic stimulants and parasympathetic stimulants, (3) an enquiry into the vitamin C content of some germinated cereals and pulses, and (4) an estimation of manganese content of some Indian foodstuffs.

Medical College, Madras.—Among the researches carried out were included (1) an investigation of the phenomenon of Vi-agglutination on the sera of positive cases of typhoid fever ; (2) biochemical investigations in respect of eclampsia patients ; (3) a study of the epidemiology of infantile cirrhosis of the liver ; (4) an investigation into the etiology and pathology of lymphadenopathies of obscure origin and lymphogranuloma inguinale ; (5) an investigation into the use of dogs for the bioassay of digitalis, which showed that dogs, which are relatively less costly than cats, can be used equally well for this purpose ; (6) a study of the effects of extreme anæmia on the heart and of the "HCL" content of gastric juice in all cases of anæmia ; and (7) an enquiry into the efficacy of gonadotropic hormones in the treatment of whooping cough, which is stated to have confirmed the fundamental rôle of the sex hormones in the causation and prevention of this disease described by investigators abroad.

Grant Medical College, Bombay.—Ultra-violet therapy for two external diseases of the eye, namely, trachomatous keratitis and pannus, is reported to have given encouraging results. Injection of tartar emetic is stated to have favourable results in cases of trachoma. Other researches included (1) observations on the relation of calcium to the clotting time of blood, (2) investigation of fæcal carriers during a typhoid epidemic, (3) work on the suprarenal cortex

in relation to fall of blood pressure after the stimulation of arterioles by substances like pituitrin, (4) studies in hæmolysis, (5) the constituents of blood in health and disease and (6) studies in basal metabolism.

Faculty of Medicine, University of Lucknow.—Mention was made last year of investigations on the pharmacological action of *Mica bhasm*. This piece of research work is reported to have been almost completed and the conclusion drawn is that, though the drug is reported to be of great benefit for chronic bronchitis and asthma, yet animal experiments did not show any antispasmodic or depressant action on the muscles. The drug has also been tried clinically on human patients without relief. In the Ophthalmology Department, investigations on the etiology of glaucoma and spring catarrh were carried out. Other researches were (1) the effects of fats and other articles of diet on the excretion of bile in cases of cholecystostomy and choledochostomy and (2) a detailed study of cases of surgical tuberculosis including the history of patients with special emphasis on dietetic habits, social and economic conditions, the type of tubercle bacillus, residence of the patients with reference to hygienic surroundings and level of subsoil water and source of infection.

King Edward Medical College, Lahore.—The main researches carried out in this institution were those financed by the Indian Research Fund Association and they have been described in the section devoted to the work of the Association.

Medical College, Calcutta.—In the Department of Chemistry investigations were in progress on (1) the influence of dietary carotene on the carotene and vitamin A content and Reichert and Iodine values of butter fat with special reference to seasonal variations, (2) the nutritive value of ghee and its industrial possibilities in Bengal, (3) the toxicology of the linseed plant, (4) a new method for the detection of small quantities of cocaine in the presence of novocaine, (5) the copper content of normal human tissues and (6) the lead content of common Indian foodstuffs. In the Department of Physiology the vital capacity of Bengalees was investigated. The action of carpaine hydrochloride was investigated in the Department of Pharmacology. It was shown to be extremely toxic to *E. histolytica*. It has but transient effect on the circulatory and respiratory systems and this alkaloid is now being tried for the treatment of amœbic dysentery.

The Department of Pathology published a number of papers of which "Observations on the dysenteric conditions among Europeans in Calcutta" deserves special mention.

The Chest Department of the Medical College carried out investigations on (1) the basal metabolism of pulmonary tuberculosis cases with a view to determining their dietetic requirements, (2) vital capacity in chest diseases and (3) bronchiectasis, its etiology, pathology, diagnosis, prognosis and treatment. In the Department of Ophthalmology investigations were in progress regarding the etiology of superficial punctate keratitis. The Department of Obstetrics and Gynæcology carried out a series of clinical studies on subjects such as ectopic gestation, treatment of puerperal infection, blood pressure in pregnancy, hyperemesis gravidarum and gonococcal vulvo-vaginitis of children in Bengal.

Carmichael Medical College, Calcutta.—Investigations were carried out on (1) the chemotherapy of tumours (2) diabetes (3) cholera and choleraic vibrios and (4) the histopathology of cholera.

PASTEUR INSTITUTES.*

Pasteur Institute of India, Kasauli.

80. The total number of patients treated at the Institute and in 194 centres attached to it was 30,474, an increase of 2,398 compared with the previous year. The vaccine employed for treatment is a carbolised 5 per cent Paris sheep brain vaccine. There were two deaths among the Asiatics treated at the Institute and 68 deaths among Asiatics treated at the centres. Amongst the Europeans treated, three deaths took place. There were four definite cases and one doubtful case of post-treatment paralysis amongst the total patients. They all eventually made good recoveries.

The research work carried out at this Institute during the year under review has been summarised at page 152

Pasteur Institute, Calcutta.

81. The total number of patients who attended the Institute during 1938 was 2,873 compared with 3,008 in 1937, a decrease of 135. On the other hand, the number of courses of treatment issued to the centres attached to the Institute was 6,373, an increase of 681 treatments over that for the previous year. Forty-eight deaths were reported during the year. Of these seven at the Institute and one at a centre arrived with symptoms of the disease. Of the remaining 40 deaths nine deaths took place within 15 days of the completion of the treatment.

Pasteur Institute, Patna.

82. The number of patients treated at the Institute and its 11 centres was 4,971, an increase of 553 over that of 1937. The vaccine used was 5 per cent carbolised sheep brain vaccine, the Paris strain of fixed virus being used for its manufacture.

As in previous years the months of January and July showed a higher incidence of dog bites than the other months of the year. The percentage of bites from jackals is comparatively higher among Asiatics than amongst Europeans, and higher risk appears to be involved in jackal bites than in the

*Details of the work of the various Pasteur Institutes mentioned will be found in the following publications :—

1. Pasteur Institute of India, Kasauli—38th Annual Report of Central Committee of the Association and the Report of the Director of the Institute for 1938-39.
2. Pasteur Institute, Calcutta.—Annual Report of the Calcutta School of Tropical Medicine and the Carmichael Hospital for Tropical Diseases for 1938. Obtainable from the Director, School of Tropical Medicine, Calcutta. (Gratis).
3. Pasteur Institute, Patna.—The 10th Annual Report of the Pasteur Institute, Patna for 1938. Superintendent, Government Printing, Bihar, Patna.
4. Pasteur Institute of Southern India, Coonoor.—Annual Report of the Director for the year ending 31st December 1938, together with the 32nd Annual Report of the Central Committee of the Association for the year ending 31st March 1939.
5. Pasteur Institute, Bombay.—Report of the Haffkine Institute for the year 1938. Superintendent, Government Printing and Stationery, Bombay.
6. Pasteur Institute, Shillong.—The Twentysecond Annual Report of the King Edward VII Memorial Pasteur Institute and Medical Research Institute, Shillong for the year 1938.

bites of dogs. More lick cases came for treatment from among Europeans than Asiatics. This shows that there is greater recognition of the danger involved in the lick of a rabid dog among Europeans than among Indians.

The research work carried out at this Institute related to (1) changes in the formed elements of blood subsequent to the completion of a course of antirabic treatment, (2) investigation of cerebrospinal fluid in fixed virus rabies, with special reference to pH, protein content, sugar content and cytology and (3) the effect of the sulphanilamide group of drugs on fixed rabies virus in vitro and in vivo.

Pasteur Institute of Southern India, Coonoor.

83. A total of 12,396 patients was treated at the Institute and in subsidiary centres during the year. Paris virus was exclusively used in the preparation of the vaccine, which is a 5 per cent carbolised sheep brain suspension prepared by Semple's method.

The total number of deaths from rabies among the treated cases (complete and incomplete) was 20 giving a mortality rate of 0.17 per cent. Of these 20 deaths, 8 or 0.07 per cent occurred among the patients who had received the full course of treatment and 12 or 0.49 per cent among those who did not take the complete course. In the latter group seven patients developed rabies while receiving treatment and the other five deaths occurred among persons who left before treatment was finished.

Antirabic treatment for animals is steadily gaining ground. During the year, 40,831 c.cs. of 5 per cent carbolised vaccine were issued for the treatment of animals, chiefly to veterinary hospitals in Madras Presidency and the neighbouring Indian States. The number of animals treated was 561 (of which 478 were dogs) compared with 525 in the previous year. During the sixteen years' period, 1923-38, the total number of animals which had received antirabic treatment was 4,190 and among them 94 deaths took place giving a mortality rate of 2.24 per cent.

The main researches carried out in this Institute were financed by funds from the Indian Research Fund Association and they have been described in the section relating to that Association. Other researches included different methods of cultivating the rabies virus and an investigation of a strain of rabies isolated from a jackal infected in nature. This virus was found to be pathogenic for fowls. By repeated passages this virus was "fixed". This fixed jackal virus was found to be highly pathogenic to other animals. Rabbits and guinea-pigs developed symptoms from 2 to 3 days after inoculation and died within 24 hours of the onset of symptoms. Pigeons developed symptoms of rabies within three days and died on the same day on which symptoms became apparent. These findings are a marked contrast to the results obtained after the inoculation of fowls with the strain of Paris fixed virus used in the preparation of the antirabic vaccine of this Institute. Using the latter strain one fowl died of rabies eight months after intracerebral inoculation and another 11 months after the introduction of the virus by corneal scarification.

Pasteur Institute, Bombay.

84. During the year 3,405 persons applied for antirabic treatment at the Institute of whom 2,740 completed the full course of treatment with a death rate from hydrophobia of 0.1 per cent. A total of 7,739 antirabic treatments was issued to the centres attached to the Institute and 167 brains were received for examination. Of these 115 or 68.9 per cent proved positive and 49 or 29.3 per cent gave no evidence of rabies and three or 1.8 per cent were received in a state unfit for examination.

Pasteur Institute, Shillong.

85. In all 2,232 persons applied for treatment at Shillong and its centres and of them 1,875 completed the treatment. Among these completed cases 12 deaths took place from hydrophobia, giving a percentage mortality of 0·64. No case of paralysis following treatment was reported during the year.

Treatments were supplied for 38 dogs and five cows. A history card for dogs is now supplied with each treatment. An attempt is made to obtain some information regarding the results of treatment of these animals. Between 1933 to 1938, the number of dogs treated has steadily risen from 23 in 1933 to 299 in 1938. At the same time the cost of a course of complete treatment was reduced from Rs. 5 to Rs. 2·8-0. In the course of a few years, in view of the steady increase of the dog population treated, sufficient information will become available for evaluating the results of prophylactic treatment of dogs.

SECTION IX.

HEALTH OF JAILS IN INDIA.

General.

86. The statistical data presented in this section relate to British India.

The figures relating to the numerical strength of prisoners, accommodation available, admissions to hospitals, deaths, and expenditure are available for all the jails in India. In regard to the prevalence of specific diseases, however, only district and central jails provide the relevant statistical material in respect of all the provinces. It is therefore convenient to present the discussion in two paragraphs, *viz.*—

- (i) all classes of jails,
- (ii) district and central jails.

The figures relating to the Andamans form a separate paragraph in this section.

Jails of all Classes.

87. *Population, accommodation and overcrowding.*—Table IX (i) sets out information relating to accommodation and daily average population of prisoners in all classes of jails in each province, for the year 1938. Figures relating to 1937 are also given for the purpose of comparison.

TABLE IX (i).

Province.	Authorised accommodation, excluding hospitals and observation cells.		Daily average population.	
	1937.	1938.	1937.	1938.
N.-W. F. P.	5,263	5,263	6,227	5,757
Punjab	15,013	14,713	20,431	19,660
U. P.	32,150	32,523	29,782	28,768
Bihar	12,987	13,013	11,029	10,896
Orissa	2,257	2,257	1,733	1,666
Bengal	16,351	15,911	21,331	19,006
C. P.	6,538	6,515	4,942	4,522
Bombay*	14,983	15,805	8,865	8,518
Sind	5,142	5,205	4,663	4,675
Madras	18,575	18,720	14,718	13,140
Assam	3,772	3,772	3,566	3,304

The figures for authorised accommodation, excluding hospitals and observation cells, do not show any marked variation when compared with those of the previous year. A satisfactory feature of the daily average population figures for 1938 is that in all provinces, except Sind, a decrease was recorded. In spite of this, the authorised accommodation continued to be less than the average daily population in N.-W. F. P., the Punjab and Bengal.

*Including Dharwar Borstal School.

In the Punjab the figures for accommodation and daily average population were 7,136 and 8,791 for the four central jails while for the 18 district jails, including a camp jail, these figures were 6,164 and 8,833 respectively. In the 11 sub-jails the corresponding figures were 1,413 and 2,036. It is thus clear that, in all the different classes of jails, overcrowding continued to exist, although the fall in prison population in 1938 helped to relieve the congestion to some extent.

In the United Provinces, a decrease in the average daily population occurred due to premature releases, which were ordered by the Government towards the close of 1937. There was overcrowding in the mental wards and great difficulty was experienced in accommodating lunatics. The majority of jails in the United Provinces remained overcrowded, the reasons being labour strikes, Shia-Sunni disputes and communal riots. Heavy monsoon rains and floods in the United Provinces were responsible for damage done to most of the jail buildings, which were of a temporary nature. The main walls and the enclosure walls of several jails collapsed and the accommodation of the prisoners in these jails presented a serious problem.

Although no separate jail exists for female prisoners in Bihar, under the existing arrangements, all habitual female convicts are confined separately at Bhagalpur Central Prison.

Overcrowding was reported to be serious in the undertrial wards in Bengal and particularly in the central jails. The maximum accommodation available for undertrial prisoners was for 2,550 persons while the maximum number confined on a single day was 5,587.

In Bombay, from 1936 onwards, there has been a steady increase in the authorised accommodation and a decline in the average daily population. There is no indication of overcrowding in this province.

The total figures relating to Sind do not show any overcrowding. In the undertrial barracks, however, overcrowding did exist and it is expected that this congestion will be remedied on the completion of a new central prison.

The daily average population of Madras jails steadily declined during the past few years, the figures from 1935 to 1938 being 16,375, 15,967, 14,717 and 13,140 respectively. It is also satisfactory to note that the authorised accommodation was increased from 18,575 in 1937 to 18,720 in 1938. Premature releases of 1,503 convicts were ordered but the daily average figures failed to show a corresponding reduction because of the additions to the prison population due to the anti-Hindustani movement, enforcement of the Prohibition Act and recurrence of labour strikes.

In Assam the accommodation for the mentally defective presented serious difficulties. The accommodation provided in Tezpur Mental Hospital was inadequate and certified lunatics had to be detained in other jails for prolonged periods. In some jails it was impossible to confine the lunatics in separate cells and certified lunatics had therefore to be accommodated in barracks along with other convicts. The provision of increased accommodation in Tezpur Mental Hospital is reported to be an imperative necessity. The Assam Government had under consideration a scheme for the conversion of Nowgong district jail into a juvenile jail for the province. The scheme when put in operation will fulfil a much needed advance in jail arrangements. There was no overcrowding in the larger jails but the jails at Karimganj, Dhubri, Habiganj, North Lakhimpur and Gauhati were overcrowded for a considerable period during the year.

Constantly sick.—Table IX (ii) gives the daily average number of constantly sick and the sick rates per 1,000 among all classes of prisoners in the different provinces for 1937 and 1938. The constantly sick rates have been calculated per 1,000 of the daily average population.

TABLE IX (ii).

Province.	Average numbers of constantly sick.		Constantly sick rate per 1,000.	
	1937.	1938.	1937.	1938.
N.-W. F. P.	140	130	22	23
Punjab	435	334	21	17
U. P.	536	497	18	17
Bihar	255	209	23	19
Orissa	46	33	27	20
Bengal	761	676	36	36
C. P.	43	64	9	14
Bombay*	137	146	15	17
Sind	96	89	21	19
Madras	200	176	14	13
Assam	78	78	22	24

The majority of the provinces show a decrease in the constantly sick rate. The provinces for which the rate shows a rise are N.-W.F.P., C.P., Bombay and Assam. Bengal still continues to show the highest sick rate in India and during the past few years there appears to have been no indication of a decline in the rate. The Central Provinces which showed the lowest rate, *viz.*, 9 per 1,000 in 1936 and in 1937, recorded a rise to 14 *per mille*. Madras had in 1938 the lowest rate among the provinces.

Admissions to hospitals and deaths.—In table IX (iii) are set out the annual hospital admissions and deaths for all classes of jails for 1937 and 1938. The admission and death figures have also been presented as rates per 1,000 of the average daily population.

TABLE IX (iii).

Province.	Admissions.				Deaths.			
	Number.		Rate per 1,000 of average strength.		Number.		Rate per 1,000 of average strength.	
	1937.	1938.	1937.	1938.	1937.	1938.	1937.	1938.
N.-W. F. P.	2,545	2,229	409	387	77	43	12	7
Punjab	9,371	8,439	459	429	177	113	9	6
U. P.	13,464	12,338	452	429	230	203	8	7
Bihar	4,219	3,932	383	361	143	108	13	10
Orissa	935	690	540	414	13	26	8	16
Bengal	19,198	17,657	900	929	234	194	11	10
C. P.	1,138	1,571	230	347	84	93	17	21
Bombay*	4,676	4,937	527	580	82	74	9	9
Sind	3,426	3,341	735	715	64	60	14	13
Madras	4,165	4,295	283	327	146	96	10	7
Assam	1,411	1,155	396	350	55	64	15	19

*Including Dharwar Borstal School.

Decrease in admission rates has occurred in all provinces except in Bengal, C. P., Bombay and Madras. The death rates have shown a rise in the case of Orissa, C. P. and Assam. The C. P. death rate, which was the largest of all the provincial rates in 1937, rose from 17 *per mille* in that year to 21 *per mille* in 1938. The death rate in Orissa doubled itself from 8 in 1937 to 16 in 1938. The causes of these wide variations lie, in many cases, in outbreaks of epidemics in selected jails in each province. The mortality from the chief diseases is discussed in a later paragraph. Decreases in the death rate occurred in N.-W. F. P., Punjab, U. P., Bihar, Bengal, Sind and Madras. The Punjab recorded the smallest death rate.

Weight of prisoners.—In table IX (iv) are set out the percentages of those prisoners (a) who gained in weight, (b) who showed no change and (c) who showed loss of weight at the time of release from jail. Figures for 1937 are also shown for purposes of comparison.

TABLE IX (iv).

Province.	Gained weight.		Stationary.		Lost weight.	
	1937.	1938.	1937.	1938.	1937.	1938.
N.-W. F. P.	59	49	32	43	9	8
Punjab	45	49	45	44	10	7
U. P.	60	56	30	34	10	10
Bihar	56	54	31	32	13	14
Orissa	62	62	27	28	11	10
Bengal	47	47	38	38	15	15
C. P.	68	63	24	28	8	9
Bombay	58	50	23	32	19	18
Sind	41	50	30	17	29	33
Madras	63	64	28	32	9	4
Assam	56	57	28	28	16	15

The following table IX (v) sets out the percentages of loss of weight for the last fifteen years in the different provinces. If these percentages are taken as negative indices of the trend of the health condition of prisoners this table is valuable for assessing the progress made in the health administration of provincial jails.

A comparison of these rates between the provinces might not be justified because the age compositions of the respective jail populations might vary considerably from province to province. It is perhaps more justifiable to compare the percentages for each province during this period of 15 years because there is little reason to assume that abnormal variations in age of the prisoners would have taken place during this short period of time. The decrease in the rate is well-marked in the case of N.-W. F. P. and to a less extent in the Punjab and Assam. In Bombay and Bihar and Orissa, there is no clear indication of a decline in the rate till 1936 when Sind became separated from Bombay and Orissa from Bihar, but the separate figures recorded for Sind and for Orissa from 1936 onwards seem to suggest that Bombay and Orissa might have had lower rates than the other two provinces. The other provinces show no evidence of any definite decrease in the rate, the figures for U. P. even suggesting that there might have been a slight worsening of the situation during recent years. Similar studies by provincial health authorities in respect of the jails within each province might be useful for focussing attention on backward jails.

Dietary, hospital, clothing and bedding and sanitation charges.—Table IX (vi) gives details of *per capita* expenditure in 1937 and 1938 on dietary, hospital, clothing and bedding and sanitation. The figures have been calculated on the average daily jail populations.

TABLE IX (v).

Percentage of prisoners who lost weight on release from jail.

Province.	1924.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.			
N.-W. F. P.	29	26	24	19	15	14	14	16	12	12	7	8	11	9	8			
Punjab	15	15	13	12	11	12	9	9	11	9	8	9	11	10	7			
U. P.	8	7	8	8	8	8	9	12	12	11	10	10	11	10	10			
Bihar	} 14	} 14	} 15	} 16	} 17	} 18	} 16	} 13	} 16	} 16	} 19	} 14	} 12	} 13	} 14			
Orissa																9	11	10
Bengal																12	15	15
C. P.	11	10	11	9	10	13	9	11	12	12	12	9	11	8	9			
Bombay	} 23	} 22	} 22	} 24	} 23	} 22	} 26	} 25	} 23	} 22	} 24	} 22	} 18	} 19	} 18			
Sind																30	29	33
Madras	10	9	8	6	6	8	9	6	5	7	7	8	8	9	4			
Assam.	21	21	19	15	15	15	14	14	14	13	12	14	13	16	15			

TABLE IX (vi).

Province.	Dietary charges per head.			Hospital charges per head.			Clothing and bedding charges per head.			Sanitation charges per head.														
	1937.		1938.	1937.		1938.	1937.		1938.	1937.		1938.												
	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.												
N.-W. F. P.	35	9	0	34	3	2	5	4	8	5	4	11	11	7	6	9	3	5	1	3	10	1	6	9
Punjab	35	1	11	29	3	5	4	7	9	3	4	2	7	11	9	7	15	10	2	5	9	2	12	8
U. P.	29	1	11	27	12	2	2	3	8	2	1	2	3	10	1	4	4	3	1	8	6	1	10	1
Bihar	36	9	5	38	5	0	5	5	10	6	2	0	5	13	0	6	14	0	2	11	3	2	8	0
Orissa	36	11	1	35	14	9	5	12	1	6	8	6	6	5	2	6	8	7	1	14	11	2	4	11
Bengal	39	8	0	41	13	0	7	9	0	8	14	0	3	10	0	5	0	0	3	4	0	4	3	0
C. P.	30	13	2	30	2	3	4	8	1	5	0	1	6	2	2	8	13	1	0	14	5	0	13	7
Bombay	43	1	5	39	0	0	1	10	8	1	9	5	3	8	5	4	4	1	7	9	2	7	1	2
Sind	39	0	3	39	10	4	2	13	4	2	4	3	5	6	5	9	9	11	3	1	7	4	3	5
Madras	40	1	5	44	5	10	3	6	2	3	3	3	5	4	11	4	7	10	3	8	4	3	12	10
Assam	33	15	3	34	15	5	4	1	6	4	7	6	4	10	3	6	4	6	0	11	9	1	0	1

On comparing the figures for 1937 and 1938 it will be seen that there are variations in respect of the *per capita* charges under the various heads. Provincial reports show that the fall in the charges was in many cases due to price changes while increases were due to improvements introduced by the authorities, such as the supply of separate towels to prisoners and of supplements to the usual diet, including meat, fish, milk and butter milk.

District and Central Jails

88. Figures for diseases for all provinces are available only in regard to the prisoners of district and central jails. The attacks and deaths from the principal causes of sickness in the district and central jails of individual provinces are given in appendix VIII. The figures of daily average population corresponding to these figures are also shown. A consolidated statement is presented in table IX (vii) below.

TABLE IX (vii).

	1937.		1938.	
	Admissions*	Rate per mille.	Admissions.	Rate per mille.
Malaria	14,205	122	12,383	113
Dysentery	3,533	30	3,999	37
Respiratory diseases*	3,764	32	3,229	30
Influenza	3,659	31	3,212	29
Diarrhoea	1,950	17	1,524	17
Pyrexia of uncertain origin	922	8	1,099	10
Pneumonia	1,127	10	933	9
Tubercle of the lungs	588	5	716	7
Enteric fever	236	2	301	3
Smallpox	33	0.3	25	0.2
Cholera	11	0.1	17	0.2

It will be seen that, with respect to a number of the diseases given in the above table, the admission rate has fallen in 1938 as compared with 1937. Malaria incidence among the jail population has shown a steady decrease during the past three years, the rates of admission during 1936, 1937 and 1938 being 150 *per mille*, 122 *per mille* and 113 *per mille*, respectively. The low incidence of epidemic diseases like smallpox and cholera indicates that the general standard of sanitation in the jails was high.

The chief causes of mortality are shown in Table IX (viii).

TABLE IX (viii).

	1937.		1938.	
	Deaths.	Rate. per mille	Deaths.	Rate. per mille
Pneumonia	236	2.0	195	1.8
Tubercle of the lungs	208	1.8	177	1.6
Dysentery	92	0.8	81	0.7
Respiratory diseases*	42	0.4	53	0.5
Anæmia and debility	32	0.3	33	0.3
Enteric fever	30	0.3	26	0.2
Malaria	44	0.4	24	0.2
Diarrhoea	21	0.2	17	0.2
Influenza	35	0.3	10	0.1
Cholera	3	0.03	3	0.03
Pyrexia of uncertain origin	4	0.03	2	0.02
Smallpox	2	0.02	1	0.01

* Excluding pneumonia and tubercle of the lungs.

While malaria claims the largest number of patients among the jail population its mortality rate is definitely lower than those of many of the diseases shown above. Pneumonia and tubercle of the lungs have contributed the largest rates of mortality.

Some brief comment may be made in respect of the more important diseases.

Cerebrospinal meningitis.—The disease was absent in the jails of all provinces except the Punjab and Bengal. In the Punjab its incidence was much less than that of the previous year, only 5 attacks being recorded in 1938 as compared with 41 during 1937. All the five cases proved fatal. The jails which were affected were the Borstal Institution at Lahore and the district jails at Multan and Ferozepur. Three cases were recorded in the Alipore Central Jail in Bengal but none proved fatal. One fatal case took place at the Krishnagar Jail.

Malaria.—In the Punjab the number of admissions due to this disease fell from 2,383 in 1937 to 1,607 in 1938. There was only one death as compared with 7 during 1937. An antimalarial campaign by the destruction of larvæ and administration of quinine was vigorously carried out and plasmochin and atabrin were used with success for treatment. In U. P. the number of admissions fell from 3,723 in 1937 to 3,396 in 1938. The number of deaths also decreased from 5 to 2. In Assam there was an appreciable decrease in admissions but the jails at Dhubri, Gauhati, Tezpur, Jorhat and Mangaldai recorded large figures for attacks from malaria, although only a single death took place among the prisoners in the province. Antimalarial measures were carried out in all jails in Madras and hospital admissions and deaths dropped from 213 and 4 in 1937 to 198 and 2 respectively in 1938. Its incidence was the highest in Bellary, followed by Coimbatore and Rajahmundry. The two deaths recorded during 1938 occurred in the Central Jail, Rajahmundry. In C. P. the number of admissions increased from 230 in 1937 to 335 in 1938. In Sind there were 1,015 admissions and 1 death as against 1,110 admissions with no death in 1937. Abnormally large admissions were recorded in Sukkur district prison and this was attributed to an increased prevalence of mosquitoes in the surrounding area. Spraying of the barracks and cells with pyrocid 20 was continued at Hyderabad Central Prison, Sind. Orissa recorded a higher incidence than that during 1937, the figures for attacks being 56 in 1938 as against 33 in 1937. Bombay recorded 930 cases with 2 deaths in 1938 as against 841 cases and 3 deaths in 1937. This increase was largely contributed by Yeravda Central Prison and Bijapur Prison where epidemics of malaria took place after heavy rains late in the monsoon season. Bihar recorded a decrease in incidence from 500 cases and 3 deaths in 1937 to 436 cases and 3 deaths in 1938. In Bengal, the incidence of malaria dropped from 3,835 admissions and 17 deaths in 1937 to 3,418 admissions and 10 deaths in 1938.

Influenza.—As a cause of mortality influenza was of little importance, the total number of deaths due to this cause in all the jails of British India, excluding the Andamans, being 10 in 1938. Admissions due to influenza totalled 3,212. Sind reported no case of influenza while, among the other provinces, the rate of admission was the highest in Bengal (106) and the lowest in the Punjab (9).

Cholera.—The general absence of cholera in the jails of British India, in spite of a wide prevalence of the disease among the surrounding civil population in many provinces, is a welcome indication of the effectiveness of the precautionary measures undertaken by the authorities to safeguard the health of the prisoners. The total number of admissions from cholera was 17 in 1938

of which 15 were in U. P. and the other two in the Punjab and Sind. In U. P., the civil population experienced a widespread epidemic following the Hardwar *Kumbh Mela* but it is satisfactory to record that only two jails reported cases, the Naini Central Prison and the Gorakhpur District Jail.

Plague.—This disease was absent from all the jails in the provinces.

Dysentery.—The Punjab has recorded a steady decrease in hospital admissions and deaths from this disease during the last quinquennium. In 1934 there were 583 attacks and 11 deaths while the corresponding figures for 1938 were only 67 and 1 respectively. In U. P. there were 512 admissions and 7 deaths in 1938 as compared with 447 admissions and 4 deaths in 1937. In Assam cases of dysentery occurred in all jails except those in Shillong, Kohima, Aijal and South Sylhet. The total numbers of admissions and deaths showed decreases during 1938, the figures being 315 and 13 respectively as compared with 351 and 14 in 1937. In Madras Presidency the incidence of the disease showed no great variation as compared with the previous year, the figures for admissions and deaths being 289 and 6 in 1938 as against 264 and 7 during the previous year. In C. P. this disease showed a considerable increase, the admissions to hospital being 428 in 1938 as compared with 102 during 1937. The jails at Nagpur and Amraoti showed the largest numbers of admissions. In Orissa there was a slight fall in the incidence of the disease, the number of admissions in 1938 being 55 as against 69 in 1937. In Bombay presidency the total admissions due to dysentery decreased from 254 in 1937 to 177 in 1938, the Yeravda Central Prison, Rana District Jail and Ahmedabad Central Prison contributing the largest share to this decrease. In Bihar admissions due to this disease totalled 480 as against 435 in 1937, the Central Jail at Buxar and the District Jails at Motihari and Darbhanga having recorded the highest figures for admissions. In Bengal the incidence of dysentery showed an increase from 1,176 in 1937 to 1,498 in 1938.

Diarrhoea.—Except in U. P. and Bengal the figures for admissions and deaths from diarrhoea in the different provinces showed no great variations from those of the previous year. In U. P. admissions rose from 354 in 1937 to 420 in 1938 while in Bengal there was a corresponding fall from 858 to 644.

Pneumonia.—Admissions due to pneumonia in British India totalled 933, as compared with 1,127, in 1937. This represents a fall of 17 per cent. A comparison of the figures for the provinces shows that in all except Sind, the Central Provinces and Orissa, the incidence in 1938 was less than in 1937, noticeable decreases being recorded in Bengal (42·5 per cent), N.-W. F. P. (37·6 per cent) and Madras (33·3 per cent).

Tubercle of the lungs.—Admissions for tubercle of the lungs in British India, excluding the Andamans, rose from 588 in 1937 to 716 in the present year, marked increases being recorded in the Punjab (74·0 per cent) and Bengal (32·0 per cent).

In a number of provinces special provision exists for the accommodation of tuberculosis patients, a summary of which was given in last year's report. Comparative figures for individual provinces during 1937 and 1938 and for the quinquennium are given in the appendix to this section.

Special Remarks on Provinces.

89. The provincial jail administration reports make special mention of measures taken to improve the physical and mental well-being of the prisoners. In nearly every province improvements to the diet and clothing, the expansion of existing facilities for the education of adult and adolescent prisoners, the provision of libraries, of newspapers and periodicals and of radio sets were

among the measures adopted to improve the conditions of jail life. In some provinces, physical exercise and games, health lectures and instruction in first aid also played a part in the campaign to improve the health of the prisoners. Religious and moral instruction also received adequate attention.

N.-W. F. Province.—In this province the numbers of central, district and sub-jails during 1938 were three, three and two respectively. The year under review was, on the whole, a healthy year. The death rate from all causes *per mille* of the total strength of prisoners fell from 12·4 in 1937 to 7·5 in 1938. A striking decrease in the incidence of malaria has been recorded since 1936, the figures for that year, 1937 and 1938 being 926, 688 and 504 respectively. Pneumonia has also shown a steady decrease in incidence during the quinquennium, 1934-38, from 187 in 1934 to 45 in 1938. The funds allotted for the repairs and maintenance of buildings were inadequate but the Public Works Department has agreed to place at the disposal of the Jail Department funds at least equal to 3/8 per cent of the capital cost of jail buildings. Among the works executed during the year mention may be made of the electrification of the District Jail at Abbottabad, provision of concrete cement drain and floor in certain buildings attached to Dera Ismail Khan and the construction of a cook-house at Bannu Jail.

Punjab.—The numbers of central, district, sub-jails and camp jails during 1938 were four, 17, 11 and one respectively. There also existed a Borstal Institution and a special jail for female prisoners. A large number of important works was carried out at a total cost of Rs. three lakhs during the year. These included the construction of new cells, barracks, work and factory sheds, kitchens, new infectious wards, wells and quarters for warders and the electrification of a number of places.

The year 1938 recorded a further improvement in health and this may be attributed to the precautionary measures taken by the medical staff, such as fly destruction, fly proofing of all jail latrines, prevention of mosquito breeding and destruction of larvae, trapping of mosquitoes, prophylactic administration of quinine, smallpox vaccination of all prisoners, purification of wells, inoculation against cholera at the time of the *Kumbh Mela*, gargling parades, mass treatment for hookworm infection and lectures on health matters.

The Borstal Institution at Lahore continued to function as a combined jail for those convicted under the Borstal Act and a Star Jail for adolescent offenders. The year 1938 was healthy for this institution also.

United Provinces.—The numbers of central, district and juvenile jails at the beginning of 1938 were six, 49 and one respectively. Special features of the year under report included legislative and executive action taken by the Provincial Government to improve the administration of jails. Three Acts were passed, namely, (1) The United Provinces First Offender's Probation Act, (2) the United Provinces Borstal Act and (3) Prisoners' Release on Probation Act. Special Committees were appointed by the Government to prepare a programme of reforms in jails together with their financial implications. The United Provinces Discharged Prisoners Aid Society was formed and branches were opened for every district. The Inspector General of Prisons undertook a tour of the provinces of Bihar, Bengal, Orissa, Madras, Bombay, Central Provinces and Delhi in order to acquaint himself with the jail administration of these areas.

From the point of view of health, it is gratifying to note that, in spite of widespread epidemics among the general population, the health of the jails remained quite satisfactory and that the year under review recorded the lowest mortality rate for the past ten years. Additional water supply was provided in seven district jails and one central prison by the construction of new wells.

Bihar.—The numbers of central, district and juvenile jails in the province were four, nine and one respectively. A new subsidiary jail was opened at Madhipura thus bringing the total of such jails to 41. Criminal lunatics are confined in the Indian Mental Hospital at Ranchi but, owing to insufficient accommodation, some were transferred to Hazaribagh jail.

The daily average of juvenile prisoners was 219. The industries taught to them were carpentry, tin, masonry, cane work, gardening, and soapmaking. The year under review showed the lowest death rate ever recorded. A fall in mortality was noticed in all the central jails. Darbhanga jail showed the highest mortality, the death rate being 25 *per mille*.

Orissa.—The numbers of the district and sub-jails during 1938 were four and 26 respectively. There was no central jail in the province and the Cuttack District Jail was therefore used to confine life convicts and long term prisoners. There is at present no juvenile jail for the province but all such prisoners were accommodated in the jail at Angul. Criminal and non-criminal lunatics were confined in the Mental Hospital at Kanke. Among the sanitary works carried out during the year the important ones were the provision of *pucca* floor and sleeping berths in the Sambalpur jail and improved sanitary arrangements at the Cuttack jail. The general health of the prisoners was reported to be better during the year under review than in 1937.

Bengal.—The numbers of central, district and subsidiary jails in the province were six, 19 and 62 respectively. There were also a Borstal School and a special jail. A new central jail was constructed at Dum Dum.

The Bengal After-Care Association and Prisoners Aid Society continued to render good service to released adolescent prisoners of the Borstal School and juvenile prisoners of the Reformatory School. An industrial section was opened for the manufacture of cycle tyres, canvas, durries and carpets thus providing employment for Borstal boys who were released on license.

Central Provinces.—The numbers of central, district and subsidiary jails during 1938 were two, ten and nine respectively. Additional accommodation was provided in the Mental Hospital at Nagpur and it is not necessary now to confine criminal lunatics in other jails. The construction of a new jail subsidiary to the Narsinghpur Borstal Institution was nearing completion and it was expected that from 1939 all adult prisoners, who had to be kept in the Borstal Institution, would be transferred to this jail. Training was imparted in weaving, carpentry, pottery, button making, glass and board painting, agriculture and engine driving. Soapmaking was introduced during 1938.

The year 1938 was on the whole not a healthy year. There were outbreaks of dysentery in the Nagpur Central Jail. The highest death rate, 128 *per mille* in 1938 as against 58 in 1937, was recorded in the Betul jail which accommodates all aged and infirm prisoners. Akola jail had a death rate of 59 *per mille*.

Bombay.—There were four central prisons, six district prisons, 184 sub-jails and 283 lockups during 1938. A temporary prison at Worli was opened when communal riots broke out in Bombay in April 1938. A separate section for juvenile female offenders was opened in Yeravda Female Jail.

Considerable improvement was effected in regard to bathing and ventilation arrangements in the sub-jails and lockups. Various other improvements were introduced including the issue of instructions to prison medical officers to obtain a second medical opinion in cases of serious illness amongst the prisoners, the appointment of non-official members to the Committees of Visitors to central and district prisons, the supply of sheets to prisoners and the provision of electrically driven pumps for the wells of the Borstal Institution at Dharwar.

Sind.—In 1938 there were in Sind one central jail, two district jails, 58 sub-jails and one convict gang. This year was on the whole more healthy than the previous year. The prison with the highest death rate of 18·9 *per mille* was the Sukkur district prison. This high death rate was ascribed to the greater mortality from pneumonia on account of extremes of temperature in January and December. The formation of “spleen gangs” for the special observation and treatment of prisoners suffering from chronic malaria was continued. The dietary was revised and considerably enlarged. Samples of milk and *til* oil were subjected periodically to chemical analysis.

Madras.—The numbers of central, district and special jails and of Borstal institutions were the same as those at the end of 1937, *viz.*, nine, two, three and two respectively. Two new sub-jails were opened during 1938, thus making a total of 293 sub-jails in the province. The Government have drawn up a scheme for sending convicts belonging to criminal tribes to suitable settlements, where they have to work under the settlement manager for a period not less than the unexpired portion of their sentence. They are permitted to take their families to the settlement.

The District Jail, Cuddalore, continued to accommodate the mental defectives, recovered criminal lunatics and epileptics for special treatment. A proposal to convert this jail into a combined institution for youthful offenders and criminal lunatics was under the consideration of the Government.

Assam.—The number of jails showed no change from the previous year. All the jails are structurally defective inasmuch as they do not provide for the segregation of habituals from casuals. The standard of discipline maintained during the year was satisfactory.

Andamans.

90. The statistical data relating to the jail population of the Andamans have been discussed in two separate parts (1) those relating to the cellular jail and associated barracks and (2) those relating to *talabdars* and self-supporting convicts outside the cellular jail and associated barracks.

Cellular jail and associated barracks.—The average daily strength of prisoners in the cellular jail and associated barracks was 325. The maximum population on any one day was 478 while there was accommodation available for 802 persons. No overcrowding therefore existed in the jail or associated barracks during the year. The daily average number of sick persons was 9·4. This gives a rate of 29 per thousand of the daily average strength for 1938 as compared with 42 per thousand for 1937. Altogether 246 persons were admitted to hospital giving an admission rate of 760 per thousand of the average daily strength as compared with the rate of 1,205 per thousand in 1937. Deaths numbered four giving a rate of 12·3 per thousand as compared with a rate of 3·1 *per mille* in the previous year. Malaria as usual was responsible for the largest amount of sickness. Next in order came dysentery, respiratory diseases, and diarrhoea.

Talabdars and self-supporting convicts outside the cellular jail and associated barracks.—The daily average population numbered 5,683 males and 6 females as against 5,670 males and 10 females in the previous year. Among this class of prisoners a certain number is employed as servants under the staff and they are accommodated in the houses of their employers. Excluding these men, the maximum number requiring accommodation on any one day of the year was 3,563 while the daily average number was 3,183. The accommodation available for them in the barracks and cells allowing 50 superficial feet per person, was for a total of 3,667. It is therefore clear that no overcrowding existed during the year.

The average daily sick numbered 174.5 as against 140.0 in 1937, an increase of nearly 25 per cent. This was due to an increase in the incidence of Weil's disease, which necessitated prolonged detention of the prisoners in hospital. The numbers of daily sick persons per thousand of the average strength for 1936, 1937 and 1938 were 21, 26 and 31 respectively. Weil's disease was also responsible for an increase in the total mortality among this class of prisoners, the figure having risen from 58 in 1937 to 76 in 1938. Due to this cause alone there were 25 deaths as against 14 in 1937.

The following table sets out the admission and case mortality rates due to malaria for the last six years. The figures given include those relating to convicts confined in the cellular jail and associated barracks.

Year.	Total admissions for malaria.	Admission rate per mille of average strength.	Total deaths.	Mortality rate (per cent of cases).
1933	1,621	245	16	0.99
1934	1,497	260	9	0.64
1935	1,353	253	7	0.52
1936	723	110	3	0.41
1937	1,438	253	5	0.32
1938	1,164	205	3	0.25

While a consistent fall is evident in respect of the mortality rate, the admission rate has not, on the other hand, shown a corresponding or continuous reduction. However, the year under review has shown a welcome drop in the rate of incidence from 253 to 205 per thousand. The spleens of all new entrants in Port Blair were examined and the cases were given treatment before being sent to different settlements.

As stated previously there was an increased prevalence of Weil's disease in 1938. Hospital admissions and deaths both showed increases. The increase during the year under review was reported to have been caused by severe floods that occurred in December 1937 resulting in the destruction of a large number of rats. Although an attempt was made to have as many dead rats as possible collected and burnt, this measure could not be carried out effectively all over the settlement.

Dysentery was responsible for 133 admissions and four deaths during 1938 as compared with 122 admissions and four deaths in 1937. There was one sporadic case of enteric fever as compared with nine in 1937. A total of 126 cases of influenza of a mild type was reported during the year. These cases occurred mostly among new arrivals or among their contacts. Anæmia caused nine deaths and was responsible for 45 cases. These cases were secondary either to malaria, ankylostomiasis, or dysentery.

Major and minor operations performed during the year numbered 559 and 219 radiograms were taken. A total of 213 vaccinations against small-pox was performed of which 176 were successful, 10 were failures and for 27 vaccinations the results were not known.

The bacteriological laboratory carried out a large amount of useful work, including examination of blood slides, sputum, urine and fœces, Wassermann, Kahn's, Fontana's and Widal tests, cultural and other examinations for Weil's disease and examination of milk samples

Conclusion.

91. During the year under review the health of the jail population in British India was satisfactory and showed an improvement in comparison with the previous year. Excluding the Andamans, the death rate from all causes decreased from 10 *per mille* in 1937 to nine *per mille* in 1938 ; the constantly sick rate and hospital admission rate also showed reductions from 22 and 493 per 1,000 of the average strength to 21 and 479 respectively in 1938. As regards special diseases, influenza, malaria, pneumonia, other respiratory diseases and diarrhoea showed appreciable decreases in incidence. During the past few years the increasing control of malaria has been a conspicuous feature of provincial jail health administration and the year under review has shown a further reduction in the incidence of this disease in almost every province.

As regards the Andamans, the convict population has been divided into two groups, (1) those confined in cellular jails and associated barracks and (2) *talabdars* and self-supporting convicts. The following tabular statement gives the death rates from all causes, the constantly sick rates and the hospital admission rates for these two classes of prisoners during 1937 and 1938 :—

	Death rate.		Constantly sick rate.		Hospital admission rate.	
	1937.	1938.	1937.	1938.	1937.	1938.
Cellular jails .	3	12	42	29	1,205	760
<i>Talabdars</i> and self-supporting prisoners .	10	13	26	31	634	598

The death rates show relatively large increases in respect of both classes of prisoners. But these increases in the rates are of little significance because they represent only total increases of two and 18 deaths in the two types of prisoners. On the other hand, in the cellular jails both the constantly sick and hospital admission rates show definite decreases in 1938 as compared with the previous year while, in respect of *talabdars* and self-supporting prisoners, the hospital admission rate has shown a decrease. An increased prevalence of Weil's disease among this class of prisoners was responsible for the higher death rate and for the rise in the constantly sick rate. On the whole the figures shown above give no indication of any deterioration in the health of the prisoners in the Andamans.

SECTION X.

VOLUNTARY ORGANISATIONS.

Introduction.

92. Voluntary effort plays such an important part in the field of public health endeavour that a review of the health conditions in India cannot be complete without a brief survey of the activities of some of the more important of these organisations. Some of these institutions are of an all-India character, with branches in the provinces and Indian States, while others confine their activities to the provincial sphere or to the local areas in which they are situated. To the former class belong the Indian Red Cross Society, the Indian Council of the British Empire Leprosy Relief Association and the Mission to Lepers. In the provinces various organisations exist, some of which are mainly engaged in health propoganda while others combine health education with the provision for the people of the areas in which they work, of specific services such as those for maternity and child welfare.

Indian Red Cross Society.*

93. The Society continued its general peacetime activities and, in addition, provided assistance for the relief of sufferers from floods in Bengal and Assam, and from famine in the Hissar district of the Punjab. In the international sphere, in response to an appeal of the International Red Cross for the continuation of Red Cross relief operations in Spain, the Indian Red Cross Society made a monthly contribution of Rs. 250 during the last six months of the year under review and two provincial branches also made monthly contributions through the Society, making a total of Rs. 2,285 during the year.

In response to further appeals from the International Red Cross for relief work in China, the Society contributed Rs. 5,000 ; contributions by branches for the same cause amounted to Rs. 3,662. Again, on the receipt of further news of serious distress in China, the Society voted a sum of Rs. 1,500 and arranged to send a supply of drugs. The Society also issued an appeal, through the press, for funds and gifts of drugs and provisions for China.

One of the primary duties of the Society is to provide for medical and other aid for the sick and wounded in the event of war and the international crisis of September 1938 found the Society ready with a comprehensive plan embracing the activities of the Indian Red Cross Society, the St. John Ambulance Association and St. John Ambulance Brigade Overseas as an auxiliary to the army medical and nursing services in time of war. This important plan has been drawn up in consultation with provincial organisations and ensures the fullest possible coordination between headquarters and branches, when put into action. The Red Cross roll of trained nurses for war and disaster, which forms part of the mobilisation plan, had 68 nurses on the list.

Dr. Alice Pennell and Dr. Jean M. Orkney represented the Society as fraternal delegates to the sixth Biennial Conference of the National Council of Women in India held in Delhi.

To the XVIth International Red Cross Conference held in London, the Society sent a delegation under the leadership of Major-General E. W. C. Bradford, who submitted a report on the growth of the Indian Society in all fields, with a map illustrating its activities. The work of the Conference was distributed among four Commissions *viz.* the Legal Commission, the Relief

*Prepared from a note supplied by the Organising Secretary, Indian Red Cross Society.

Commission, the Educational Commission and the General Commission. The Indian delegation was represented on all the Commissions and made its contribution to the deliberations.

Both headquarters and branches continued to take a very active interest in the appeal made by Her Excellency the Marchioness of Linlithgow for the King Emperor's Anti-Tuberculosis Fund.

The branches of the Red Cross in India at the end of 1938 consisted of 26 provincial and State branches and of 265 district branches as compared with 25 and 241 respectively during 1937.

KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND.

The outstanding feature of the year was the successful appeal of Her Excellency the Marchioness of Linlithgow for the King Emperor's Anti-Tuberculosis Fund. Her Excellency in issuing the appeal stated that, if it was successful, the intention was to found a Tuberculosis Association for India, consisting of a central body supported by affiliated provincial and State organisations. The establishment of a comprehensive organisation with the help of the new fund marks an important step towards a more effective control of tuberculosis in India.

His Excellency the Viceroy was approached to sanction the separation of the King George Thanksgiving (Anti-Tuberculosis) Fund from the Indian Red Cross Society and to allow the transfer of the capital and balances of the Fund to the new Tuberculosis Association. His Excellency was pleased to sanction the reorganisation. Although the new arrangement has resulted in a formal separation of the two bodies the two will continue to work in close cooperation in the fields of education and prevention.

Fortyfive doctors received training at two post-graduate courses.

There was an extension of the Fund's educational activities in co-operation with various voluntary and social organisations. At the suggestion of the Fund the Indian Medical Gazette published a special Tuberculosis Number.

In the field of international relationships a new contact was established with the "Imperial Bureau" of the Empire Conference on the Care and After Care of the Tuberculous, and several provincial representatives took advantage of the facilities for study tours offered by the Bureau. With the help of the International Union against Tuberculosis a nominee of the Fund secured a scholarship at the Carlo Forlanini Institute, Rome.

MATERNITY AND CHILD WELFARE BUREAU.

The Committee of the Maternity and Child Welfare Bureau administered the funds of the Lady Chelmsford League, the Victoria Memorial Scholarships Fund and the Army Child Welfare Fund.

The funds of the Lady Chelmsford League were distributed mainly as grants-in-aid to health schools and welfare centres. The schools for health visitors in Delhi, Calcutta, Madras, Rangoon and the new school in Poona received grants as well as the Nursery School and Kindergarten, Mysore and the School of Mothercraft, Bareilly. A scholarship was provided for a woman medical graduate for the course of the Diploma in Maternity and Child Welfare at the All-India Institute of Hygiene and Public Health, Calcutta. A few additional grants were given direct from the funds of the Bureau to certain maternity and child welfare schemes, one of which was a grant towards the work of the Najafgarh Rural Unit.

The Victoria Memorial Scholarships Fund was distributed almost wholly as grants-in-aid for the training of *dais*. Grants were given to seven training schools. Other aided schemes give institutional and domiciliary training, or domiciliary training alone, the training being carried on in connection with welfare centres.

The Army Child Welfare Fund was distributed to 54 Indian and 26 British Army centres during the year under review. Army child welfare work owes much to the help and enthusiasm of voluntary workers and the progress in this field has been marked.

JUNIOR RED CROSS.

The activities of the Junior Red Cross for the promotion of health increased in all directions, specially in anti-epidemic and village improvement work. An essay competition on "Junior's mission in promoting the health of the community with special reference to tuberculosis" was organised for Junior Red Cross groups. Branches also organised a number of Junior Red Cross competitions and rallies. Considerable interest was shown in the Junior Red Cross movement in the provinces, particularly in the Punjab, Bombay, the Central Provinces and Madras. A successful conference of Bengal Junior Red Cross Counsellors was held in Calcutta. A number of Junior Red Cross publications was prepared in Hindi and Urdu. One hundred and seventyone albums were received and 94 were sent out during 1938; the quality of exchange albums showed considerable improvement and they were appreciatively commented upon by the League of Red Cross Societies, Paris.

The campaign for the prevention of blindness was continued and courses of lectures in teachers' training institutions were given in Assam, Bangalore, Baroda, Bengal, Bombay, the Central Provinces, Delhi, Hyderabad, Kotah, Orissa, Rajputana, Sind, Trāvancore and the United Provinces. Pamphlets on the subject in Indian languages, lantern slides, posters and literature were distributed and material for a radio talk was supplied for a broadcast from the Delhi station.

Propaganda and Publicity.—The activities under these heads were of a varied nature. A steady increase has taken place in the demand for cinema films, particularly from schools, an indication of the growing popularity of this method of health propaganda. In addition, the Red Cross Depot distributed a large amount of health propaganda material etc. to provincial, State and district branches, and also to Government departments of health, private bodies, health centres, educational institutions, officials and others. The sale of magic lantern equipment increased by 50 per cent.

At the request of the High Commissioner for India a comprehensive series of exhibits was supplied to the Women's Pavilion at the Glasgow Empire Exhibition; these included posters, pamphlets and cut-out models showing the part played in the relief of disaster and in work among women and children. Several requests from various health organisations, both in the United States and England, for posters and literature of the Society were received directly or through the Public Health Commissioner with the Government of India and such material was supplied free of charge.

Radio dialogues on health subjects were supplied to the Bombay, Calcutta, Delhi, Madras, Lahore, Lucknow, Peshawar and Mysore Stations in addition to special talks on maternity and child welfare topics asked for by the Delhi Station.

The staff of the Society produced 3,274 lantern slides and publicity photographs for all sections of the Society and prepared a number of certificates and warrants of constitution for the St. John Ambulance Association.

The periodicals published included "Journal of the Indian Red Cross Society" and "The Indian Junior" from the Headquarters, "The Red Cross" by the Punjab Branch, "The Madras Junior" by the Madras Branch and "The Sind Junior" by the Sind Branch of the Indian Red Cross Society.

Miscellaneous Activities.—The headquarters scheme of first aid posts on highways was introduced by the Punjab branch which established 46 posts, with the international type of signboard, on the Grand Trunk Road. They are located in schools, dispensaries, hospitals and police stations on the roadside.

Several provincial branches, acting on the suggestion of the Headquarters, devoted funds to the improvement of sick nursing. Reports from all branches indicate close cooperation with the St. John Ambulance Association.

British Empire Leprosy Relief Association (Indian Council).*

94. The year 1938 was a year of steady progress in antileprosy work in India. The work of the provincial branches has developed and extended, partly as the result of the adoption of the new constitution recommended two years ago and partly as the result of increased interest taken by provincial Governments in the campaign against the disease. In various parts of India schemes for the development of antileprosy work are under consideration or are being adopted.

Another encouraging sign is the increased interest in leprosy taken by the medical profession as a whole, for which the special courses of training provided by the Association during recent years have undoubtedly been largely responsible. During the year under review special courses were held in Calcutta, Bombay, Chingleput and Dichpali. The total attendance at these courses was 99 including 13 final year M. B. B. S. students of Osmania University who took their training at Dichpali. The greater interest taken by the medical profession in leprosy is also shown by the excellent reception given to two books on leprosy published by the Association during the year. The first is the enlarged and completely revised sixth edition of Dr. Muir's book entitled "Leprosy, its Diagnosis, Treatment and Prevention". The second, "Lecture Notes on Leprosy" by Dr. Lowe, is a smaller and less expensive publication and it has been designed primarily for general practitioners and medical students.

Mention may also be made of the increasing emphasis laid on the segregation of infectious cases in the preventive campaign against leprosy. During the year, several new institutions and colonies for this purpose have been established in India; the necessity for the isolation of lepers outside villages and towns is also becoming more fully recognised.

An important event during the year was the International Leprosy Congress at Cairo in March. India was represented at the Congress by a strong delegation headed by Colonel Sir Alexander Russell. The delegation from India took an active part in the proceedings and the Conference was of great benefit to the workers from India by enabling them to establish

*Prepared from a note supplied by the Honorary Secretary, British Empire Leprosy Relief Association (Indian Council) New Delhi.

contacts with workers abroad and mutually to exchange experience in antileprosy work. The reports of the discussions at the Conference indicate that antileprosy work in India has been proceeding on acknowledged sound lines.

Research work was carried on, as in previous years, at the Calcutta School of Tropical Medicine in cooperation with the School and the Indian Research Fund Association under the direction of Dr. Lowe, who was assisted by a staff of clinical, bacteriological and chemical workers. Most of them are paid for by the British Empire Leprosy Relief Association. A summary of the researches carried out is given at pages 61 and 62.

Dr. Santra, the Propaganda Officer, toured in the provinces of Orissa, Bombay and Bihar, and in the Indian States of Cochin, Travancore, Kanker, Tripura and Cooch Behar. He carried out surveys and propaganda work, besides offering advice to the authorities for the development of their anti-leprosy campaigns.

The provincial and State branches of the Association reported considerable activity during the year, including the opening of new treatment centres, the carrying out of leprosy surveys and propaganda among the people. For detailed accounts of these activities the Association's annual report for 1938 should be consulted. However, special attention may be drawn to the Orissa provincial branch, which was started in 1937 and which is reported to have made good progress during the year under review. The provincial Government have sanctioned a scheme of antileprosy work which provides a District Leprosy Officer and three compounders for each district and a Leprosy Officer for the province as a whole. Survey work has been undertaken by these officers on an organised basis, while other activities included a course of training in leprosy at Cuttack and intensive propaganda among the people. Mention should also be made of the Madras branch, which was reorganised with its headquarters at the Lady Willingdon Leper Settlement and with the Superintendent of the Settlement as the Honorary Treasurer of the provincial branch. It was decided that routine treatment should be made the concern of district authorities and that the provincial headquarters should concentrate on investigations into leprosy of childhood, rural and urban control of leprosy, experiments in the segregation of leper children and the training of workers for propaganda.

The total income of the Indian Council for 1938 was Rs. 1,27,485 and the expenditure was Rs. 1,38,362 including Rs. 69,975 distributed as grants to provincial and State branches.

Mission to Lepers.

95. The latest annual report of the Mission to Lepers, which has now completed 65 years in India, has again recorded a period of expanding activity and of increased usefulness. The expenditure in India and Burma of the Mission's work was Rs. 8,42,535 in 1938 compared with Rs. 8,12,209 in 1937. Of this total expenditure nearly 48·7 per cent came from voluntary subscriptions and the extent to which the cause of the Indian leper has found support in other lands may be judged from the fact that well over three and a half lakhs of rupees came from subscriptions abroad. In the 34 homes maintained by the Mission 7,565 resident lepers were cared for and, in addition, 834 healthy children of lepers were brought up separately. The Mission was also able to make grants-in-aid of a substantial character to other homes with 2,270 leper inmates and 151 healthy children. The superintendence of the

homes is, in almost every case, a voluntary service and the Mission was therefore able to devote practically the whole of the income to the direct care of the lepers and the maintenance of the local staffs.

Five hundred and fourteen patients were discharged during 1938 with the disease arrested before deformity began. The patients are kept under observation for a period of six months after the last traces of activity have disappeared. However, the Mission's report rightly points out that the proper term to use is "arrested" and not "cured" because the number of known relapses in 1938 from among those discharged in previous years was 79. Apart from medical aid it is pointed out that the chief service "which the Mission brings to the adult patient is, perhaps, by the fellowship and activities and regular conditions of living provided, which help to re-establish him in a life of happiness and usefulness, even within the bonds of his disease. For the children with only early marks of leprosy the Mission has evidence that it can do much more, enabling them to grow up into men and women who, with reasonable safeguards, should remain in good health". To the community as a whole the facilities for the segregation of thousands of infectious patients which the Mission's homes have provided during these many years have constituted a service of inestimable benefit.

International Health Division of the Rockefeller Foundation.*

96. The activities reported in 1937 were in operation in 1938. New work was undertaken in respect of the Singur Health Unit, Bengal Presidency, while research work on the flow of ground waters commenced in the Punjab under the direction of a Staff Engineer of the Foundation.

Madras Presidency.—Malaria research work at the King Institute Guindy, at Ennore and at Pattukottai in the Tanjore district made further advances. Additional engineering research at Pattukottai was undertaken by the Staff Malaria Engineer. Supervisory engineering assistance was arranged for in respect of the Madras Government's malaria control project in the town of Pattukottai.

Cooperation with the Public Health Department in the Poonamallee Health Unit continued. The chief development in this Unit has been the increased popularity of the maternity and child welfare work making necessary the employment of additional midwives. The Unit leads in India in respect of the provision of good water supplies by means of bored wells. The general sanitation work as represented by health leagues remains to be developed.

Mysore State.—In the Closepet Health Unit cooperative work made steady progress throughout the year. In addition to the routine health unit work the Government class for sanitary inspectors received two weeks' field training in the Unit. This is one of the important functions of health unit work. In ten villages, health leagues were formed.

Travancore State.—Although the financial assistance given by the Foundation ceased, it is gratifying to note that the health unit activities continued, in spite of considerable local difficulties not associated with public health work.

United Provinces.—The financial cooperative arrangement between the provincial Government and the Rockefeller Foundation, in respect of the

*A note prepared by Dr. W. P. Jacocks, a representative of the Rockefeller Foundation in India.

health unit work at Partabgarh ended in July. The Government contemplated stopping the work after the cooperative period ended, even though this was not in accord with the original understanding. It is encouraging to report, however, that the people made such strong representations that the Government felt compelled to continue the Unit. It is worth while mentioning also that, in order to keep the Unit going, four local bodies provided from their meagre funds a large part of the money which had been formerly supplied by the International Health Division. It is desirable to record again that, in the development of active health leagues, the Partabgarh Unit still remains the leader in India.

Delhi Province.—As is usual in the beginning, the Najafgarh Health Unit met many obstacles in its second year of operation in establishing working methods and in developing a satisfactory staff. By the end of the year, however, most of the difficulties had been overcome and the work of the Unit seemed destined to develop in a satisfactory way.

Bengal Presidency.—Cooperation with the Bengal Presidency in respect of the Singur Health Unit began this year. Due to local circumstances no actual work was attempted, but a suitable medical officer of health was selected and trained in Ceylon and a part of the subordinate staff was assembled. A philanthropic minded person donated a large sum of money to finance the building of a central office and adequate quarters for the maternity and child welfare staff. This is unique in health unit history in India and is worthy of emulation. It is hoped that suitable arrangements can be made at Singur for giving field training in rural health subjects to the students of the All-India Institute of Hygiene and Public Health.

Assistance in health unit work, on a sliding scale over a period of five years, is a part of the accepted policy of the International Health Division in India. This work has proved useful for demonstrating methods of procedure and for training local personnel. Provinces are not receiving the greatest return from their investments due to their inability to employ and keep suitably trained medical officers of health, lady doctors, health visitors and midwives. Interest in rural health work is increasing and the demand for trained workers will be greater from year to year. Increased facilities for training such workers will no doubt be put into practice in each province.

During the year the International Health Division agreed to lend the services of one of its officers to the Government of India to be Director of the All-India Institute of Hygiene and Public Health, Calcutta.

Fellowships.—Six fellowships of one year each were awarded to medical officers and sanitary engineers for study in India and in foreign countries. One fellow was given an extension of time to complete his programme and seven returned to India to work in their respective departments after completing their studies.

Travel Grants.—In addition five senior public health officers were given travel grants to study special subjects in Europe for periods of one to three months each, and a junior medical officer was sent to Ceylon for two months' training in health unit work.

Articles on Researches.—Eight articles on researches in malaria were prepared by the staff and published in the Journal of the Malaria Institute of India.

Voluntary Organisations in Bombay Presidency.

97. In Bombay Presidency, of the many associations devoted to health activities special mention may be made of (1) the Bombay Presidency Baby and Health Week Association, (2) the Bombay Presidency Infant Welfare Society and (3) the Bombay Mofussil Maternity, Child Welfare and Health Council. These and a number of other organisations carried out a considerable amount of health propaganda at exhibitions and festivals. In addition the Bombay Presidency Baby and Health Week Association undertook research on balanced diets, the investigations being conducted along two lines, (1) nutritional and (2) analytical and experimental.

The activities of the Bombay Presidency Infant Welfare Society include parental, antivenereal and maternity and infant welfare work as well as the maintenance of a creche. As compared with the previous year the attendance at its centres increased by 3,000, a clear indication, as pointed out by Lady Lumley, its President, of the increasing recognition by the women of the benefits of the centres. In addition to these activities a Health Visitors' Institute is being maintained for the training of health visitors and the third batch of students passed out during the year.

The Bombay Mofussil Maternity, Child Welfare and Health Council has as its main object the coordination of the maternity and child welfare services in the mofussil, in order to prevent overlapping of work as well as to raise the standard of service at the welfare centres. During the year five new centres were added, thus making a total of 47 centres working in 13 districts of the province. In addition the Poona Health School was started by the Council on 15th April, 1938, with financial assistance from the Government of Bombay, the Indian Red Cross Society and the Poona District Committee of the Council.

Health Propaganda Board, Madras.

98. The Board was constituted in 1921 for the purpose of stimulating and promoting an interest in and a knowledge of, all matters connected with the general and personal health of the population of Southern India. The Board continued to maintain a library and a reading room. They deal with health subjects and are used by the public from different parts of Madras city. The Board arranged as usual an exhibition of its models and illustrated posters. The daily average attendance at this exhibition was over 600. An exhibition was also held at Tiruvottiyur in the Local Fund hospital compound for ten days and three films were exhibited to the public.

The Board started publishing a monthly health journal in English called "Arogyamargam" from April 1938 for disseminating correct and modern ideas on matters of health and sanitation. The Board also carried on an intensive campaign against tuberculosis by organising an anti-tuberculosis week in the City of Madras.

The Central Cooperative Antimalaria Society, Bengal.

99. This organisation was brought into existence in 1919 for the purpose of organising antimalarial cooperative societies throughout the rural areas of Bengal. Between 1919 and 1938 the number of such societies has grown to be three thousand. The central society has mainly concerned itself with two lines of work, (1) the formation of as many rural societies as possible and (2) the guidance of these societies in the carrying out of their antimalarial

work. Experienced malariologists have held that a factor of great importance in the causation of malaria in Bengal is man's interference with the natural drainage of the soil. In this province the two great rivers, the Brahmaputra and the Ganges, their tributaries and the net work of channels forming the deltaic system provide excellent natural drainage. One of the practices causing hindrance to such drainage has been the setting up of bunds in the beds of rivers in order to divert the course of water and thus render land available for cultivation. Attempts to remove these embankments often produce considerable opposition from the people. The central society, with the help of village societies, has held conferences in different parts of the province, which are attended by large gatherings of the people and at which representatives of the Irrigation Department are also present. These conferences have been greatly helpful in persuading the people to accept the removal of the embankments as an essential measure in the campaign against malaria. The rural cooperative societies have also taken an active part in the removal of vegetation from water courses as an antilarval measure.

Bengal Health Welfare Committee.

100. This committee has been established for coordinating the activities of six other committees engaged in health work, (1) Calcutta Maternity and Child Welfare Committee, (2) District Maternity and Child Welfare Committee, (3) Industrial Welfare Committee, (4) Sir John Anderson Health School Committee, (5) Bengal Health Education Committee, and (6) Calcutta Health Week Committee. As will be seen from the titles of these committees, they are mainly engaged in maternity and child welfare work and in the promotion of health education. The Calcutta Maternity and Child Welfare Committee had charge of six welfare centres in 1937 and in 1938 its activities expanded considerably by many new centres becoming affiliated to it and by the services of its Medical Officer being rendered available to various authorities for the organisation of welfare centres in several places in and around Calcutta. Outside Calcutta also the year under review recorded greater progress in the development of maternity and child welfare work through the activities of the committee for district work. Commenting on the work of these organisations the Director of Public Health, Bengal, stated, "although there is a very great deal of work that remains to be done, there is a noticeable appreciation by the public of the problems pertaining to the women and children of this province".

The Association for the prevention of Blindness, Bengal.

101. A brief account of the activities of this Association was given in last year's report. During the year under review the activities of the Association were further extended, an innovation being the eye examination of children in schools and orphanages. The Association maintains two travelling eye dispensaries, each of which has two medical officers who carry on propaganda work through lectures, posters, pamphlets, magic lantern and cinema demonstrations on the prevention of blindness. Sample surveys of blindness in villages are undertaken. Whenever hospital accommodation was available, such as in sub-divisional hospitals or in private medical institutions, the travelling dispensaries carried out their treatment of patients in such hospitals. Operative work was also undertaken at all centres where indoor accommodation was available. One dispensary worked in the districts of Dinajpur, Rajshahi and Khulna while the other dispensary worked in Eastern Bengal in the districts of Mymensingh and Dacca. These dispensaries were so popular and successful in their work that periods of extension of stay in particular places

had to be sanctioned from time to time in order to meet the rush of patients. It is a credit to the local public that they contributed to the upkeep of the dispensaries during these extensions. That the work of the Association, which has now completed its ninth year, has been appreciated by the provincial Government is shown by the fact that a grant of Rs. 15,000 was sanctioned from provincial funds for the ensuing year. This sum will enable the Association to start two more travelling dispensaries in order to meet the increasing demand from the people for the treatment and cure of eye conditions.

E. COTTER, LIEUT.-COLONEL, I.M.S.,
*Public Health Commissioner with the
Government of India.*

NEW DELHI;
The 10th November, 1940.

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Appendix I

relating to

Section I.

Deaths in the rural areas of British India and the provinces are given in table G distributed according to months and in table K by age and sex. The total figure for British India does not, however, correspond in the two cases. This is because, for Madras Presidency, the figures shown in table G are for the area exclusive of municipalities alone, whilst those of table K relate to an area excluding municipalities and rural towns. For this reason the total figure in table G is greater than that of table K by 57,161.

Deaths in urban areas are given in tables H and L. For the above reason the total figure in table L is greater by 57,161 than that in table H.

The figures in tables G and H together equal those in K and L.

Owing to certain errors discovered in the population figures hitherto used for the registration areas of Assam, new figures for the estimated populations for the period 1931-37 and mortality rates for specific age periods for the same years have been calculated and are shown in tables Q and R of this Appendix.

TABLE A.—ESTIMATED POPULATION ON 30TH JUNE, 1938, IN RURAL AND URBAN AREAS AND BY SEX.

	Rural.	Urban.	Total.	Male.	Female.	Area in square miles.	Density per square mile.
BRITISH INDIA	249,899,545	26,141,268	275,540,813	141,922,596	133,618,217	762,664	361
N.-W. P.	2,197,215	341,844	2,539,059	1,376,087	1,162,972	13,308	191
Punjab	23,108,979	3,488,677	26,597,656	14,435,899	12,162,257	196,614	275
Delhi	220,101	495,818	715,419	411,447	303,972	578	1,238
U. P.	47,046,741	5,947,964	52,994,705	27,830,785	25,163,920	106,248	499
Bihar	33,679,317	1,405,348	35,084,665	17,557,944	17,526,721	69,348	506
Orissa	7,027,199	224,707	7,251,906	3,459,301	3,792,605	21,492	337
Bengal	49,046,946	3,536,595	52,583,541	27,334,173	25,249,368	72,514	725
C. P.	14,902,163	1,846,318	16,748,481	8,354,672	8,393,809	98,730	170
Bombay	15,896,864	3,723,871	19,620,735	10,162,924	9,457,811	76,389	257
Sind	3,508,186	757,378	4,265,564	2,393,625	1,871,939	46,663	91
Madras	43,906,312	3,966,098	47,872,410	23,721,303	24,151,107	125,438	382
Coorg	154,719	9,390	164,109	90,745	73,364	1,593	103
Assam	8,293,718	213,256	8,506,974	4,477,800	4,029,174	31,382	271
Ajmer-Merwara	411,085	184,504	595,589	316,891	279,198	2,367	252

TABLE B.—ESTIMATED POPULATION ON 30TH JUNE, 1938, BY AGE AND SEX.

	N.-W. F. P.		Punjab.		Delhl.		U. P.		Bihar.		Orissa.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Under 1 year .	40,792	33,439	497,199	493,156	11,292	11,330	817,842	821,250	420,957	430,671	95,098	98,673
1—5 years .	167,920	162,348	1,642,448	1,588,423	38,236	37,930	3,178,249	3,210,612	2,157,616	2,293,321	377,089	400,042
5—10 years .	195,664	158,063	1,895,499	1,650,950	43,835	37,877	3,550,645	3,066,693	2,518,896	2,313,953	423,922	414,33
10—15 years .	174,646	130,756	1,761,262	1,454,359	44,188	35,752	3,290,543	2,687,931	2,167,849	1,920,453	402,510	380,908
15—20 years .	121,151	103,019	1,348,706	1,121,648	44,215	33,009	2,519,519	2,207,445	1,429,429	1,479,774	327,631	356,811
20—30 years .	236,964	222,174	2,502,934	2,116,459	90,816	61,937	4,970,754	4,592,477	2,986,710	3,145,569	617,244	726,419
30—40 years .	189,225	158,178	1,879,948	1,482,789	66,939	40,014	4,028,524	3,601,299	2,531,256	2,515,455	504,936	581,808
40—50 years .	119,844	95,726	1,296,407	1,032,696	39,234	23,658	2,810,429	2,442,180	1,724,736	1,644,686	365,424	410,353
50—60 years .	72,045	54,953	853,098	654,488	19,800	13,357	1,616,669	1,471,962	977,897	992,515	223,884	256,805
60 years and over	57,836	39,316	757,898	568,289	12,892	9,303	1,047,611	1,062,071	642,598	790,324	121,563	166,459
	Bengal.		G. P.		Bombay.		Sind.		Madras.			
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
Under 1 year .	871,490	874,257	289,183	296,843	294,837	299,631	59,158	55,993	658,252	679,271		
1—5 years .	3,164,910	3,254,087	989,731	1,042,537	1,143,277	1,172,713	272,720	260,792	2,751,485	2,829,622		
5—10 years .	3,739,450	3,316,640	1,074,858	1,041,215	1,313,116	1,217,499	314,100	244,412	3,107,384	3,040,926		
10—15 years .	3,271,807	2,921,224	972,247	923,253	1,186,053	1,065,300	270,855	190,482	2,857,589	2,709,177		
15—20 years .	2,394,979	2,668,117	735,863	775,201	889,565	879,607	207,292	161,551	2,072,561	2,210,622		
20—30 years .	5,006,854	4,988,478	1,481,564	1,516,475	1,839,262	1,762,928	469,199	378,492	3,981,200	4,561,728		
30—40 years .	4,048,468	3,239,924	1,162,965	1,140,448	1,568,244	1,304,618	381,747	270,887	3,383,379	3,343,307		
40—50 years .	2,559,032	1,987,262	833,319	783,705	998,712	860,208	229,696	161,246	2,369,327	2,221,63		
50—60 years .	1,365,807	1,165,999	482,582	480,093	564,399	522,759	114,523	86,211	1,436,117	1,415,688		
60 years and over	911,376	833,380	332,860	394,039	365,459	372,548	74,335	61,873	1,104,009	1,139,155		61
	Coorg.		Assam.		Ajmer-Merwara.		British India.					
	M.	F.	M.	F.	M.	F.	M.	F.				
Under 1 year .	2,131	2,204	141,139	142,798	9,910	9,916	4,209,280	4,254,432				
1—5 years .	7,555	7,733	579,268	599,200	35,266	35,289	16,505,770	16,894,649				
5—10 years .	9,545	9,166	605,298	549,615	38,905	33,988	18,830,617	17,095,129				
10—15 years .	10,012	9,036	514,545	460,250	36,764	30,808	16,960,870	14,919,689				
15—20 years .	9,146	7,573	369,438	410,452	31,593	27,622	12,501,088	12,442,451				
20—30 years .	19,656	15,367	795,769	775,646	59,058	50,694	25,057,984	24,913,843				
30—40 years .	16,370	10,399	669,305	508,179	42,652	36,892	20,473,958	18,234,192				
40—50 years .	9,395	5,974	424,169	299,723	33,745	27,506	13,813,469	11,996,561				
50—60 years .	4,426	3,475	230,920	169,749	18,889	15,834	7,981,056	7,303,855				
60 years and over	2,509	2,437	147,949	113,562	9,609	10,649	5,588,504	5,563,416				

TABLE C.—BIRTHS IN RURAL AND URBAN AREAS.

	Rural.	Urban.	Total	Rate p. m.		
				Rural.	Urban.	Total.
BRITISH INDIA	8,365,602	1,032,409	9,398,011	33.5	39.5	34.1
N.-W. F. P.	61,987	19,990	71,977	23.2	29.2	28.3
Punjab	1,033,071	132,766	1,165,837	44.7	38.1	43.8
Delhi	12,071	22,069	34,140	54.8	44.6	47.7
U. P.	1,531,352	249,766	1,781,118	32.5	42.0	33.6
Bihar	1,090,305	25,873	1,116,178	32.4	18.4	31.8
Orissa	233,406	5,391	238,797	33.2	24.0	32.9
Bengal	1,441,523	79,731	1,521,254	29.4	22.5	28.9
C. P.	583,284	78,501	661,785	39.1	42.5	39.5
Bombay	623,409	135,086	758,495	39.2	36.8	38.7
Sind	50,858	26,911	77,269	14.4	35.5	18.1
Madras	1,458,513	251,032	1,709,545	33.2	63.3	35.7
Coorg	3,289	496	3,785	21.3	52.8	23.1
Assam	230,642	6,538	237,180	27.8	30.7	27.9
Ajmer-Merwara	12,392	8,259	20,651	30.1	44.8	34.7

TABLE D.—TOTAL BIRTHS BY MONTHS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
BRITISH INDIA	819,348	715,710	773,040	727,664	692,419	680,876	733,209	779,461	841,051	895,562	873,212	866,399
N.-W. F. P.	6,623	5,680	6,501	5,769	4,986	4,909	5,901	5,793	5,922	6,488	6,152	7,253
Punjab	102,866	88,176	90,927	75,627	73,653	81,132	99,980	104,714	109,775	115,783	111,396	111,808
Delhi	2,633	2,104	2,290	1,961	2,322	2,589	3,228	3,159	3,654	3,554	3,515	3,131
U. P.	160,333	138,355	126,932	123,272	115,079	122,713	148,207	163,492	174,211	174,056	161,271	168,197
Bihar	102,965	84,121	89,208	93,896	88,860	76,211	75,682	92,026	107,823	103,663	101,043	100,680
Orissa	19,594	17,175	20,829	21,930	23,390	21,162	20,462	19,142	17,428	18,835	19,524	19,328
Bengal	153,548	141,719	160,928	131,053	107,513	92,397	80,765	81,301	103,823	144,239	163,318	160,590
C. P.	52,680	47,430	57,147	54,827	51,682	47,644	50,985	59,291	63,596	65,661	57,139	53,703
Bombay	58,018	54,274	65,542	60,448	58,739	59,892	63,990	67,589	69,544	70,239	65,914	64,306
Sind	7,507	5,859	5,410	4,554	5,065	5,157	5,938	6,646	7,158	8,984	7,985	7,006
Madras	125,255	108,018	126,478	130,512	142,940	149,700	162,398	158,730	157,950	157,752	147,762	142,050
Coorg	234	254	293	303	341	345	360	370	363	306	278	288
Assam	25,319	21,153	19,159	17,228	16,585	15,400	13,638	15,292	17,915	23,781	25,714	25,996
Ajmer-Merwara	1,723	1,452	1,396	1,284	1,259	1,625	1,675	1,916	1,886	2,171	2,201	2,063

TABLE E.—TOTAL DEATHS BY MONTHS.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	Rate p. m.
BRITISH INDIA	546,025	455,369	485,475	530,320	583,641	549,695	569,130	589,942	575,134	577,802	606,953	615,634	6,685,120	24.3
N.-W. F. P. . . .	6,158	4,631	4,349	3,903	5,087	4,554	4,126	3,692	3,319	3,985	4,111	6,067	53,982	21.8
Punjab	54,117	43,535	42,067	48,816	77,206	66,036	51,499	45,992	43,849	45,005	48,977	55,600	622,699	23.4
Delhi	1,314	989	1,184	1,483	2,332	1,639	1,364	1,275	1,171	1,010	1,236	1,735	16,732	23.4
U. P.	97,352	80,400	81,674	111,293	135,721	136,992	116,851	106,446	98,433	94,207	91,748	93,871	1,249,988	23.6
Bihar	59,287	47,007	52,921	65,405	65,878	62,816	69,226	72,188	70,171	63,717	70,842	64,275	763,733	21.8
Orissa	18,325	15,184	17,355	15,760	15,853	16,092	19,300	20,186	16,759	14,985	18,440	20,347	208,586	28.8
Bengal	119,669	98,736	108,586	103,234	85,153	81,885	86,985	91,419	104,406	123,598	155,014	152,201	1,315,886	25.0
C. P.	35,594	34,032	39,339	45,167	55,631	39,488	54,098	78,011	74,388	64,882	58,576	50,095	629,301	37.6
Bombay	39,750	39,155	42,518	43,587	39,489	39,467	52,438	58,336	53,823	48,584	45,192	45,048	547,387	27.9
Sind	5,942	4,542	4,451	3,956	4,035	3,586	3,185	3,142	3,185	3,740	4,187	4,134	48,085	11.3
Madras	91,932	73,180	77,414	73,520	81,021	79,902	94,296	94,607	90,532	91,421	87,836	96,391	1,032,052	21.6
Coorg	364	252	357	287	317	416	415	330	331	349	288	280	3,986	24.3
Assam	14,843	12,418	11,697	12,150	14,079	15,892	14,324	13,086	13,682	16,466	19,607	19,523	177,767	20.9
Ajmer-Merwara . .	1,378	1,308	1,563	1,759	1,839	930	1,023	1,232	1,085	853	899	1,067	14,936	25.1

TABLE F.—DEATH RATES PER MILLE BY MONTHS.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
British India	23·8	19·8	21·1	23·1	25·4	23·9	24·8	25·7	25·1	25·2	26·4	26·8
N. W. F. P.	29·1	21·9	20·6	18·4	24·0	21·5	19·5	17·4	15·7	18·8	19·4	28·7
Punjab	24·4	19·6	19·0	22·0	34·8	29·8	23·2	20·8	19·8	20·3	22·1	25·1
Delhi	22·0	16·6	19·9	24·9	39·1	27·5	22·9	21·4	19·6	16·9	20·7	29·1
U. P.	22·0	18·2	18·5	25·2	30·7	31·0	26·5	24·1	22·2	21·3	20·8	22·4
Bihar	20·3	16·1	18·1	22·4	22·5	21·5	23·7	24·7	24·0	21·8	24·2	22·0
Orissa	30·3	25·1	28·7	26·1	26·2	26·6	31·9	33·4	27·7	24·8	30·5	33·7
Bengal	27·3	22·5	24·8	23·6	19·4	18·7	19·9	20·9	23·8	29·3	35·4	34·7
C. P.	25·5	24·4	28·2	32·4	39·9	28·3	38·8	55·9	53·3	46·5	42·0	35·9
Bombay	24·3	23·9	26·0	26·7	24·2	24·1	32·1	35·7	32·9	29·7	27·6	27·6
Sind	16·7	12·8	12·5	11·1	11·4	10·1	9·0	8·8	9·0	10·5	11·8	11·6
Madras	23·0	18·3	19·4	18·4	20·3	20·0	23·6	23·7	22·7	22·9	22·0	24·2
Coorg	26·6	18·4	26·1	21·0	23·2	30·4	30·3	24·1	24·2	25·5	21·1	20·5
Assam	20·9	17·5	16·5	17·1	19·9	22·4	20·2	18·5	19·3	23·2	27·7	27·5
Ajmer-Merwara	27·8	26·4	31·5	35·4	37·1	18·7	20·6	24·8	21·9	17·2	18·1	21·5

TABLE G.—DEATHS BY MONTHS IN RURAL AREAS.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	Rate p. m.
British India	490,717	407,648	431,276	469,546	516,048	494,238	507,160	526,767	517,992	523,919	552,165	559,257	5,996,733	24·0
N.-W. F. P.	5,375	4,183	3,865	3,410	4,362	3,868	3,583	3,248	2,989	3,471	3,682	5,483	47,519	21·6
Punjab	48,293	39,075	37,753	42,553	68,356	58,532	44,816	40,165	38,677	40,074	43,587	48,884	550,765	23·8
Delhi	442	298	320	479	846	554	506	425	356	361	483	718	5,788	26·8
U. P.	84,469	69,916	68,401	92,936	113,664	120,720	101,017	90,165	84,150	81,548	79,343	86,161	1,072,490	22·8
Bihar	57,811	45,799	51,611	63,787	64,279	61,308	67,613	70,378	68,558	62,237	69,379	62,903	745,663	22·1
Orissa	17,938	14,881	17,011	15,439	15,516	15,746	18,886	19,820	16,389	14,683	17,997	19,910	204,216	29·1
Bengal	112,231	92,264	101,584	96,515	78,926	176,477	80,426	84,862	97,869	121,577	147,272	144,601	1,234,604	25·2
C. P.	31,671	30,173	34,842	40,016	49,883	35,600	46,666	70,048	67,028	58,433	52,537	44,733	561,090	37·7
Bombay	30,332	29,570	31,878	33,426	30,351	31,334	41,555	47,009	44,206	39,798	36,214	36,163	431,836	27·2
Sind	4,365	3,342	3,199	2,739	2,808	2,375	2,138	2,026	2,076	2,587	3,027	2,717	33,399	9·5
Madras	82,116	64,901	68,223	65,287	72,135	71,761	85,015	84,907	81,467	82,295	78,774	86,998	923,879	21·0
Coorg	317	223	304	251	275	371	373	284	284	310	255	247	3,494	22·6
Assam	14,459	12,202	11,424	11,879	13,746	15,596	14,010	12,739	13,360	16,115	19,156	19,184	173,870	21·0
Ajmer-Merwara	898	821	861	829	901	636	556	691	683	430	459	555	8,120	19·8

TABLE H.—DEATHS BY MONTHS IN URBAN AREAS.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	Rate p. m.
BRITISH INDIA	55,308	47,721	54,199	60,774	67,593	55,457	61,970	63,175	57,142	53,883	54,788	56,377	688,387	26·3
N.-W. F. P.	783	448	484	493	725	686	543	444	330	514	429	584	6,463	18·9
Punjab	5,824	4,460	4,314	6,263	8,850	7,504	6,683	5,827	6,172	4,931	5,390	6,716	71,934	20·6
Delhi	872	691	864	1,004	1,486	1,085	858	850	815	649	753	1,017	10,944	22·1
U. P.	12,883	10,484	13,273	18,357	22,057	16,272	15,834	16,281	14,233	12,659	12,405	12,710	177,498	29·8
Bihar	1,476	1,208	1,310	1,618	1,599	1,508	1,613	1,810	1,613	1,430	1,463	1,372	18,070	12·9
Orissa	387	303	344	321	337	346	414	366	370	302	443	437	4,370	19·4
Bengal	7,488	6,472	7,002	6,719	6,227	5,408	6,559	6,557	6,537	7,021	7,742	7,600	81,282	23·0
C. P.	3,923	3,859	4,497	5,151	5,748	4,428	7,432	7,963	7,360	6,449	6,039	5,362	68,211	36·9
Bombay	9,418	9,585	10,640	10,161	9,138	8,133	10,883	11,327	9,617	8,786	8,978	8,885	115,551	31·0
Sind	1,577	1,200	1,252	1,217	1,227	1,211	1,047	1,116	1,109	1,153	1,160	1,417	14,686	19·4
Madras	9,816	8,279	9,191	8,233	8,886	8,141	9,281	9,700	9,065	9,126	9,062	9,393	108,173	27·3
Coorg	47	29	53	36	42	45	42	46	47	39	33	33	492	52·4
Assam	384	216	273	271	333	296	314	347	322	351	451	330	3,897	18·3
Ajmer-Merwara	480	487	702	930	938	394	467	541	502	423	440	512	6,816	36·9

TABLE I.—DEATHS ACCORDING TO AGE AND SEX.

	Under one year.		1—5 years.		5—10 years.		10—15 years.		15—20 years.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
BRITISH INDIA	858,619	711,577	670,223	631,308	198,193	175,827	108,057	92,341	100,118	121,798
N.-W. F. P.	6,366	4,724	5,768	5,066	1,805	1,684	1,151	1,027	1,175	1,075
Punjab	106,691	87,817	68,859	62,272	16,330	14,488	11,296	10,879	10,459	10,726
Delhi	2,751	2,359	1,893	1,709	350	320	192	249	255	393
U. P.	147,566	117,123	156,562	135,214	39,398	27,708	20,385	17,340	17,088	16,985
Bihar	74,073	59,715	84,362	78,306	26,911	22,058	15,162	10,769	13,834	12,015
Orissa	28,155	24,833	17,310	17,918	5,195	4,785	2,443	2,172	2,786	3,541
Bengal.	152,159	128,764	105,221	106,934	50,488	46,668	25,226	19,786	23,008	35,594
C. P.	85,732	71,902	68,150	61,050	18,711	16,194	9,648	8,171	9,707	11,275
Bombay	71,532	60,568	64,712	66,111	12,566	13,199	5,357	5,629	4,927	6,819
Sind	5,191	4,184	4,245	3,692	1,562	1,318	918	749	839	816
Madras	154,697	129,233	76,907	77,379	21,842	21,288	12,143	12,022	12,026	16,948
Coorg	341	296	223	241	87	80	68	60	123	132
Assam	21,074	17,983	14,103	13,548	6,665	5,766	3,920	3,337	3,811	5,247
Ajmer-Merwara	2,291	2,076	1,908	1,868	283	271	148	151	130	232
	20—30 years.		30—40 years.		40—50 years.		50—60 years.		60 years & over.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
BRITISH INDIA	238,988	307,092	253,468	241,746	265,929	197,121	271,223	214,473	527,678	501,341
N.-W. F. P.	2,454	2,427	2,396	2,359	2,300	1,885	2,364	1,620	3,633	2,703
Punjab	16,780	18,744	15,945	16,038	17,520	14,577	19,648	15,650	49,053	38,927
Delhi	559	845	469	593	501	413	492	381	1,099	909
U. P.	43,775	48,148	45,947	43,772	51,260	37,247	55,801	41,200	103,446	90,023
Bihar	34,598	34,126	35,959	29,681	33,872	25,212	34,315	30,975	52,910	54,880
Orissa	7,397	10,281	8,273	8,262	8,292	7,124	9,907	9,672	13,981	16,309
Bengal	57,179	84,784	60,540	54,780	59,964	42,473	53,983	42,256	87,200	78,879
C. P.	21,547	28,312	1,916	21,635	22,678	17,246	23,270	19,416	45,391	47,350
Bombay	15,274	20,792	16,770	16,791	19,582	13,469	21,066	14,793	48,771	48,659
Sind	2,341	2,505	2,641	2,199	2,793	1,529	2,388	1,002	4,307	2,866
Madras	28,884	43,076	33,510	36,855	33,714	29,759	39,950	31,598	105,392	109,829
Coorg	225	290	345	250	324	171	206	174	187	163
Assam	7,593	12,199	8,392	8,132	7,597	5,670	7,163	5,339	11,293	8,935
Ajmer-Merwara	382	563	365	399	532	346	670	397	1,015	909

M.—Males.

F.—Females.

TABLE J.—DEATH RATES ACCORDING TO AGE AND SEX.

	*Under 1 year.		1—5 years.		5—10 years.		10—15 years.		15—20 years.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
BRITISH INDIA . . .	175·8	157·6	40·6	37·4	10·4	10·3	6·4	6·2	8·0	9·8
N.-W. F. P. . . .	154·3	153·8	34·3	31·2	9·2	10·7	6·6	7·9	9·7	10·4
Punjab	173·4	159·5	41·9	39·2	8·6	8·8	6·4	7·5	7·8	9·6
Delhi	155·7	143·2	49·5	45·1	8·0	8·5	4·3	7·0	5·8	11·9
U. P.	156·1	140·1	49·3	42·1	9·4	9·0	6·2	6·5	6·8	7·7
Bihar	129·7	109·6	39·1	34·1	10·7	9·5	7·0	5·6	9·7	8·1
Orissa	230·2	213·2	45·9	44·8	12·3	11·5	6·1	5·7	8·4	9·9
Bengal	193·0	175·7	33·2	32·9	13·5	14·1	7·7	6·8	9·6	13·3
C. P.	251·8	223·7	68·9	58·6	17·4	15·6	9·9	8·9	13·2	14·5
Bombay	183·6	164·2	56·6	56·4	9·6	10·8	4·5	5·3	5·5	7·8
Sind	119·5	123·7	15·6	14·2	5·0	5·4	3·4	4·0	4·0	5·1
Madras	177·1	154·6	28·0	27·3	7·0	7·0	4·2	4·4	5·8	7·7
Coorg	172·1	164·1	29·5	31·2	9·1	8·7	6·8	6·6	13·4	17·4
Assam	172·2	156·6	24·3	22·6	11·0	10·5	7·6	7·3	10·3	12·8
Ajmer-Merwara . . .	206·0	217·9	54·1	52·9	7·3	8·0	4·0	4·9	4·1	8·4

*Ratios have been worked out per 1,000 of live births.

	20—30 years.		30—40 years.		40—50 years.		50—60 years.		60 years & over.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
BRITISH INDIA . . .	9·5	12·3	12·4	13·3	19·3	16·4	34·0	29·4	94·4	90·1
N.-W. F. P.	10·4	10·9	12·7	14·9	19·2	19·7	32·8	29·5	62·8	68·8
Punjab	6·7	8·9	8·5	10·8	13·5	14·1	23·0	23·9	64·7	68·5
Delhi	6·2	13·6	7·0	14·8	12·8	17·5	24·8	28·5	85·2	97·7
U. P.	8·8	10·5	11·4	12·2	18·2	15·3	34·5	28·0	98·7	84·8
Bihar	11·6	10·8	14·2	11·8	19·6	15·3	35·1	31·2	82·3	69·4
Orissa	12·0	14·2	16·4	14·2	22·7	17·4	44·3	37·7	115·0	98·0
Bengal	11·4	17·0	15·0	16·9	23·4	21·4	39·5	36·2	95·7	94·6
C. P.	14·5	18·7	18·8	19·0	27·2	22·0	48·2	40·4	136·4	120·2
Bombay	8·3	11·8	10·7	12·9	19·6	15·7	37·3	28·3	133·5	130·6
Sind	5·0	6·6	6·9	8·1	12·2	9·5	20·9	11·6	57·9	46·3
Madras	7·3	9·4	9·9	11·0	16·3	13·4	27·8	22·3	95·5	96·4
Coorg	11·4	18·9	21·1	24·0	34·5	28·6	46·5	50·1	74·5	66·9
Assam	9·5	15·7	12·5	16·0	17·9	18·9	31·0	31·5	76·3	78·7
Ajmer-Merwara . . .	6·5	11·1	8·6	10·8	15·8	12·6	35·5	25·1	105·6	85·4

M.—Males.

F.—Females.

TABLE K.—DEATHS ACCORDING TO AGE AND SEX IN RURAL AREAS.

	Under one year.		1—5 years.		5—10 years.		10—15 years.		15—20 years.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
BRITISH INDIA . . .	751,752	821,640	599,777	562,435	180,859	161,327	99,313	82,199	89,790	106,044
N.-W. F. P. . . .	5,597	4,108	5,109	4,488	1,639	1,511	1,046	883	1,026	893
Punjab	94,549	77,247	61,489	55,168	14,835	12,996	10,259	9,528	9,289	9,080
Delhi	958	836	696	627	119	125	74	64	86	58
U. P.	119,976	93,744	135,216	114,217	29,919	24,366	18,549	14,736	15,227	13,118
Bihar	72,340	58,329	82,668	76,855	26,345	21,601	14,780	10,399	13,405	11,569
Orissa	27,726	24,449	17,077	17,678	5,097	4,696	2,887	2,137	2,649	3,465
Bengal	144,153	122,073	100,579	102,510	48,189	44,739	23,801	18,616	21,308	23,813
C. P.	75,594	63,398	61,530	54,818	17,310	14,784	8,826	7,193	8,754	9,665
Bombay	54,921	46,886	52,459	53,631	10,492	11,094	4,385	4,472	3,623	4,807
Sind	2,865	2,267	2,896	2,498	1,291	1,087	761	590	617	524
Madras	131,064	109,984	64,914	65,410	18,833	18,423	10,453	10,172	9,903	13,689
Coorg	328	285	212	231	82	76	55	56	109	127
Assam	20,653	17,608	18,852	13,314	6,535	5,664	3,857	3,274	3,716	5,149
Ajmer-Merwara . . .	1,028	926	1,080	990	173	160	100	74	78	87
	20—30 years.		30—40 years.		40—50 years.		50—60 years.		60 years & over.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
BRITISH INDIA . . .	209,491	268,277	226,175	216,246	237,249	173,536	242,803	195,261	466,303	443,595
N.-W. F. P.	2,114	2,127	2,145	2,152	2,023	1,706	2,042	1,445	3,143	2,322
Punjab	14,621	15,863	14,051	14,088	15,461	13,062	17,332	13,978	43,463	34,406
Delhi	174	196	153	219	181	173	171	153	391	329
U. P.	38,963	39,612	41,505	38,455	46,299	33,453	50,297	37,278	89,852	77,708
Bihar	33,700	33,149	34,968	28,967	32,998	24,692	33,530	30,390	51,462	53,536
Orissa	7,177	10,041	8,031	8,101	8,018	6,965	9,625	9,475	13,566	15,856
Bengal	50,238	78,410	55,689	51,124	55,613	39,519	50,167	39,381	81,273	73,409
C. P.	19,156	24,617	19,532	19,382	20,329	15,789	20,763	17,646	40,063	41,936
Bombay	10,794	15,108	12,379	12,952	14,776	10,959	16,553	12,181	39,767	40,097
Sind	1,712	1,780	1,993	1,760	2,069	1,189	1,718	730	3,150	1,902
Madras	23,091	34,912	27,156	30,602	31,565	25,068	33,000	26,912	88,887	92,675
Coorg	171	246	235	223	240	157	181	160	170	150
Assam	7,332	11,937	8,105	7,978	7,356	5,568	6,987	5,258	11,016	8,711
Ajmer-Merwara . . .	243	279	228	243	321	236	437	274	600	558

M.—Males.

F.—Females.

TABLE L.—DEATHS ACCORDING TO AGE AND SEX IN URBAN AREAS.

	Under one year.		1—5 years.		5—10 years.		10—15 years.		15—20 years.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
BRITISH INDIA	106,867	89,937	70,446	68,873	15,334	14,500	8,744	10,142	10,328	15,754
N.-W. F. P.	769	616	659	578	166	178	105	144	149	182
Punjab	12,142	10,570	7,370	7,104	1,495	1,492	1,087	1,351	1,170	1,646
Delhi	1,793	1,523	1,197	1,082	231	195	118	185	169	335
U. P.	27,590	23,879	21,346	20,997	8,479	8,342	1,836	2,604	1,861	3,867
Bihar	1,733	1,386	1,694	1,451	566	457	402	370	429	446
Orissa	429	384	233	240	98	89	56	85	87	76
Bengal	8,006	6,691	4,642	4,424	2,299	1,929	1,425	1,170	1,700	1,781
C. P.	10,138	8,504	6,620	6,232	1,401	1,410	822	978	953	1,610
Bombay	16,611	14,182	12,253	12,480	2,074	2,105	972	1,157	1,804	2,012
Sind	2,326	1,917	1,349	1,194	271	231	157	159	222	292
Madras	23,633	19,249	11,993	11,969	3,009	2,860	1,690	1,850	2,123	3,259
Coorg	13	11	11	10	5	4	18	4	14	5
Assam	421	375	251	234	130	102	63	68	95	98
Ajmer-Merwara	1,263	1,150	828	878	110	111	48	77	52	145
	20—30 years.		30—40 years.		40—50 years.		50—60 years.		60 years & over.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
BRITISH INDIA	29,497	33,815	27,293	25,500	28,630	18,585	23,420	19,212	60,875	57,746
N.-W. F. P.	340	300	251	207	277	179	322	175	490	381
Punjab	2,159	2,881	1,894	1,950	2,059	1,515	2,316	1,672	5,590	4,521
Delhi	385	649	311	374	320	240	321	228	708	580
U. P.	4,812	8,536	4,442	5,317	4,961	3,764	5,504	3,922	13,594	12,315
Bihar	898	977	991	714	874	520	785	585	1,448	1,344
Orissa	220	240	242	161	274	159	282	197	415	453
Bengal	6,941	6,374	4,851	3,656	4,351	2,954	3,816	2,875	5,927	5,470
C. P.	2,391	3,695	2,384	2,253	2,349	1,457	2,507	1,770	5,328	5,414
Bombay	4,480	5,684	4,391	3,839	4,806	2,510	4,513	2,612	9,004	8,562
Sind	629	725	648	439	724	340	670	272	1,157	964
Madras	5,793	8,164	6,354	6,253	7,149	4,691	6,950	4,686	16,505	17,154
Coorg	54	44	110	27	84	14	25	14	17	13
Assam	261	262	287	154	241	102	176	81	277	224
Ajmer-Merwara	134	284	137	156	211	110	233	123	415	351

M.—Males.

F.—Females.

TABLE M.—INFANTILE MORTALITY RATE IN THE LARGE TOWNS DURING 1938.

Towns.	Rate p.m. of live births.	Towns.	Rate p.m. of live births.
<i>N.-W. P. Province.</i>		<i>Bengal Presidency—contd.</i>	
Peshawar	163.2	Titagarh	179.5
Dera Ismail Khan	120.0	Naihati	85.9
<i>Delhi.</i>		Bhatpara	239.6
Delhi City	156.0	Calcutta	218.6
New Delhi	115.7	Sirajganj	186.2
<i>United Provinces.</i>		Dacca	179.4
Dehra Dun	223.2	Narayanganj	278.3
Saharanpur	302.8	Mymensingh	79.2
Hardwar Union	318.6	Barisal	202.5
Muzaffarnagar	203.3	Chittagong	213.7
Meerut	143.1	<i>Central Provinces.</i>	
Khurja	255.2	Nagpur	264.2
Aligarh	195.3	Jubbulpore	280.1
Hathras	274.3	Saugor	285.6
Muttra	223.5	Khandwa	266.8
Agra	200.1	Burhanpur	248.1
Bareilly	142.0	Raipur	198.6
Budaun	219.2	Bilaspur	203.6
Moradabad	179.3	Amraoti	198.3
Amroha	225.8	Akola	273.0
Sambhal	247.7	<i>Bombay Presidency.</i>	
Shahjahanpur	214.4	Bombay	267.9
Pilibhit	232.5	Jalgaon	196.5
Farrukhabad-cum-Fatehgarh	296.2	Dhulia	125.8
Etawah	321.1	Surat	268.4
Cawnpore	335.8	Broach	148.3
Allahabad	195.8	Nadiad	285.3
Jhansi	265.7	Godhra	184.4
Benares	222.3	Ahmedabad	283.0
Mirzapur-Bindhachal	174.2	Ahmednagar	174.9
Jaunpur	171.2	Poona	269.0
Gorakhpur	188.0	Nasik	372.9
Lucknow	226.4	Malegaon	187.1
Fyzabad-Ajodhya	145.2	Bandra	151.0
Bahraich	189.8	Kurla	229.6
<i>Bengal Presidency.</i>		Belgaum	137.5
Asansol	103.1	Gadag-Betigeri	174.0
Bankura	57.3	Bijapur	121.0
Hooghly-Chinsura	158.2	Sholapur	244.5
Serampur	152.2	<i>Sind.</i>	
Howrah	261.9	Karachi	149.6
South Suburban	250.9	Hyderabad	192.6
Baranagar	213.4	Sukkur	96.9
		Shikarpur	219.3

TABLE M. —INFANTILE MORTALITY RATE IN THE LARGE TOWNS DURING 1938 *contd.*

Towns.	Rate <i>p.m.</i> of live births.	Towns.	Rate <i>p.m.</i> of live births.
<i>Madras Presidency.</i>		<i>Madras Presidency—contd.</i>	
Bellary	179.4	Tellicherry	153.6
Adoni	123.9	Nellore	95.1
Donjeeveram	137.9	Vellore	145.2
Saidapet	178.4	Virudhunagar	180.4
Coimbatore	134.7	Srivilliputtur	161.9
Erode	111.3	Salem	134.6
Cocanada	261.5	Cuddalore	143.7
Rajahmundry	244.6	Tanjore	156.3
Kuntur	219.7	Kumbakonam	124.8
Penali	192.5	Negapatam	186.3
Bezwada	199.5	Mayavaram	113.7
Masulipatam	211.9	Tuticorin	203.0
Madras	222.1	Tinnevelly	221.7
Madura	186.7	Palamcottah	157.5
Dindigul	164.9	Trichinopoly	135.7
Kalicut	127.4	Vizagapatam	241.7
Palghat	142.7	Vizianagram	203.1
Channanore	143.8		

TABLE N.—INFANTILE MORTALITY IN RURAL AND URBAN AREAS.

	Rural.		Urban.	
	Deaths.	Rate <i>p. m.</i> of live births.	Deaths.	Rate <i>p. m.</i> of live births.
BRITISH INDIA	1,373,392	164.2	196,804	190.6
N.-W. F. P.	9,705	156.6	1,385	138.6
Punjab	171,796	166.3	22,712	171.1
Delhi	1,794	148.6	3,316	150.3
U. P.	213,720	139.6	50,969	204.1
Bihar	130,669	119.8	3,119	120.6
Orissa	52,175	223.5	813	152.8
Bengal	266,226	184.7	14,697	184.3
C. P.	138,992	238.3	18,642	237.5
Bombay	101,307	162.5	30,793	228.0
Sind	5,132	101.9	4,243	157.7
Madras	241,048	165.3	42,882	170.8
Coorg	613	186.4	24	48.4
Assam	38,261	165.9	796	121.7
Ajmer-Merwara	1,954	157.7	2,413	292.2

TABLE O.—THE FOLLOWING ARE THE CHANGES IN, OR ADDITIONS TO, THE LIST OF NOTIFIABLE DISEASES GIVEN ON PAGES 265—274 OF THE ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER FOR THE YEAR 1937.

A.—BRITISH INDIA, PROVINCES.

Delhi Province.—Scarlet fever, influenza, pneumonia and erysipelas were deleted. Relapsing fever, whooping cough, amœbic and bacillary dysentery, mumps, puerperal fever, and leprosy were added. "Enteric fever and its allied fevers" were substituted in the place of "Enteric fever".

Bihar.—Tuberculosis was added.

Assam.—Influenza was added to the list of diseases notifiable in all municipalities.

Typhoid, tuberculosis and diphtheria which in 1937 were notifiable in Shillong Municipality only were included in the list for all municipalities. "Typhoid or enteric fever" was substituted in the place of "Typhoid".

B.—BRITISH INDIA, TOWNS.

Delhi City.—The changes are shown above against Delhi province.

Patna Town.—Tuberculosis was added.

C.—INDIAN STATES.

Hyderabad.—Typhoid and tuberculosis have also been included under the Epidemic Diseases Act which was submitted to Government for sanction.

Gujarat States Agency.—Information regarding the individual States in this Agency was not available for 1937. Complete lists of notifiable diseases for 1938 are given below.

Baria.—Plague, smallpox and cholera.

Chota Udaipur.—Cholera, smallpox, dysentery and diarrhoea, typhoid fever (enteric), influenza, cerebrospinal fever, malaria, rabies, measles, whooping cough and diphtheria.

Cambay.—Smallpox, measles, typhoid fever, dysentery and diarrhoea.

Dharampur.—Cholera, smallpox, influenza and plague.

Lunawada.—Plague, cholera, cerebrospinal fever and meningitis and influenza.

Rajpipla.—Cholera, smallpox, plague, influenza, typhus, relapsing fever and cerebrospinal fever.

Sant.—Plague, cholera, smallpox, dysentery and diarrhoea, typhoid fever, influenza, cerebrospinal fever, malaria, rabies, measles, diphtheria and whooping cough.

Sachin.—Smallpox, chickenpox, measles, cholera, plague, typhoid fever, malaria, influenza, dysentery and diarrhoea, diphtheria and rabies.

Bansda.—Cholera, smallpox, measles, typhoid, plague, tuberculosis and influenza.

Mysore.—Revised and separate lists for Mysore City, Kolar Gold Fields and for Bangalore City are given below:—

Mysore City.—Cholera, smallpox, plague, tuberculosis, rabies, typhoid, para-typhoid, malaria, dysentery, continuous fever of over 7 days' duration and fever with glandular swellings.

Sanitary Board Area Kolar Gold Field.—Cholera, smallpox, plague, tuberculosis, rabies, typhoid and para-typhoid.

Bangalore City.—Cholera, smallpox and plague.

Cochin.—Acute pneumonia, influenza, relapsing fever and rabies were added.

Kapurthala.—Dysentery was added.

Dujana.—Dysentery was added.

Nalagarh.—Dysentery was added.

Terhi Garhwal.—Plague, cerebrospinal fever and diphtheria were deleted. Measles and tuberculosis were added.

Benares.—Cerebrospinal meningitis and tuberculosis were added.

Rampur.—Cerebrospinal fever and measles were deleted.

TABLE P.—CRUDE AND STANDARDISED DEATH RATES *per mille* (DIRECT METHOD) FOR DIFFERENT PROVINCES IN INDIA. THE 1931 CENSUS POPULATION DISTRIBUTION FOR INDIA HAS BEEN TAKEN AS THE STANDARD.

		1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.
BRITISH INDIA	Standardised	24.1	21.0	21.6	22.8	22.1	22.7	22.0	23.7
	Crude	25.2	21.6	22.4	24.9	23.6	23.2	22.4	24.3
N.-W. F. P.	Standardised	20.5	20.3	21.2	20.7	18.8	17.1	20.4	21.8
	Crude	20.2	19.7	20.8	20.4	18.6	17.0	19.9	21.3
Punjab	Standardised	23.4	22.0	24.5	24.6	21.1	20.5	19.2	20.8
	Crude	25.9	24.2	27.1	26.3	23.3	22.0	23.1	23.4
Delhi	Standardised	23.4	23.9	31.8	30.6	28.9	25.6	23.4	22.8
	Crude	23.7	24.2	31.9	28.5	28.7	23.8	23.8	23.4
U. P.	Standardised	26.1	21.4	17.2	25.7	23.1	21.2	19.4	23.2
	Crude	26.9	22.0	18.2	25.6	23.6	21.2	19.8	23.6
Bihar	Standardised	26.0†	19.9†	20.9†	26.2†	23.6†	21.3	20.7	21.4
	Crude	26.5†	20.4†	21.6†	25.1†	24.1†	20.5	21.0	21.8
Orissa	Standardised	::	::	::	::	::	28.2	27.0	28.5
	Crude	::	::	::	::	::	27.0	27.6	28.8
Bengal	Standardised	23.5	21.8	25.0	23.5	22.7	24.0	24.0	26.3
	Crude	22.2	20.3	23.7	23.2	22.1	23.7	23.6	25.0
C. P.	Standardised	31.8	23.5	23.0	*	*	31.1	28.4	35.2
	Crude	35.4	26.5	25.7	35.5	32.6	32.4	30.1	37.6
Bombay	Standardised	23.5†	22.4†	23.9†	20.9†	24.2†	26.6	24.8	27.1
	Crude	23.7†	22.7†	24.1†	24.5†	24.4†	26.0	25.4	27.9
Sind	Standardised	::	::	::	::	::	12.3	13.0	13.2
	Crude	::	::	::	::	::	11.5	11.1	11.3
Madras	Standardised	21.3	19.8	21.3	24.3	22.3	22.1	20.9	20.8
	Crude	23.6	21.6	22.9	23.9	23.6	22.0	22.3	21.6

Coorg	Standardised	25.7	24.9	26.5	25.0	24.6	25.6	29.8	26.6
	Crude	23.8	23.3	24.0	23.1	22.9	23.7	27.2	24.3
Assam	Standardised	19.7	19.4	20.6	19.6	21.4	19.5	21.8	22.1
	Crude	18.6	18.7	19.8	19.0	20.5	18.6	20.9	20.9
Ajmer-Merwara	Standardised	30.0	24.5	27.4	28.9	27.8	24.2	29.3	25.0
	Crude	30.1	24.8	28.1	28.7	28.4	24.1	29.8	25.1

* Figures not available.

† Including Orissa.

‡ Including Sind.

TABLE Q*.—ESTIMATED POPULATION OF ASSAM BY AGE AND SEX.

	1931.		1932.		1933.		1934.		1935.		1936.		1937.	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
0—1 year .	132,224	132,920	133,409	134,300	134,971	136,017	136,202	137,386	137,453	138,796	138,722	140,184	140,034	141,605
1—5 years .	542,680	557,747	547,544	563,541	553,951	570,745	559,004	576,487	564,138	582,407	569,348	588,228	574,733	594,192
5—10 years .	567,065	511,593	572,148	516,907	578,843	523,514	584,123	528,781	589,488	534,211	594,932	539,551	600,560	545,021
10—15 years .	482,045	428,410	486,365	432,860	492,057	438,393	496,545	442,804	501,105	447,351	505,733	451,822	510,517	456,403
15—20 years .	346,103	382,057	349,205	386,026	353,292	390,960	356,514	394,894	359,789	398,949	363,111	402,937	366,546	407,022
20—30 years .	745,506	721,987	752,188	729,486	760,991	738,811	767,932	746,245	774,985	753,908	782,141	761,443	789,540	769,163
30—40 years .	627,030	473,024	632,650	477,937	640,054	484,047	645,892	488,917	651,824	493,937	657,843	498,874	664,066	503,932
40—50 years .	397,377	278,989	400,939	281,886	405,631	285,490	409,331	288,362	413,090	291,323	416,905	294,235	420,849	297,218
50—60 years .	216,334	158,006	218,273	159,647	220,828	161,688	222,842	163,315	224,889	164,992	226,965	166,641	229,112	168,330
60 years and over.	138,605	105,705	139,847	106,803	141,483	108,169	142,774	109,257	144,085	110,379	145,416	111,482	146,791	112,612

*Please see the remarks on page 191 in respect of this table.

TABLE R.*—DEATH RATES ACCORDING TO AGE AND SEX IN ASSAM.

	1931.		*1932.		1933.		1934.		1935.		1936.		1937.	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
0—1 years . . .	160.4	144.8	166.0	146.5	173.0	154.0	174.0	156.0	170.0	156.0	158.5	142.6	166.5	153.2
1—5 years . . .	20.6	18.9	20.8	20.0	21.6	20.2	21.3	19.7	26.2	25.6	22.5	20.9	24.0	22.1
5—10 years . . .	9.3	8.7	10.6	10.2	10.9	10.5	9.5	9.2	11.5	11.2	9.7	9.4	11.1	10.7
10—15 years . . .	6.0	5.7	6.0	5.7	6.3	5.8	5.8	5.5	6.5	6.2	6.3	5.4	7.2	7.2
15—20 years . . .	8.1	11.1	8.0	11.1	9.0	11.8	7.8	11.1	8.9	10.7	8.3	10.6	10.4	12.2
20—30 years . . .	8.7	13.8	8.1	13.3	8.7	13.9	6.2	13.1	8.6	13.6	8.1	12.6	9.3	15.0
30—40 years . . .	12.2	15.0	11.1	13.5	11.7	14.6	11.7	13.4	11.7	14.8	10.9	14.1	12.2	16.1
40—50 years . . .	18.0	16.4	17.3	16.2	18.2	17.1	17.2	16.3	17.4	17.4	16.9	16.5	18.5	19.3
50—60 years . . .	31.1	28.2	29.3	27.7	30.9	28.7	30.0	27.9	30.1	29.6	30.0	28.3	32.1	33.5
60 years and over . . .	67.2	63.6	61.6	59.4	68.8	66.8	67.0	63.2	74.3	73.3	66.7	65.4	75.0	75.4

Please see the remarks on page 191 in respect of this table.

Appendix II
relating to
Section II—Chief diseases

TABLE A.—DEATHS AND RATES *PER MILLE* FROM CERTAIN CAUSES OR GROUPS OF CAUSES OF MORTALITY.

Province.	Cholera.		Smallpox.		Plague.		Fevers.		Dysentery and Diarrhoea.		Respiratory Diseases.		Other causes.		Total.	
	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.
BRITISH INDIA .	236,143	0·9	89,844	0·1	17,371	0·06	3,883,627	14·1	292,482	1·1	536,649	1·9	1,679,004	6·1	6,685,120	24·3
N-W. F. P. .	740	0·3	1,065	0·4	...	...	41,622	16·4	456	0·2	3,704	1·5	6,395	2·5	53,982	21·3
Punjab . .	5,760	0·2	5,455	0·2	1	0·00	410,198	15·4	12,046	0·5	77,668	2·9	111,571	4·2	622,699	23·4
Delhi . .	182	0·3	90	0·1	...	...	4,856	6·8	966	1·4	5,763	8·1	4,875	6·7	16,732	23·4
U. P. . .	70,622	1·3	4,411	0·1	13,436	0·3	940,469	17·7	21,015	0·4	46,957	0·9	153,078	2·9	1,249,938	23·6
Bihar . .	14,750	0·4	5,977	0·2	1,838	0·1	615,966	17·6	3,726	0·1	3,040	0·1	118,436	3·3	763,733	21·3
Orissa . .	1,309	0·2	3,350	0·5	...	...	113,610	15·7	19,816	2·7	4,967	0·7	65,534	9·0	208,536	28·8
Bengal . .	71,133	1·4	9,289	0·2	...	...	819,763	15·6	69,232	1·3	99,763	1·9	246,706	4·6	1,315,886	25·0
C. P. . .	45,832	2·7	409	0·02	535	0·03	322,404	19·2	42,793	2·6	54,137	3·2	163,691	9·8	629,301	37·6
Bombay . .	3,813	0·2	4,355	0·2	406	0·02	186,363	9·5	34,242	1·7	125,618	6·4	192,590	9·9	547,387	27·9
Sind . . .	343	0·1	941	0·2	...	...	27,970	6·6	1,316	0·3	8,759	2·1	8,756	2·0	48,085	11·3
Madras . .	10,252	0·2	2,273	0·05	1,155	0·02	282,708	5·9	74,064	1·5	96,420	2·0	565,180	11·9	1,032,052	21·6
Coorg. . .	...	...	8	0·02	...	...	3,027	18·4	123	0·8	251	1·5	577	3·6	3,986	24·3
Assam . .	11,907	1·4	1,649	0·2	...	...	105,687	12·4	11,925	1·4	6,874	0·8	39,725	4·7	177,767	20·9
Ajmer-Merwara .	...	...	577	1·0	...	...	8,984	15·1	757	1·3	2,728	4·6	1,890	3·1	14,936	25·1

TABLE B.—DEATHS AND RATES *PER MILLE* FROM CERTAIN CAUSES OR GROUPS OF CAUSES OF MORTALITY IN RURAL AND URBAN AREAS.

Province.	Cholera.				Smallpox.				Plague.			
	Rural.		Urban.		Rural.		Urban.		Rural.		Urban.	
	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.
BRITISH INDIA	222,489	0·9	13,654	0·5	30,704	0·1	9,140	0·3	15,887	0·1	1,484	0·1
N.-W. F. P.	617	0·3	123	0·4	920	0·4	145	0·4	...	...	...	...
Punjab	4,914	0·2	846	0·2	4,644	0·2	811	0·2	1	0·00	...	...
Delhi	67	0·3	115	0·2	4	0·02	86	0·2	...	...	...	...
U. P.	66,667	1·4	3,955	0·7	3,244	0·1	1,167	0·2	12,332	0·3	1,104	0·2
Bihar	14,423	0·4	327	0·2	5,493	0·2	484	0·3	1,740	0·1	98	0·1
Orissa	1,272	0·2	37	0·2	3,321	0·5	29	0·1	...	...	...	...
Bengal	67,771	1·4	3,362	1·0	6,635	0·1	2,654	0·8	...	...	...	...
C. P.	41,717	2·8	3,615	2·0	210	0·01	199	0·1	477	0·03	58	0·03
Bombay	3,710	0·2	103	0·03	2,086	0·1	2,269	0·6	342	0·02	64	0·02
Sind	312	0·1	31	0·04	871	0·2	70	0·1	...	...	...	...
Madras	9,251	0·2	1,001	0·3	1,407	0·03	866	0·2	995	0·02	160	0·04
Coorg . . . . .	...	...	...	...	3	0·02	...	...	...	...	...	...
Assam	11,768	1·4	139	0·7	1,641	0·2	8	0·04	...	...	...	...
Ajmer-Merwara . . . . .	...	...	...	...	225	0·5	352	1·9	...	...	...	...

TABLE B.—DEATHS AND RATES PER MILLE FROM CERTAIN CAUSES OR GROUPS OF CAUSES OF MORTALITY IN RURAL AND URBAN AREAS—*contd.*

Province.	Fevers.				Dysentery and Diarrhoea.				Respiratory diseases.			
	Rural.		Urban.		Rural.		Urban.		Rural.		Urban.	
	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.	Deaths.	Rate p. m.
BRITISH INDIA	3,680,188	14.8	203,439	7.7	230,240	0.9	62,242	2.4	372,324	1.5	164,325	6.8
N.-W. F. P.	38,903	17.7	2,719	8.0	251	0.1	205	0.6	2,083	0.9	1,621	4.7
Punjab	379,310	16.4	30,888	8.9	7,705	0.3	4,341	1.2	61,259	2.7	16,409	4.7
Delhi	3,742	17.0	1,114	2.2	293	0.9	763	1.5	1,277	5.8	4,486	9.1.
U. P.	871,789	18.5	68,680	11.5	6,847	0.1	14,168	2.4	9,739	0.2	37,218	6.3
Bihar	607,184	18.0	8,782	6.2	2,744	0.1	982	0.7	2,351	0.1	689	0.5
Orissa	112,229	16.0	1,381	6.1	19,125	2.7	691	3.1	4,634	0.7	333	1.5
Bengal	804,016	16.4	15,747	4.5	59,694	1.2	9,538	2.7	80,970	1.7	18,793	5.3
C. P.	300,386	20.2	22,018	11.9	36,739	2.5	6,054	3.3	44,055	3.0	10,082	5.5
Bombay	164,741	10.4	21,622	5.8	26,772	1.7	7,470	2.0	87,588	5.5	38,030	10.2
Sind	25,157	7.2	2,813	3.7	169	0.05	1,147	1.5	3,886	1.1	4,873	6.4
Madras	257,300	5.9	25,408	6.4	58,479	1.3	15,385	3.9	67,956	1.5	28,464	7.2
Coorg	2,988	19.3	39	4.2	117	0.8	11	1.2	138	0.9	113	12.0
Assam	104,685	12.6	1,002	4.7	11,391	1.4	534	2.5	6,379	0.8	495	2.3
Ajmer-Merwa	7,758	18.9	1,226	6.6	4	0.01	753	4.1	9	0.02	2,719	14.7

TABLE C.—DEATHS FROM CHOLERA FROM 1905 TO 1938.

Year.	British India.	N.-W. F. P.	Punjab.	Delhi.	U. P.	Bihar.		Orissa.	Bengal.	C. P.	Bombay. Sind.		Madras.	Coorg.	Assam.	Burma.	Almer-Merwara.	Indian States.			
						Raj-putana.	Central India.				Hyder-abad.	Mysore.									
1905—1909.	2,371,365	3,545	20,354	324	399,144	555,350	...	677,816	61,011	89,644	...	422,658	410	95,927	44,897	235	5,926	13,366	2,227	16,600	
1910—1914.	1,767,770	5,421	17,643	503	331,970	394,482	...	451,025	78,258	96,929	...	289,444	254	81,967	19,800	74	6,219	25,896	9,210	17,672	
1915—1919.	2,038,749	5,557	25,030	242	346,359	598,862	...	453,864	110,998	97,606	...	321,297	191	99,088	38,713	942	7,970	15,652	26,647	13,062	
1920—1924.	1,069,136	4,390	22,843	781	228,540	229,512	...	276,455	72,680	25,793	...	131,845	34	54,379	21,805	79	3,911	6,826	9,254	8,023	
1925	115,645	116	3,049	50	7,653	17,336	...	84,276	124	57	...	44,815	4	6,233	1,932	...	...	43	22	...
1926	138,151	...	87	18	6,166	27,268	...	59,106	4,565	73	...	24,407	2	10,275	6,182	2	4	269	26	6	
1927	304,710	2	11,286	16	28,285	49,022	...	118,377	16,311	26,153	...	35,334	...	15,392	4,528	4	1,357	2,584	8,913	1,307	
1928	351,305	...	2,034	34	44,941	77,103	...	136,245	12,198	6,881	...	57,677	...	6,916	7,209	68	1,371	7,520	4,314	413	
1929	295,434	30	2,309	193	50,924	104,034	...	81,090	6,168	9,084	...	25,846	1	7,765	7,970	20	722	1,155	450	140	
1930	337,322	449	1,181	8	61,334	155,215	...	54,963	23,250	15,142	...	18,746	...	6,332	661	41	2,101	11,165	18,369	535	
1931	220,909	105	391	61	31,118	40,943	...	79,073	14,135	18,616	...	30,232	116	5,523	534	32	204	1,411	5,653	6,385	
1932	67,219	70	614	4	9,734	9,348	...	33,910	854	1,353	...	5,278	...	4,971	1,082	1	122	168	71	83	
1933	68,318	...	160	...	1,915	17,514	...	29,242	2,152	7,797	...	3,851	...	5,508	179	...	35	642	4,838	90	
1934	199,708	...	178	19	31,903	57,289	...	50,742	27,329	11,362	...	18,158	1	1,904	822	1	969	4,471	4,951	346	
1935	217,162	245	714	181	10,412	64,876	...	59,605	20,140	11,235	...	35,456	...	7,436	6,858	4	33	1,043	10,553	1,407	
1936	159,720	68	1,762	48	6,793	6,070	7,977	76,100	10,691	11,304	8	34,117	2	3,816	984	21	776	604	9,065	1,793	
1937	*99,054	24	105	...	6,341	13,949	5,076	32,710	1,107	10,992	2	23,307	1	5,440	†	...	..	1,042	2,351	4,842
1938	*236,143	740	5,760	182	70,622	14,750	1,309	71,133	45,332	3,813	343	10,252	...	11,907	†	...	2,070	11,702	8,687	880	

*Excluding Burma.

†Burma was separated from India since April 1937.

TABLE D.—DEATHS AND RATES *per mille* FROM CHOLERA IN RURAL AND URBAN AREAS.

	Deaths.			Rate p. m.			No. of anti-cholera inoculations.	Total villages.	Number infected.
	R.	U.	Total.	R.	U.	Total.			
BRITISH INDIA	222,489	13,654	236,143	0·9	0·5	0·9	10,779,332	451,210	44,259
N.-W. F. P.	617	123	740	0·3	0·4	0·3	234,185	2,802	157
Punjab	4,914	846	5,760	0·2	0·2	0·2	666,652	34,875	1,422
Delhi	67	115	182	0·3	0·2	0·3	93,213	309	24
U. P.	66,667	3,955	70,622	1·4	0·7	1·3	1,544,041	105,640	9,493
Bihar	14,423	327	14,750	0·4	0·2	0·4	593,375	67,879	3,273
Orissa	1,272	37	1,309	0·2	0·2	0·2	132,260	19,466	445
Bengal	67,771	3,362	71,133	1·4	1·0	1·4	3,353,053	86,361	17,753
C. P.	41,717	3,615	45,332	2·8	2·0	2·7	1,887,632	39,246	5,969
Bombay	3,710	103	3,813	0·2	0·03	0·2	323,579	21,455	812
Sind	312	31	343	0·1	0·04	0·1	27,434	9,095	70
Madras	9,251	1,001	10,252	0·2	0·3	0·2	951,079	34,830	2,212
Coorg . . . . .	...	...	...	...	...	...	...	298	...
Assam	11,768	139	11,907	1·4	0·7	1·4	972,696	28,333	2,629
Ajmer-Merwara . . . . .	...	...	...	..	...	...	133	621	...

R.—Rural.

U.—Urban.

TABLE E.—DEATHS FROM CHOLERA BY MONTHS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
BRITISH INDIA	5,436	5,573	10,268	13,021	27,763	32,192	27,225	29,457	22,270	20,287	23,527	19,074
N.-W. F. P. . . . .	...	...	...	1	123	242	152	171	45	6	...	...
Punjab . . . . .	...	...	...	337	2,878	2,131	712	167	35	...	...	...
Delhi . . . . .	...	...	1	17	91	40	32	1	...	...	...	...
U. P.	128	55	291	2,063	14,103	21,013	11,987	7,240	4,057	4,694	3,457	1,534
Bihar	168	492	260	432	578	1,107	2,133	2,246	2,630	1,626	2,386	1,292
Orissa	91	93	194	155	276	291	118	65	5	5	7	9
Bengal	2,615	3,707	8,435	6,699	3,821	2,122	1,343	1,214	5,561	8,557	14,031	13,023
C. P.	22	23	282	2,096	5,364	3,332	8,066	15,596	7,723	2,263	471	94
Bombay	15	6	60	10	34	143	850	1,018	728	823	474	157
Sind . . . . .	...	...	...	1	71	127	112	32	...	...	...	...
Madras	2,256	1,034	428	740	458	714	1,509	1,097	959	663	148	246
Coorg . . . . .	...	...	...	...	...	...	...	...	...	...	...	...
Assam	191	163	317	470	466	930	706	615	1,127	1,650	2,553	2,719
Ajmer-Merwara . . . . .	...	...	...	...	...	...	...	...	...	...	...	...

TABLE F.—DEATHS FROM FLAGRA BY MONTHS.

(i) British Provinces.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	Rate p.m.	No. of anti- plague inoculations.
GRAND TOTAL	3,528	3,314	4,915	3,957	1,001	261	639	1,276	1,378	1,548	1,405	1,955	25,177	...	...
BRITISH INDIA	2,548	2,530	4,223	3,676	925	192	283	507	410	370	510	1,199	17,371	0·06	420,662
N.-W. F. P.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Punjab	...	...	1	...	...	...	...	...	...	...	...	...	1	0·00	352
Delhi	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
U. P.	2,020	1,903	3,418	3,228	847	139	142	257	173	117	261	931	13,496	0·3	163,944
Bihar	252	342	572	349	49	12	43	71	85	7	24	82	1,838	0·1	34,972
Orissa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bengal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C. P.	75	92	106	38	2	...	3	33	40	39	57	50	535	0·08	19,485
Bombay	14	30	39	20	6	12	16	37	49	52	75	56	406	0·02	41,560
Sind	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Madras	185	163	87	41	21	29	79	109	113	155	93	80	1,155	0·02	159,510
Coorg	...	...	...	...	...	...	...	...	...	...	...	...	...	...	839
Assam	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ajmer-Merwara	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

(ii) Indian States* and Agencies.

Kolhapur State	66	43	40	19	...	...	24	39	15	35	34	7	322		
Kurundwad Jr. State (Deccan States).	...	...	...	...	...	...	...	...	...	...	1	3	4		
Sangli State (Deccan States).	...	...	...	...	...	...	...	1	...	...	4	8	13		
Benares State	36	89	224	95	9	...	...	...	2	...	12	42	509		
Mysore State	817	576	362	156	67	69	304	598	720	651	476	400	5,196		
C. & M. Station, Bangalore	...	3	1	...	...	...	...	2	5	...	...	...	11		
Hyderabad State	63	73	65	11	...	...	28	129	226	491	367	296	1,749		
Cochin State (Madras Presidency).	...	...	...	...	...	...	...	...	...	1	1	...	2		

* Among the Indian States from which plague returns have been received, only those states in which at least one death from plague was reported have been included in the above table.

TABLE G.—DEATHS AND RATES *per mille* FROM SMALLPOX IN RURAL AND URBAN AREAS.

	Deaths.			Death rate p. m.			Deaths in children.			Percentages of deaths to total mortality from smallpox.	
	R.	U.	Total.	R.	U.	Total.	Under 1 year.	1—10 years.	Total.	Under 1 year.	1—10 years.
BRITISH INDIA	30,704	9,140	39,844	0·1	0·3	0·1	6,165†	10,837†	17,002†	15·7†	27·6†
N.-W. F. P.	920	145	1,065	0·4	0·4	0·4	269	609	878	25·3	57·2
Punjab	4,644	811	5,455	0·2	0·2	0·2	1,531	2,737	4,268	28·1	50·2
Delhi	4	86	90	0·02	0·2	0·1	26	56	82	23·9	62·2
U. P.	3,244	1,167	4,411	0·1	0·2	0·1	1,202	1,645	2,847	27·1	37·3
Bihar	5,493	484	5,977	0·2	0·3	0·2	311	680	991	5·2	11·4
Orissa	3,321	29	3,350	0·5	0·1	0·5	183	569	757	5·6	17·0
Bengal	16,635	2,654	9,289	0·1	0·8	0·2	530	1,183	1,713	5·7	12·7
C. P.	210	199	409	0·01	0·1	0·02	145	203	348	35·5	49·6
Bombay	2,086	2,269	4,355	0·1	0·6	0·2	1,059	1,857	2,916	24·3	42·6
Sind	871	70	941	0·2	0·1	0·2	160	430	590	17·0	45·7
Madras	1,407	866	2,273	0·03	0·2	0·05	596	583	1,179	26·2	25·6
Coorg	8	...	8	0·02	...	0·02	2	1	3	66·7	33·3
Assam	1,641	8	1,649	0·2	0·04	0·2	146	284	430	8·9	17·2
Ajmer-Merwara	225	352	577	0·5	1·9	1·0	*	*	*	*	*

†Excluding Ajmer-Merwara.

*Not available.

R.—Rural.

U.—Urban.

TABLE H.—DEATHS FROM SMALLPOX BY MONTHS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.	Oct.	Nov.	Dec.
BRITISH INDIA	4,696	4,446	6,093	6,143	6,105	3,640	2,213	1,397	835	576	1,323	2,372
N.-W. F. P.	234	137	94	63	114	80	53	60	6	17	92	115
Punjab	981	737	641	610	745	562	265	141	65	54	195	459
Delhi	6	8	8	19	19	9	1	1	1	...	3	15
U. P.	379	296	510	688	901	551	258	121	53	31	136	487
Bihar	515	374	567	1,118	1,263	681	395	181	152	70	364	292
Orissa	363	317	535	396	385	299	271	249	184	58	75	213
Bengal	1,068	1,182	2,127	1,696	1,389	668	330	222	125	115	101	266
C. P.	11	34	79	93	72	34	48	14	9	4	2	9
Bombay	473	776	918	717	503	310	213	109	81	60	67	123
Sind	181	87	120	132	125	67	51	66	5	25	46	36
Madras	264	277	273	217	174	150	187	177	108	87	115	244
Coorg . . . . .	...	...	8	...	...	...	...	...	...	...	...	...
Assam	176	155	87	233	280	199	133	52	46	55	132	101
Ajmer-Merwara	45	66	131	161	130	30	8	4	...	...	...	2

TABLE I.—DEATHS AND RATES *per mille* FROM FEVERS AND MALARIA IN RURAL AND URBAN AREAS.

	Fever deaths.			Death rate p. m.			Reported malaria deaths.		
	R.	U.	Total.	R.	U.	Total	R.	U.	Total.
BRITISH INDIA	3,680,168	203,439	3,883,627	14.8	7.7	14.1	1,520,886	56,979	1,577,865
N.-W. F. P.	38,903	2,719	41,622	17.7	8.0	16.4	@	50*	50
Punjab	379,310	30,388	410,198	16.4	8.9	15.4	4,242	778	5,015
Delhi	8,742	1,114	4,856	17.0	2.2	6.8	12	303	315
U. P.	871,789	68,680	940,469	18.5	11.5	17.7	789,909	29,148	819,057
Bihar	607,184	8,782	615,966	18.0	6.2	17.6	@	1,320*	1,320
Orissa	112,229	1,381	113,610	16.0	6.1	15.7	@	489*	489
Bengal	804,016	15,747	819,763	16.4	4.5	15.6	413,557	2,964	416,521
C. P.	900,386	22,018	922,404	20.2	11.9	19.2	285,399	16,851	802,250
Bombay	164,741	21,622	186,363	10.4	5.8	9.5	27,335	2,455	29,790
Sind	25,157	2,813	27,970	7.2	3.7	6.6	432	1,254	1,686
Madras	257,800	25,408	282,708	5.9	6.4	5.9	@	1,190*	1,190
Coorg	2,988	39	3,027	19.3	4.2	18.4	...	...	...
Assam	104,685	1,002	105,687	12.6	4.7	12.4	@	181*	181
Ajmer-Merwara	7,758	1,228	8,984	18.9	6.6	15.1	@	1*	1

@ Not available.
* For Municipalities only.

R.—Rural. U.—Urban.

TABLE J.—DEATHS FROM FEVERS BY MONTHS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
BRITISH INDIA	322,761	263,347	278,593	321,390	355,232	324,773	321,951	324,563	320,317	330,831	357,179	362,706
N.-W. F. P.	4,746	3,603	3,417	3,043	3,931	3,313	3,084	2,687	2,599	3,199	3,236	4,759
Punjab	34,152	27,226	26,937	32,455	53,181	44,958	34,196	30,212	29,031	30,218	32,325	35,307
Delhi	356	246	311	461	765	523	419	362	334	276	349	454
U. P.	77,776	63,675	61,927	86,314	99,247	96,427	83,923	76,654	72,883	70,556	71,785	79,292
Bihar	48,424	37,324	43,176	53,791	54,797	50,570	54,847	57,176	54,173	50,437	57,936	52,815
Orissa	9,369	8,099	9,374	8,296	8,199	7,739	9,750	10,772	9,462	8,772	11,297	11,981
Bengal	76,448	60,693	63,760	62,942	51,905	52,476	57,057	60,188	65,230	79,995	95,332	93,681
C. P.	19,861	18,648	22,627	26,167	32,780	20,877	23,660	30,468	33,539	33,676	32,328	27,773
Bombay	13,174	13,031	14,572	16,336	14,575	13,049	17,306	19,206	18,032	16,151	15,869	15,542
Sind	3,326	2,468	2,620	2,441	2,513	2,098	1,820	1,742	1,847	2,291	2,546	2,258
Madras	24,408	19,331	21,792	20,306	22,780	21,566	25,663	25,679	24,129	25,314	23,709	23,023
Coorg	286	203	253	204	237	334	380	238	240	253	229	217
Assam	8,992	7,421	6,878	7,693	9,340	10,277	9,259	8,408	8,100	9,176	10,177	9,966
Ajmer-Merwara	943	876	969	930	982	566	622	771	668	517	541	629

TABLE K.—DEATHS AND RATES *per mille* FROM DYSENTERY AND DIARRHŒA IN RURAL AND URBAN AREAS AND BY SEX.

	Deaths.					Rate <i>per mille</i>		
	R.	U.	Total.	M.	F.	R.	U.	Total.
BRITISH INDIA	230,240	62,242	292,482	152,239	140,243	0·9	2·4	1·1
N.-W. F. P.	251	205	456	270	186	0·1	0·6	0·2
Punjab	7,705	4,341	12,046	6,540	5,506	0·3	1·2	0·5
Delhi	203	763	966	479	487	0·9	1·5	1·4
U. P.	6,847	14,168	21,015	11,072	9,943	0·1	2·4	0·4
Bihar	2,744	982	3,726	2,190	1,536	0·1	0·7	0·1
Orissa	19,125	691	19,816	10,340	9,476	2·7	3·1	2·7
Bengal	59,694	9,538	69,232	36,126	33,106	1·2	2·7	1·3
O. P.	36,739	6,054	42,793	22,069	20,724	2·5	3·3	2·6
Bombay	26,772	7,470	34,242	17,660	16,582	1·7	2·0	1·7
Sind	169	1,147	1,316	740	576	0·05	1·5	0·3
Madras	58,479	15,585	74,064	37,988	36,076	1·3	3·9	1·5
Coorg	117	11	128	66	62	0·8	1·2	0·3
Assam	11,391	534	11,925	6,321	5,604	1·4	2·5	1·4
Ajmer-Merwara	4	753	757	378	379	0·01	4·1	1·3

R—Rural U—Urban. M—Males. F—Females.

TABLE L.—DEATHS FROM DYSENTERY AND DIARRHŒA BY MONTHS.

	Jan.	Feb.	Mar.	April	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec
BRITISH INDIA	19,938	16,058	18,303	20,300	21,599	22,321	30,509	34,445	30,508	27,733	25,892	24,376
N.-W. F. P.	27	14	22	42	59	52	58	49	53	33	18	29
Punjab	466	337	449	923	2,063	1,675	1,241	1,219	1,087	1,001	914	671
Delhi	23	86	48	92	218	119	124	116	49	54	46	41
U. P.	955	678	1,207	2,182	2,512	2,590	2,401	2,586	1,899	1,616	1,292	1,097
Bihar	219	160	193	268	276	304	754	518	304	251	252	237
Orissa	1,536	1,356	1,525	1,367	1,278	1,803	2,382	2,343	1,735	1,458	1,435	1,598
Bengal	5,412	4,580	5,658	5,895	4,668	4,532	4,929	4,883	5,476	6,870	8,355	7,974
O. P.	1,820	1,566	1,761	2,025	1,900	2,103	4,342	7,300	7,159	5,526	4,178	3,113
Bombay	1,528	1,337	1,423	1,701	1,849	2,551	5,198	6,315	4,612	3,203	2,359	2,166
Sind	103	85	99	83	118	144	107	139	166	106	95	71
Madras	7,025	5,260	5,223	4,378	5,483	5,640	7,860	7,947	7,001	6,370	5,487	5,890
Coorg . . . . .	...	8	11	14	12	16	13	10	13	12	6	13
Assam	793	612	600	729	1,013	1,238	,040	927	889	1,208	1,434	1,442
Ajmer-Merwara	31	29	84	111	150	54	60	93	65	25	21	34

TABLE M.—DEATHS AND RATES *per mille* FROM RESPIRATORY DISEASES IN RURAL AND URBAN AREAS AND BY SEX.

	Deaths.					Rate <i>per mille</i> .					Reported deaths from pulmonary tuberculosis.	
	R.	U.	Total.	M.	F.	R.	U.	Total.	M.	F.	R.	U.
	BRITISH INDIA	372,324	164,325	536,649	304,208	232,443	1.5	6.3	1.9	2.1	1.7	40,958	31,085
N.-W. F. P.	2,083	1,621	3,704	2,123	1,576	0.9	4.7	1.5	1.5	1.4	†	364*
Punjab	61,259	16,409	77,668	43,510	34,158	2.7	4.7	2.9	3.0	2.8	10,379	2,822
Delhi	1,277	4,436	5,763	3,007	2,756	5.8	9.1	8.1	7.3	9.1	131	926
U. P.	9,739	37,218	46,957	25,050	21,907	0.2	6.3	0.9	0.9	0.9	876	5,450
Bihar	2,351	689	3,040	1,764	1,276	0.1	0.5	0.1	0.1	0.1	†	141*
Orissa	4,634	333	4,967	2,351	2,116	0.7	1.5	0.7	0.8	0.6	†	5*
Bengal	80,970	18,793	99,763	62,912	36,851	1.7	5.3	1.9	2.3	1.5	10,076	4,592
C. P.	44,055	10,082	54,137	31,207	22,930	3.0	5.5	3.2	3.7	2.7	1,238	426
Bombay	87,588	38,030	125,618	67,883	57,735	5.5	10.2	6.4	6.7	6.1	17,780	7,785
Sind	3,886	4,873	8,759	5,251	3,508	1.1	6.4	2.1	2.2	1.9	478	1,018
Madras	67,956	28,464	96,420	53,020	43,400	1.5	7.2	2.0	2.2	1.8	†	6,929*
Coorg	138	113	251	176	75	0.9	12.0	1.5	1.9	1.0	†	...
Assam	6,379	495	6,874	4,048	2,826	0.8	2.3	0.8	0.9	0.7	†	66*
Ajmer-Merwara	9	2,719	2,728	1,399	1,329	0.02	14.7	4.6	4.4	4.8	†	561*

* For municipalities only.

† Not available.

R.—Rural.

U.—Urban.

M.—Male.

F.—Female.

TABLE N.—DEATHS FROM RESPIRATORY DISEASES BY MONTHS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
BRITISH INDIA	50,566	44,769	47,089	45,298	43,445	38,095	40,211	42,297	42,387	42,863	46,877	52,752
N.-W. F. P.	648	446	336	265	290	250	214	189	107	174	254	531
Punjab	9,188	7,209	6,181	6,026	7,125	6,022	5,141	4,544	4,630	4,846	6,691	10,065
Delhi	536	453	505	455	603	410	333	342	394	380	519	733
U. P.	5,029	3,938	4,351	4,659	4,831	3,524	3,202	3,257	3,209	3,165	3,457	4,335
Bihar	317	260	242	325	251	243	210	246	240	185	222	299
Orissa	425	396	415	406	395	424	455	442	397	381	406	425
Bengal	10,146	9,178	9,606	8,475	7,430	6,444	6,562	6,545	7,137	8,159	9,713	10,327
C. P.	3,443	3,606	4,145	4,536	4,322	3,244	4,191	5,655	5,834	5,120	5,299	4,742
Bombay	9,725	10,280	11,800	11,493	9,217	8,625	10,458	11,429	11,014	10,477	10,412	10,688
Sind	1,454	1,229	994	665	526	497	427	444	444	487	663	929
Madras	8,674	7,007	7,615	6,995	7,497	7,676	8,354	8,553	8,264	8,630	8,422	8,733
Coorg	26	12	26	29	19	22	19	28	23	17	14	11
Assam	708	549	630	586	549	572	471	430	486	674	604	615
Ajmer-Merwara	197	206	243	383	340	142	174	193	203	177	201	269

TABLE O.—QUININE AND CINCHONA FEBRIFUGE ISSUED BY THE PUBLIC HEALTH, MEDICAL, AND OTHER DEPARTMENTS IN THE VARIOUS PROVINCES OF BRITISH INDIA DURING 1938.

	Quinine.		Cinchona febrifuge.	
	Total issues in lbs.	Grains per head of population.	Total issues in lbs.	Grains per head of population.
British India	83,984	2·1	23,938	0·6
N.-W. F. P.	1,373	3·8	769	2·1
Punjab	2,302	0·6	407	0·1
Delhi	217	2·1	108	1·1
U. P.	5,164	0·7	3,608	0·5
Bihar	3,665	0·7	Nil	..
Orissa	1,425	1·4	565	0·5
Bengal	46,461	6·2	14,507	1·9
C. P.	3,802	1·6	899	0·4
Bombay	6,265	2·2	448	0·2
Sind	2,672	4·4	184	0·3
Madras	5,591	0·8	642	0·1
Coorg	842	35·9	390	16·6
Assam	4,111	3·4	1,334	1·1
Ajmer-Merwara	94	1·1	77	0·9

Appendix III

relating to

Section III

TABLE A.—MATERNAL DEATH RATES PER 1,000 OF LIVE AND STILL BIRTHS FOR CERTAIN TOWNS IN BRITISH INDIA.

	1938.		1938.	
	Deaths.	Rate. p. m.	Deaths.	Rate. p. m.
<i>North-West Frontier Province.</i>				
Peshawar	47	14.6		
Dera Ismail Khan	7	4.4		
<i>Punjab.</i>				
Bhiwani	6	3.2		
Rohtak	2	1.3		
Panipat	13	7.9		
Ambala	10	6.8		
Jullundur	14	3.3		
Ludhiana	10	2.8		
Ferozepore	5	2.9		
Lahore	119	7.2		
Kasur	16	7.6		
Amritsar	103	9.5		
Batala	1	0.5		
Sialkot	10	2.3		
Gujranwala	6	2.8		
Rawalpindi	19	5.3		
Lyallpur	16	6.8		
Jhang Maghiana	13	7.1		
Multan	58	10.4		
<i>Delhi Province.</i>				
Delhi City	122	6.7		
New Delhi	17	6.3		
<i>United Provinces.</i>				
Lucknow	78	5.6		
Cawnpore	116	8.7		
Agra	57	4.0		
Benares	157	13.7		
Allahabad	64	8.4		
Bareilly	32	4.7		
Moradabad	56	8.8		
Meerut	62	12.9		
Koil (Aligarh)	38	8.5		
Shahjahanpur	35	11.4		
Saharanpur	53	12.2		
Jhansi	24	5.8		
Mirzapur-Bindhachal	12	4.2		
Muttra	17	4.7		
Fyzabad-Ajodhya	24	15.4		
Gorakhpur	27	10.3		
Farrukhabad-cum-Fatehgarh	37	13.8		
<i>United Provinces—contd.</i>				
Etawah	25	9.4		
Budaun	15	7.2		
Amroha	17	6.3		
Sambhal	13	5.1		
Dehra Dun	22	10.8		
Hathras	24	9.4		
Jaunpur	3	2.2		
Pilibhit	14	6.8		
Muzaffarnagar	7	4.3		
Bahraich	11	7.5		
Hardwar Union	31	23.9		
Khurja	12	7.0		
<i>Bihar.</i>				
Patna . . . . .	..	..
Bihar . . . . .	..	..
Gaya	21	7.5		
Arrah . . . . .	..	..
Chapra	5	3.6		
Muzaffarpur	14	16.7		
Darbhanga	1	0.6		
Monghyr	10	7.6		
Jamalpur	6	5.8		
Bhagalpur . . . . .	..	..
Ranchi . . . . .	..	..
Jamshedpur . . . . .	..	..
<i>Orissa.</i>				
Berhampur	10	6.1		
Cuttack	2	2.2		
Puri	7	7.1		
<i>Bengal Presidency.</i>				
Calcutta	66	2.1		
Howrah	51	7.7		
Dacca	63	10.9		
Bhatpara	22	11.6		
Garden Reach	21	19.4		
Chittagong	27	17.4		
Titagarh	6	7.1		
Burdwan	13	12.7		
South Suburban	9	10.2		
Serampur	5	5.9		
Baranagar	9	9.7		
Barisal	11	13.8		

TABLE A.—*contd.*

		1938.				1938.	
		Deaths.	Rate.			Deaths.	Rate.
		p. m.				p.m.	
<i>Bengal Presidency—contd.</i>				<i>Sind.</i>			
Narayanganj		11	9.3	Karachi		84	5.8
Hooghly-Chinsura		9	7.7	Hyderabad		42	10.3
Sirajganj		18	34.0	Sukkur		23	8.8
				Shikarpur		39	16.8
Midnapur		20	29.0	<i>Madras Presidency.</i>			
Bankura		7	16.1	Bellary		34	14.9
Comilla		7	28.2	Adoni		10	6.1
Asansol		10	10.4	Conjeeveram		57	19.8
Naihati		1	2.6	Saidapet		9	7.1
Mymensingh		4	18.8	Sembiam		6	6.6
Kamarhati		8	15.9	Coimbatore		53	11.5
Bally		7	13.8	Erode		13	11.0
				Cocanada		25	11.9
				Rajahmundry		31	13.2
<i>Central Provinces.</i>				Ellore		28	11.4
Nagpur City	}	22	1.9	Guntur		80	19.9
Nagpur Civil Station				Tenali		9	6.4
Jubbulpore		36	5.6	Bezwada		28	10.5
Saugor		24	10.0	Masulipatam		32	12.2
Khandwa		24	13.8	Kurnool		26	14.6
Burhanpur		45	19.0	Madras		284	8.8
Raipur		22	11.4	Madura		136	14.2
Amraoti		65	23.3	Dindigul		24	11.1
Akola		16	6.4	Calicut		48	12.3
				Palghat		18	8.5
				Cannanore		12	12.2
<i>Bombay Presidency.</i>				Tellicherry		16	16.0
Bombay City		185	4.7	Nellore		57	20.9
Ahmedabad		151	7.9	Vellore		50	14.5
Surat		44	6.6	Virudhunagar		21	14.8
Broach		43	18.2	Srivilliputtur		14	11.8
Nadiad		10	5.3	Rajapalayam		28	17.1
Godhra . . . . .		..	..	Aruppukottai		9	8.3
Jalgaon		24	14.7	Salem		46	10.8
Dhulia		3	2.2	Cuddalore		32	13.2
Ahmednagar		22	8.9	Mangalore		35	13.6
Poona		39	4.8	Tanjore		66	24.1
Nasik		25	19.5	Kumbakonam		36	12.9
Malegaon		1	0.8	Negapatam		38	20.8
Bandra . . . . .		..	..	Mayavaram		16	14.8
Kurla		1	1.2	Tuticorin		35	15.8
Belgaum		12	8.2	Tinnevely		22	10.1
Dharwar		20	14.7	Trichinopoly		79	14.0
Hubli		55	20.7	Vizagapatam		14	6.1
Gadag-Betigeri		23	11.0	Vizianagram		14	7.5
Bijapur		13	8.3	<i>Ajmer-Merwara.</i>			
Sholapur		70	8.9	Ajmer		54	8.9

TABLE B.—MATERNITY AND CHILD WELFARE CENTRES IN RURAL AND URBAN AREAS.

	Centres maintained by								Trained visitors.		Trained midwives.		Trained does.	
	Govt.		Local and Municipal bodies.		Other Agencies.		Total.							
	R.	U.	R.	U.	R.	U.	R.	U.	R.	U.	R.	U.	R.	U.
British India	18	13	362	349	62	189	442	551	69	252	1,335	1,308	3,540	2,438
N.-W. F. P. . . . .	..	2	..	..	..	1	..	3	..	5	..	5	34.	6
Punjab.	1	1	20	21	8	40	29	62	30	63	5	15	479	1,023
Delhi	4	..	4	20	2	2	10	22	8	26	19	22	9	43
U. P. . . . .	..	..	147	154	..	..	147	154	..	19	144	188	45	51
Bihar . . . . .	..	6	..	7	4	6	4	19	..	7	34	46	26	49
Orissa . . . . .	..	..	2	4	1	2	3	6	..	2	13	10	9	7
Bengal	8	..	7	23	5	..	20	23	3	10	22	61	2,795	714
C. P. . . . .	..	..	..	7	19	49	19	56	19	56	1	..	36	423
Bombay	1	1	25	13	9	46	35	60	1	20	45	184	56	75
Sind . . . . .	..	..	31	9	5	11	36	20	..	6	7	31	45	38
Madras	4	..	122	78	9	20	135	98	8	34	1,041	726	..	..
Coorg . . . . .	..	..	..	..	..	..	..	..	..	..	..	..	3	..
Assam . . . . .	..	3	4	13	..	9	4	25	..	3	4	19	3	7
Ajmer-Merwara . . . . .	..	..	..	..	..	3	..	3	..	1	..	1	..	2

R.—Rural. U.—Urban.

Appendix IV

relating to

Section IV

TABLE A.—EXPENDITURE ON PUBLIC HEALTH DURING 1938-39.

	Total.	Public Health establish-ment.	Grants for public health purposes.	Expenditure for rural water supply.	Expenses in connection with epidemic diseases.	Bacteriological laboratories.	Pasteur Institute.	Works.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Total	1,82,90,846	64,64,562	60,65,700	74,800	25,74,805	11,47,148	2,42,354	17,21,477
Central Govt.	12,95,886	4,12,163	3,66,569	..	2,73,593	2,21,180	5,253	17,128
N.-W. F. P.	1,58,872	1,03,207	24,332	..	31,333	..	..	..
Punjab	20,14,030	7,91,545	9,64,790	74,800	1,25,559	21,049	35,365	922
U. P.	24,39,866	15,22,860	5,46,711	..	3,23,265	..	..	47,030
Bihar	11,57,370	4,14,040	3,76,802	..	1,77,228	30,176	15,124	1,44,000
Orissa	2,17,739	91,900	49,540	..	35,455	15,303	2,739	22,802
Bengal	40,86,321	6,49,177	26,37,455	..	6,03,952	79,149	42,164	24,424
C. P.	4,90,512	86,265	59,267	..	3,42,444	2,536	..	..
Bombay	27,29,804	6,57,356	1,05,594	..	1,75,448	3,34,873	13,612	14,42,921
Sind	2,52,420	1,15,899	71,951	..	37,746	23,867	2,957	..
Madras	26,14,910	12,68,490	7,68,749	..	1,57,977	4,07,398	9,714	2,582
Coorg	22,099	10,438	2,947	..	8,714	..	..	..
Assam	8,61,017	3,41,222	90,993	..	2,82,091	11,617	1,15,426	19,668

TABLE B.—DISTRIBUTION OF HEALTH STAFFS IN RURAL AND URBAN AREAS.

	Rural Areas.									
	Medical Officers of Health.				Epidemic Staff.	Sanitary and Health Inspectors.	Vaccinators.		School Medical Officers.	Other Health Staffs.
	Holding D. P. H.		Licentiates (L. P. Hs.)				M.	F.		
	Whole time.	Part time.	Whole time.	Part time.						
Total	146	3	93	2	827	1,258	6,413	73	27	1,422
N.-W. F. P.	...	...	...	...	4*	...	30	...	7	4*
Punjab	28	...	12	1	...	49	426	...	3	665
Delhi	1	1	...	...	...	8	3	...	5	24
U. P.	43	1	32	...	44	150	821	...	...	...
Bihar	10	...	10	...	185	86	998	1	8	149
Orissa	4	...	2	...	15	35	261	7	2	10
Bengal	30	1	16	1	386	592	2,159	52	2	480
C. P.	...	...	...	...	43	...	261	...	†	39
Bombay	2	...	...	...	59	4	303	...	...	51
Sind	...	...	1	...	...	1	75	1	...	...
Madras	27	...	19	...	28	331	616	11	...	...
Coorg	1	...	1	...	...	2	4	...	...	...
Assam	...	...	...	...	63	...	446	1	...	...
Ajmer-Merwara	...	...	...	...	...	...	10	...	...	...

* appointments sanctioned for rural as well as for urban areas.

	Urban Areas.									
	Medical Officers of Health.				Sanitary and Health Inspectors.	Vaccinators.		Inspectors of Vaccination.	School Medical Officers.	Other Health Staffs.
	Holding D. P. H.		Licentiates (L. P. Hs.)			M.	F.			
	Whole time.	Part time.	Whole time.	Part time.						
Total	142	9	113	7	1,127	947	49	81	72	11,838
N.-W. F. P.	1	1	3	1	10	8	1	6	6	...
Punjab	15	7	6	6	170	160	12	...	16	11,271
Delhi	3	...	...	...	20	14	...	...	11	23
U. P.	21	...	13	...	176	175	...	...	13	...
Bihar	10	1	2	...	93	74	2	7	...	33
Orissa	2	...	1	...	10	17	3	2	...	18
Bengal	26	...	...	...	103	134	16	8	8	146
C. P.	2	...	2	...	75	93	...	...	†	3
Bombay	28	...	51	...	109	52	...	1	8	230
Sind	6	...	2	...	24	11	2	1	1	...
Madras	26	...	33	...	312	172	13	17	8	...
Coorg	...	...	...	...	2	2	...	...	...	...
Assam	1	...	...	...	12	28	...	38	...	89
Ajmer-Merwara	1	...	...	...	11	7	...	1	1	25

† There are no officers appointed particularly for the medical inspection of schools. The work is done by the Subassistant Health Officers on epidemic duty and Assistant Medical Officers incharge of branch dispensaries.

Appendix V

relating to

Section VI.

TABLE—VACCINATION OPERATIONS PERFORMED IN BRITISH INDIA AND IN DIFFERENT PROVINCES DURING 1938-39.

Province.	Population.	Operations performed.			Percentage of success.		Children successfully vaccinated.		Total cost.	Average cost per successful case.	Rate of successful vaccinations per 1,000 of population.	Percentage of annual births successfully vaccinated.
		P.	R.	Total.	P.	R.	Under 1 year.	1 to 6 years.				
									Rs.	Rs. A. P.		
BRITISH INDIA . . .	2,58,400,179	10,204,648	13,488,906	23,683,823	97	48	4,313,635	4,074,990	30,93,299	0 3 7	54	46
N.-W. F. P. . . .	3,762,678	143,848	145,827	289,675	99	82	70,417	50,242	30,097	0 2 0	65	98
Punjab	23,551,210	1,057,097	3,572,230	4,629,327	99	65	808,855	135,725	4,17,433	0 2 5	118	69
Delhi	636,246	32,857	131,784	164,641	98	60*	24,291	5,310	15,294	0 2 7	149	71
U. P.	48,408,763	1,606,335	309,094	1,915,429	98	48	1,023,608	441,536	3,83,537	0 3 8	35	57
Bihar	32,371,434	994,795	505,969	1,500,764	99	56	280,248	671,828	55,420	0 0 9	35	25
Orissa	8,009,559	238,023	402,668	640,691	97	64	67,879	125,516	61,411	0 2 7	48	28
Bengal	50,114,002	2,876,619	4,972,453	7,849,072	86	31	370,887	1,489,458	4,58,503	0 1 10	79	24
C. P.	15,323,080	514,752	118,236	632,988	98	58	397,109	88,638	2,24,982	0 6 11	35	60
Bombay	17,967,050	623,183	255,042	883,225	100	49	445,504	135,500	4,85,844	0 11 10	37	53
Sind	3,887,070	137,013	83,162	220,175	100	26	66,410	53,989	1,16,882	0 13 6	35	86
Madras	44,422,597	1,481,847	2,590,449	4,072,296	98	24	661,500	597,362	7,18,083	0 6 7	40	39
Coorg	163,327	2,521	3,433	6,004	96	55	512	1,415	10,830	1 11 4	26	14
Assam	9,247,857	463,800	391,234	855,034	95	60	78,910	274,437	1,06,402	0 3 1	66	33
Ajmer-Merwara	535,306	26,958	7,275	34,233	92	85	17,505	4,034	8,581	0 4 5	58	85

P = Primary.
R = Revaccinations.

Appendix VI
relating to
Section VII.

TABLE—NUMBER OF TOWNS HAVING PROTECTED WATER SUPPLIES IN DIFFERENT PROVINCES.

	Towns having a population of over 50,000.		Towns having a population of 30,000—50,000.		Towns having a population below 30,000.		Total.			
	No. of towns.	Towns having a protected water supply.	No. of towns.	Towns having a protected water supply.	No. of towns.	Towns having a protected water supply.	No. of towns.	Aggregate population.	Towns having a protected water supply.	Population of towns included in col. 10.
1	2	3	4	5	6	7	8	9	10	11
BRITISH INDIA	76	59	84	48	1,069	134	1,229	23,629,405	241	12,585,107
N.-W. F. P.	1	1	1	1	15	6	17	299,284	8	206,293
Punjab	8	6	11	4	162	30	181	3,020,273	40	1,436,384
Delhi	2	2	...	...	4	3	6	504,702	5	495,427
U. P.	17	12	13	4	410	10	440	5,435,144	26	1,829,976
Bihar	6	5	6	3	57	2	69	1,495,138	10	760,243
Orisaa	1	...	2	2	5	...	8	216,806	2	75,318
Bengal	5	4	17	15	96	33	118	2,351,407	52	1,474,083
O. P.	2	2	7	4	103	3	112	1,679,546	9	550,338
Bombay	7	6	12	5	112	18	131	3,806,892	29	2,507,158
Sind	4	3	...	...	22	2	26	685,202	5	456,507
Madras	22	18	15	10	46	15	83	3,715,160	43	2,654,109
Coorg . . . . .	...	...	...	...	2	1	2	9,827	1	5,995
Assam . . . . .	...	...	...	...	31	10	31	229,825	10	111,870
Ajmer-Merwara	1	...	...	...	4	1	5	180,199	1	21,897

Appendix VII

relating to

Section VIII

List of scientific papers by research workers under the Government of India, the Indian Research Fund Association, provincial Governments and Indian States published during 1938.*

A.—PAPERS PUBLISHED IN THE INDIAN JOURNAL OF MEDICAL RESEARCH (I. J. M. R.).

Ahmad, B., and Gore, H. K.

A diet survey of fiftyone families of Ferozepore, Punjab. (Volume XXVI, No. 1).

Ahmad, B., Lal, R. B., and Roy, N. C.

Observations on the basal metabolism of healthy subjects under varying conditions of temperature and humidity. (Volume XXVI, No. 1).

Aykroyd, W. R., and Krishnan, B.G.

The treatment of stomatitis caused by diet deficiency. (Volume XXV, No. 3).

Aykroyd, W. R., Madhava, K. B., and Rajagopal, K.

The detection of malnutrition by measurements of arm, chest and hip. (Volume XXVI, No. 1).

Basu, K. P., and De, H. N.

Nutritional investigation of some species of Bengal fish. Part I. Biological value of the proteins of Ruhee (*Labeo rohita*) and Hilsa (*Clupea ilisa*) by the nitrogen balance and growth methods, and supplementary effect of fish on pulse proteins. (Volume XXVI, No. 1).

Nutritional investigation of some species of Bengal fish. Part II. Extraction and chemical analysis of the proteins of Ruhee (*Labeo rohita*) and Hilsa (*Clupea ilisa*). (Volume XXVI, No. 1).

Nutritional investigation of some species of Bengal fish. Part III. Determination of vitamin-A contents of the liver and body oils of Ruhee (*Labeo rohita*) and Hilsa (*Clupea ilisa*) by the biological method. (Volume XXVI, No. 1).

Biswas, M. M.

Absorption of hydrogen ions by serum globulin and its antibody. (Volume XXVI, No. 2).

Chakravarti, D. N., and Tyagi, N.

Studies in "effects of heat". Part I. Biochemical and physical changes in ten cases suffering from "effects of heat". (Volume XXV, No. 3).

Chopra, R. N., Chatterjee, R. G., De, N., and Ghosh, S.

A preliminary note on the chemistry and pharmacology of the leaves of *Skimmia laureola*, Hook, F. (Volume XXVI, No. 2).

Chopra, R. N., Das, N. N. and Mukerji, B.

The action of certain cardiac drugs on embryonic heart explants. (Volume XXVI, No. 1).

Chopra, R. N., Ghosh, S., and Dutt, A. T.

Some inorganic preparations of the Indian indigenous medicine. Part VI. *Samudra phena* (Volume XXVI, No. 2).

Chopra, R. N., Mukerji, B., and Chakravarti, M.

Studies on some dextro-rotatory hydrocupreidine derivatives. Part I. Comparative hæmolytic activity. (Volume XXVI, No. 1).

Chopra, R. N., and Roy, A. C.

The effect of Seitz filtration on hæmolysins and the components of a hæmolytic system. (Volume XXVI, No. 1).

De, N. K., and Majumdar, B. N.

Further studies on factors affecting the vitamin-A activity of animal and vegetable products. (Volume XXV, No. 4).

The assimilation of carotene by rats from a 'poor Madrasi diet'; The influence of skimmed milk and calcium lactate. (Volume XXVI, No. 2).

* It is not claimed that list is complete.

De, N. K., Majumdar, B. N., and Sundararajan, A. R.

The vitamin-A activity of some fish oils and vegetable foods. Parts I and II. (Volume XXVI, No. 2).

De, P., and Bhattacharyya, S.

A comparative study of glycolysis in normal and diabetic blood. (Volume XXV, No. 4).

Glycolysis in drawn blood in twentyfour hours. (Volume XXV, No. 4).

De, P., and Chatterjee, C. C.

The rôle of formalin in the estimation of nitrogen in body fluids. (Volume XXV, No. 4).

De, S. P., and Basu, U. P.

Chemotherapeutic study of streptococcal infections. (Volume XXVI, No. 2).

Dey, B. B., Lakshmikantham, P., David, J. C., and Krishnaswami, R.

Preparation, properties, and pharmacological action of p-aminobenzoyl aminomethyl-1-hydrocotarnine. (Volume XXV, No. 3).

Dharmendra and Lowe, J.

Attempts to cultivate *M. lepræ muris*. (Volume XXV, No. 4).

Ghosh, B. N., and De, S. S.

Investigation on the isolation of the neurotoxin and hæmolysin of cobra (*Naja naja*) venom. (Volume XXV, No. 3).

Giri, K. V.

The availability of phosphorus from Indian foodstuffs. (Volume XXV, No. 4).

Giri, K. V., and Doctor, N. S.

Pyrophosphate in the determination of vitamin-C content of plant and animal tissues. (Volume XXVI, No. 1).

Goswami, H., and Basu, U. P.

'Available' iron in Indian foodstuffs. (Volume XXV, No. 4).

Goyal, R. K.

A serological study of the actinomyces. (Volume XXV, No. 4).

Greval, K. S., and Kochhar, B. D.

Vitamin-A contents of ghee. (Volume XXV, No. 3).

Greval, S. D. S., Das, B. C., and Sen Gupta, P. C.

On Wassermann reaction. Part III. The positive serum. (Volume XXVI, No. 2).

Iyengar, N. K., Sehra, K. B., and Mukerji, B.

Studies on the protease of Cobra venom. (Volume XXVI, No. 2).

Kamala Bhagvat.

Enzyme method for the estimation of adrenaline in suprarenal glands. (Volume XXV, No. 4).

Krishnan, B. G.

Skimmed milk and the growth of school children. (Volume XXV, No. 3).

Lahiri, D. C.

Use of non-specific substances in the production of tetanus and diphtheria antitoxin. (Volume XXVI, No. 1).

Studies on the utility of Ramon's flocculation test in the standardization of Tetanus antitoxin. (Volume XXVI, No. 2).

Experimental studies to guide the selection of the most satisfactory type of anti-Welchii serum for the prevention and treatment of gas gangrene in man. (Volume XXVI, No. 2).

Lal, R. B., Ahmad, B., and Roy, S. C.

Investigations into the epidemiology of epidemic dropsy. Part VI. Allylthiocyanate as an aetiological factor in epidemic dropsy. (Volume XXVI, No. 1).

Linton, R. W., Mitra, B. N., and Seal, S. C.

Electrophoresis and metabolism of some vibrio strains in relation to variability and chemical classification. (Volume XXVI, No. 2).

Linton, R. W., Seal, S. C., and Mitra, B. N.

Chemical and serological variation in single-cell cultures of *vibrio cholerae* and related organisms. (Volume XXV, No. 3).

Linton, R. W., Shrivastava, D. L., and Seal, S. C.

Studies on the specific polysaccharides of the vibrios. Part I. The effect of the growth-medium. (Volume XXV, No. 3).

Linton, R. W., Shrivastava, D. L., Seal, S. C., and Mookerji, S. P.

Studies on the specific polysaccharides of the vibrios. Part II. Chemistry and serology. (Volume XXVI, No. 1).

Mahal, H. S.

Studies on blood choline esterase. (Volume XXV, No. 3).

Majumdar, B. N., and De, N. K.

The oxalic-acid content of some Indian foodstuffs. (Volume XXV, No. 3).

Maplestone, P. A., and Dey, N. C.

Laboratory tests on the fungistatic and fungicidal effects of various substances. (Volume XXV, No. 3).

Mukerji, B., and Guha, R. C.

The effects of anterior pituitary extracts and choline on the liver-fat of rabbits. (Volume XXVI, No. 1).

Mukerji, B., and Iyengar, N. K.

Studies on some dextro-rotatory hydrocupreidine derivatives. Part II. Comparative action on digestive enzymes. (Volume XXVI, No. 1).

Nandi, B. K., and Dikshit, B. B.

A new colorimetric test for plasmoquine. (Volume XXV, No. 4).

Napier, L. E., and Majumdar, D. N.

Hæmatological studies in Indians. Part IX. The analysis of the hæmatological findings in 57 cases of anæmia in pregnant tea-garden coolie women, with special reference to the results of treatment. (Volume XXVI, No. 2).

Narasimhamurthy, G.

The nitrogen complex of Indian foodstuffs. Condiments: Part II. Chillies (*Capsicum annum*) and coriander seeds (*Coriandrum sativum*). (Volume XXV, No. 4).

Pal, R. K., and Narindra Singh.

The effect on rats of supplementing a South Indian diet with calcium and phosphorus. (Volume XXV, No. 3).

Further studies on the effect in rats of supplementing a South Indian diet with calcium and phosphorus. (Volume XXVI, No. 1).

Pandit, C. G., Sanjiva Rao, R., and Shortt, H. E.

Response of the chorio-allantoic membrane of the developing chick-embryo to inoculation with various substances with special reference to *B. proteus*, X 19. (Volume XXV, No. 3).

Pandit, S. R., and Maitra, N. M.

Vibrios in natural water sources in Assam. (Volume XXVI, No. 1).

Pasricha, C. L., Chatterjee, D. N., and Das, P. C.

The distribution and characteristics of vibrios isolated from certain non-human sources in Calcutta. (Volume XXVI, No. 1).

Patwardhan, V. N., and Chitre, R. G.

Studies in calcium and phosphorus metabolism. Part I. The calcium and phosphorus content of the soft tissues of normal rats. (Volume XXV, No. 3).

Studies in calcium and phosphorus metabolism. Part II. The effect of toxic doses of vitamin D on the ash, Ca, and P content of the bones and on the excretion of N, Ca, and P in the albino rats. (Volume XXVI, No. 2).

Radhakrishna Rao, M. V.

Studies on vitamin-A deficiency. Part III. Lesions of the peripheral nervous system. (Volume XXV, No. 3).

Hæmatological investigations in South India. Part IV. Hæmoglobin in normal pregnancy. (Volume XXV, No. 4).

The study of Myelin degeneration in polarized light. (Volume XXVI, No. 1).

Raja, K. C. K. E., Satya Swaroop, Basak, K. C., and Lal, R. B.

Application of analysis of variance to mortality rates. (Volume XXVI, No. 1).

Rajagopal, K.

The basal metabolism of Indian and European men on the Nilgiri Hills (South India) (Volume XXVI, No. 2).

Ranganathan, S.

The 'available' iron in some common Indian foodstuffs, determined by the α , α /dipyridine method. (Volume XXV, No. 3).

Variation in the iron content of foodstuffs and the problem of iron requirements. (Volume XXVI, No. 1).

Rao, M. Narasimha.

Vitamin C and peptic ulcer. (Volume XXVI, No. 1).

Rao, R. Sanjiva.

Cultivation of sheep-pox virus on the chorio-allantoic membrane of the chick embryo. (Volume XXVI, No. 2).

Ray, N. N., and Das, G. C.

The immunization of horses for the production of high-titre tetanus antitoxin. Part I. (Volume XXV, No. 3).

The immunization of horses for the production of high-titre tetanus antitoxin. Part II. (Volume XXVI, No. 1).

Ray, S. N., and Ganguly, R.

Urinary composition of normal Bengalee subjects. (Volume XXVI, No. 2).

Observations on the metabolic activity of patients suffering from epidemic dropsy. Part I. Urinary composition of epidemic-dropsy patients. (Volume XXVI, No. 2).

Roy, A. C.

Lipolytic activity of the venous (Cobra and Russell's viper). (Volume XXVI, No. 1).

Roy, A. C., and Chopra, R. N.

Some biochemical characteristics of snake venom. (Volume XXVI, No. 1).

Roy, D. N.

On the number of eggs of the common house-frequenting flies of Calcutta. (Volume XXVI, No. 2).

Sankaran, G., and Radhakrishna Rao, M. V.

Hæmatological investigations in South India. Part III. The mean red cell diameter. (Volume XXV, No. 4).

Sankaran, G., and Rajagopal, K.

Hæmatological investigations in South India. Part I. The estimation of hæmoglobin. (Volume XXV, No. 3).

Hæmatological investigations in South India. Part II. The effect of the administration of iron on the hæmoglobin level in Indian girls and young women. (Volume XXV, No. 3).

Hæmatological investigations in South India. Part V. The effect of altitude on hæmoglobin content. (Volume XXV, No. 4).

Satya Swaroop.

Numerical estimation of *B. coli* by dilution method. (Volume XXVI, No. 2).

Sen, B. B.

Studies on meningococcus bacteriophage. (Volume XXVI, No. 2).

Sen, P.

A note on the overwintering of the house fly, *Musca domestica*. (Volume XXVI, No. 2).

Shortt, H. E., Hawley, H., and Swaminath, C. S.

Iron-hæmatoxylin staining technique: An illusion. (Volume XXVI, No. 1).

Shortt, H. E., Pandit, C. G., and Rao, R. Sanjiva.

The virus of sandfly fever in culture and certain of its properties. (Volume XXVI, No. 1).

Shortt, H. E., Pandit, S. R., Menon, K. P. and Swaminath, C. S.

The absence of effective immunity after cure of protozoal infections. (Volume XXV, No. 3).

Shourie, K. L., and Narindra Singh.

A diet survey of a group of Sikh soldiers. (Volume XXV, No. 3).

Sinton, J. A.

The successful transmission of cutaneous leishmaniasis by inoculation to man from a natural lesion occurring on a dog in India. (Volume XXV, No. 3).

Sokhey, S. S., Gokhale, S. K., Malandkar, M. A., and Billimoria, H. S.

Red cells, hæmoglobin, colour index, saturation index, and volume index standards. Part II. Normal Indian women: A study based on the examination of 101 women. (Volume XXV, No. 3).

Stewart, A. D., and Ghosal, S. C.

On the value of Wilson and Blair's bismuth sulphite medium in the isolation of *Bact. typhosum* from river water. (Volume XXV, No. 3).

Sundararajan, A. R.

Phytin-phosphorus content of Indian foodstuffs. (Volume XXV, No. 3).

Swaminathan, M.

The relative amounts of the protein and non-protein nitrogenous constituents occurring in foodstuffs and their significance in the determination of the digestibility co-efficient of proteins. (Volume XXV, No. 4).

The relative value of the proteins of certain foodstuffs in nutrition. Part V. Supplementary values of the proteins of *Eleusine coracana* (Ragi) and of certain pulses and skimmed milk powder studied by the nitrogen balance and the growth method. (Volume XXVI, No. 1).

The relative value of the proteins of certain foodstuffs in nutrition. Part VI. General conclusions. (Volume XXVI, No. 1).

A chemical method for the estimation of nicotinic acid in biological materials. (Volume XXVI, No. 2).

Taylor, J., and Ahuja, M. L.

Incidence and characters of vibrios in waters in Northern India. (Volume XXVI, No. 1).

Vardon, A. C., and Datta Roy, B. K.

A papain-casein culture medium for the preparation of bacteriophage and for general laboratory use. (Volume XXVI, No. 2).

Venkataraman, K. V., and Pandit, C. G.

An epidemic of cholera in a rural area in South India caused by the 'Ogawa' type of *V. cholerae*. (Volume XXV, No. 3).

Veeraraghavan, N., and Philipsz, G. L. C.

Cultivation of the rabies virus on the chorio-allantoic membrane of the developing egg. (Volume XXVI, No. 2).

Wilson, H. E. C., and Mitra, D. D.

A diet and physique survey in Assam, rural Bengal, and Calcutta. (Volume XXVI, No. 1).

Wilson, H. E. C., and Roy, G. K.

The flavine and vitamin-B₆ (antidermatitis) content of Indian foodstuffs. (Volume XXV, No. 4).

Wilson, H. E. C., and Roy, N. C.

Observations on the basal metabolism of Indian boys in Calcutta. (Volume XXV No. 4).

B.—PAPERS PUBLISHED IN THE INDIAN MEDICAL GAZETTE DURING 1938. VOLUME LXXIII.

Ali P. M.

A rat-flea survey of Mattanchery (Cochin) (1937). (Page 409).

Allen, F. R. W. K., and Basu, I.

A simple method of obtaining hyper-extension for the application of a plaster of paris jacket in cases of fracture of the thoracic and lumbar vertebrae. (Page 341).

Bana, F. D.

Control of *stegomyia fasciata (aedes aegypti)* mosquitoes in Indian country craft by a mosquito-proof metal cap for drinking water receptacles. (Page 344).

Barton, R. M.

Methods of destruction of tubercle bacilli in the sputum for use in Indian homes, with some experiments. (Page 559).

Basu, U. P., and De, S. P.

The chemotherapy of streptococcal infections. (Page 35).

Benjamin, P. V.

The seriousness of tuberculosis in India as shown by study of incidence and type. (Page 540).

Benjamin, P. V., and Barton, R. M.

Deductions from experience in a tuberculosis expatriates' colony in India. (Page 545).

Bhatia, S. L.

Conditioned reflexes. (Page 226).

Bliss, C. H.

Spinal anaesthesia. (Page 474).

Bose, J. P.

Protamine zinc insulin. (Page 390).

Chakravarti, J.

Pre-cancerous conditions of the cervix uteri and their treatment. (Page 661).

Chakraverti, S. N., and Roy, S. N.

Experiments on the stability of seminal stains from a medico-legal standpoint. (Page 412).

Charlewood, G. P.

Induction of labour. (Page 733).

Chatterjee, D. N., and Malik, K. S.

The bacteriological examination and the hydrogen-ion concentration of the urine of a series of 122 cholera patients. (Page 612).

Chatterjee, H. N.

Some clinical aspects of anaemia in pregnancy in Indian women living in Bengal (Page 267).

Chaudhuri, R. N.

Spontaneous subarachnoid haemorrhage. (Page 466).

Chellappa, E. S.

Premedication in sodium evipan anaesthesia—A study of 535 cases. (Page 342).

Chopra, B. L.

Antimalarial measures in the railway area at Delhi. (Page 150).

Chopra, R. N.

Incurables. (Page 747).

The physiology of the individual in the tropics. Part I. (Page 40).

The physiology of the individual in the tropics. Part II. (Page 102).

Present position of antimalarial drug therapy in India. (Page 418).

Chopra, R. N., and Chopra, G. S.

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Appendix VIII

relating to

Section IX.

TABLE SHOWING SICKNESS AND MORTALITY OF ALL CLASSES

Provinces.	Average daily strength.	Constantly sick.	Influenza.				Cholera.			
			Actuals.		Ratios.		Actuals.		Ratios.	
			A.	D.	A.	D.	A.	D.	A.	D.
India (excluding the Andamans.) *	109,347	21	3,212	10	29	0·1	17	3	0·2	0·03
	116,830	22	3,659	35	31	0·3	11	3	0·1	0·08
	121,821	23	4,426	25	36	0·2	15	3	0·1	0·02
N.-W. F. P.	5,643	23	60	1	11	0·2	...	...	...	...
	6,179	23	50	...	8	...	...	...	...	...
	6,493	23	82	...	13	...	...	...	...	...
Punjab	17,624	18	159	2	9	0·1	1	...	0·06	...
	18,415	23	147	2	8	0·1	...	...	...	...
	19,661	22	148	1	8	0·05	...	...	...	...
U. P.	28,768	17	433	1	15	0·03	15	3	0·5	0·1
	29,782	18	739	13	25	0·4	7	2	0·2	0·07
	31,552	20	984	8	31	0·3	10	2	0·3	0·06
Bihar	9,036	20	146	...	16	...	...	...	...	...
	9,284	24	245	...	26	...	1	...	0·1	...
	9,833	23	347	3	35	0·3	2	...	0·2	...
Orissa	1,076	20	24	...	22	...	...	...	...	...
	1,096	25	9	1	8	0·9	...	...	...	...
	982	24	20	...	20	...	...	...	...	...
Bengal	16,992	38	1,803	3	106	0·2	...	...	...	...
	19,387	37	1,968	8	102	0·4	1	...	0·05	...
	19,200	38	2,072	6	108	0·3	2	...	0·1	...
C. P.	3,996	15	111	...	28	...	...	...	...	...
	4,384	9	151	11	34	2·5	...	...	...	...
	4,422	9	133	3	30	0·7	...	...	...	...
Bombay	6,926	18	88	...	13	...	...	...	0·3	0·1
	7,250	17	52	...	7	...	2	1	...	...
	8,087	20	84	...	10	...	...	...	...	...
Sind	3,722	21	...	...	...	...	1	...	0·3	...
	3,803	24	1	...	0·3	...	...	...	...	...
	3,826	23	8	...	2	...	...	...	...	...
Madras	10,255	14	187	...	18	...	...	...	...	...
	11,710	15	192	...	16	...	...	...	...	...
	11,917	16	412	2	35	0·2	...	...	...	...
Assam	3,304	24	102	2	31	0·6	...	...	...	...
	3,566	22	79	...	22	...	...	...	...	...
	3,882	23	105	1	27	0·3	...	...	...	...

*The sickness and mortality figures relating to the Andamans have been dealt with in paragraph 90 of this report.

A.—Admissions; D.—Deaths.

OF PRISONERS IN DISTRICT AND CENTRAL JAILS IN INDIA.

Smallpox.				Enteric fever.				Malaria.			
Actuals.		Ratios.		Actuals.		Ratios.		Actuals.		Ratios.	
A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.
25	1	0.2	0.01	301	26	3	0.2	12,383	24	113	0.2
33	2	0.3	0.02	236	30	2	0.3	14,205	44	122	0.4
49	3	0.4	0.03	248	33	2	0.3	19,598	63	161	0.6
3	...	0.5	...	28	1	5	0.2	607	2	108	0.4
2	...	0.3	...	32	8	5	1.3	787	2	127	0.3
1	...	0.2	...	34	4	5	0.6	1,114	4	172	0.6
4	...	0.2	...	68	3	4	0.2	1,607	1	91	0.06
6	...	0.3	...	66	4	4	0.2	2,383	7	129	0.4
5	...	0.3	...	64	7	3	0.4	4,354	13	222	0.7
14	...	0.5	...	51	8	2	0.3	3,396	2	118	0.1
9	1	0.3	0.03	33	3	1	0.1	3,723	5	125	0.2
21	1	0.7	0.03	32	2	1	0.06	4,544	7	144	0.3
1	1	0.1	0.1	51	4	6	0.4	436	3	48	0.3
...	...	...	...	29	3	3	0.3	500	3	54	0.3
2	...	0.2	...	26	4	3	0.4	605	5	51	0.3
...	...	...	...	2	...	2	...	56	...	52	...
...	...	...	...	...	...	...	...	33	...	30	...
...	...	...	...	...	...	...	...	74	...	75	...
2	...	0.2	...	40	4	2	0.2	3,418	10	201	0.6
10	1	0.6	0.05	21	6	1	0.3	3,835	17	198	0.9
13	1	0.7	0.05	24	5	1	0.3	4,788	20	249	1.0
...	...	...	...	3	1	0.8	0.3	835	...	84	...
...	...	...	...	1	1	0.2	0.2	230	1	52	0.2
1	...	0.2	...	3	...	0.7	...	195	2	44	0.5
...	...	...	...	14	1	2	0.1	930	2	134	0.3
...	...	...	...	22	1	3	0.1	841	3	116	0.4
...	...	...	...	15	2	2	0.2	1,599	2	198	0.3
...	...	...	...	19	2	5	0.5	1,015	1	273	0.3
2	...	0.5	...	22	3	6	0.8	1,110	...	292	...
1	...	0.3	...	16	3	4	0.3	1,285	2	336	0.5
...	...	...	...	12	1	1	0.1	198	2	19	0.2
2	...	0.2	...	3	...	0.3	...	213	4	18	0.3
1	...	0.08	...	16	2	1	0.2	240	3	20	0.3
...	...	...	...	10	...	3	...	203	1	61	0.3
2	...	0.6	...	1	1	0.3	0.3	271	...	76	...
...	...	...	...	7	1	2	0.3	420	3	108	0.3

NOTE.—The three figures against each administrative group are those for (1) 1938, (2) 1937 and (3) 1935-37. The rates have been calculated *per mille* of the average strength.

TABLE SHOWING SICKNESS

Provinces.	Average daily strength.	Constan- tly sick.	Pyrexia of uncertain origin.				Tubercle of the lungs.			
			Actuals.		Ratios.		Actuals.		Ratios.	
			A.	D.	A.	D.	A.	D.	A.	D.
India (excluding Andamans*).	the { 109,347	21	1,099	2	10	0·02	716	177	7	1·6
	{ 116,880	22	922	4	8	0·08	588	208	5	1·8
	{ 121,891	23	939	5	8	0·04	702	234	6	1·9
N.-W. F. P.	{ 5,643	23	15	...	3	...	58	12	10	1·1
	{ 6,179	23	40	...	6	...	57	21	9	3·4
	{ 6,493	28	26	...	4	..	57	20	9	3·1
Punjab	{ 17,824	18	201	2	11	0·1	134	29	8	1·6
	{ 18,415	23	220	...	12	...	77	13	4	1·0
	{ 19,601	22	258	2	13	0·1	167	43	9	2·4
U. P.	{ 23,768	17	219	..	8	..	137	28	5	1·0
	{ 29,732	18	155	1	5	0·03	107	39	4	1·3
	{ 31,552	20	370	..	9	..	105	36	3	1·1
Bihar	{ 9,036	20	59	...	7	...	78	20	9	2·2
	{ 9,284	24	5	...	1	...	70	37	8	4·0
	{ 9,333	23	11	...	1	...	73	36	7	3·7
Orissa	{ 1,076	20	...	...	...	...	...	2	...	1·9
	{ 1,096	25	...	...	...	...	12	3	11	2·7
	{ 982	24	...	...	..	...	5	2	5	2·0
Bengal	{ 16,992	38	463	...	27	...	132	35	8	2·1
	{ 19,387	37	392	...	15	...	100	29	5	1·5
	{ 19,200	38	290	...	15	...	108	32	6	1·7
C. P.	{ 3,996	15	20	...	5	..	19	4	5	1·0
	{ 4,384	9	34	2	8	0·5	19	6	4	1·4
	{ 4,422	9	37	1	8	0·2	22	7	5	1·6
Bombay	{ 6,926	18	7	...	1	...	25	9	4	1·3
	{ 7,250	17	7	...	1	...	25	12	3	1·7
	{ 8,087	20	8	...	1	...	30	14	4	1·7
Sind	{ 3,722	21	18	...	5	...	21	8	6	2·1
	{ 3,803	24	4	...	1	...	19	8	5	2·1
	{ 3,826	23	4	...	1	...	14	6	4	1·6
Madras	{ 10,255	14	70	...	7	...	64	16	6	1·6
	{ 11,710	15	27	1	2	0·1	64	23	5	2·0
	{ 11,917	16	15	...	1	...	72	19	6	1·6
Assam	{ 3,304	24	13	...	4	...	39	12	12	3·6
	{ 3,566	22	6	...	2	...	32	10	9	2·8
	{ 3,882	23	7	...	2	...	40	10	10	2·6

*The sickness and mortality figures relating to the Andamans have been dealt with in paragraph 90 of this report.

A.—Admissions; D.—Deaths.

AND MORTALITY—*contd.*

Pneumonia.				Other respiratory diseases.				Dysentery.			
Actuals.		Ratios.		Actuals.		Ratios.		Actuals.		Ratios.	
A.	D.	A.	D.	A.	D.	A.	D.	A.	D.	A.	D.
933	195	9	1.8	3,229	53	30	0.5	3,999	81	37	0.7
1,127	236	10	2.0	3,764	42	32	0.4	3,533	92	30	0.8
1,324	284	11	2.3	3,823	50	31	0.4	4,244	95	35	0.8
63	15	11	2.7	121	...	21	...	25	...	4	...
101	16	16	2.6	235	2	38	0.3	27	4	4	0.6
132	24	20	3.7	303	2	47	0.3	59	2	9	0.3
130	22	7	1.2	769	2	44	0.1	67	1	4	0.06
141	27	8	1.5	762	4	41	0.2	70	...	4	...
185	41	9	2.1	789	5	40	0.3	382	9	19	0.6
233	50	8	1.7	687	22	24	0.8	512	7	18	0.2
252	61	8	2.0	896	11	30	0.4	447	4	15	0.1
271	64	9	2.0	823	13	26	0.4	438	7	14	0.2
74	13	8	1.4	245	4	27	0.4	480	16	53	1.8
84	20	9	2.1	265	2	29	0.2	435	17	47	1.8
123	27	13	2.7	324	5	33	0.6	514	15	52	1.5
4	1	4	0.9	18	1	17	0.9	30	2	28	1.9
4	2	4	1.8	17	...	15	...	41	1	37	0.9
10	3	10	3.1	20	...	20	...	39	2	40	2.0
138	28	8	1.7	634	7	37	0.4	1,498	22	88	1.3
240	43	12	2.2	728	9	38	0.5	1,176	33	61	1.7
237	50	12	2.6	751	8	39	0.4	1,263	27	66	1.4
50	15	13	4.0	35	7	9	1.8	428	8	107	2.0
33	9	8	2.1	41	1	9	0.2	102	7	23	1.6
37	11	8	2.5	48	3	11	0.7	131	5	30	1.1
32	5	5	0.7	150	1	22	0.1	177	3	26	0.4
36	11	5	1.5	119	3	16	0.4	254	3	35	0.4
49	8	6	1.0	177	2	22	0.2	227	2	28	0.2
104	17	28	4.6	172	...	46	...	147	3	39	0.8
89	16	23	4.2	181	1	47	0.3	268	1	70	0.3
116	22	30	5.8	185	2	48	0.5	294	3	77	0.8
44	11	4	1.1	143	4	14	0.4	289	6	28	0.6
66	18	6	1.5	183	4	15	0.2	264	7	23	0.6
62	13	5	1.1	128	6	11	0.5	416	12	35	1.0
47	12	14	3.6	135	...	41	...	315	13	95	3.9
57	10	16	2.8	172	3	48	0.8	351	14	98	3.9
71	15	18	3.9	191	2	49	0.5	400	10	103	2.6

Note.—The three figures against each administrative group are those for (1) 1938, (2) 1937 and (3) 1933-37. The rates have been calculated *per mille* of the average strength.

TABLE SHOWING SICKNESS

Provinces.	Average daily strength.	Constantly sick.	Diarrhoea.			
			Actuals.		Ratios.	
			A.	D.	A.	D.
India (excluding the Andamans*).	109,347	21	1,824	17	17	0·2
	116,830	22	1,950	21	17	0·2
	121,821	23	2,524	23	21	0·2
N.-W. F. P.	5,643	23	34	1	6	0·2
	6,179	23	18	1	3	0·2
	6,493	23	34	1	5	0·2
Punjab	17,624	18	140	...	8	...
	18,415	23	170	3	9	0·2
	19,601	22	259	6	13	0·3
U. P.	28,768	17	420	6	15	0·2
	29,782	18	354	6	12	0·2
	31,552	20	392	6	12	0·2
Bihar	9,036	20	108	1	12	0·1
	9,284	24	121	...	13	...
	9,833	23	208	...	21	...
Orissa	1,076	20	17	...	16	...
	1,096	25	30	...	27	...
	982	24	32	...	33	...
Bengal	16,992	38	644	6	38	0·4
	19,387	37	858	3	44	0·1
	19,200	38	1,111	2	58	0·1
C. P.	3,996	15	41	2	10	0·5
	4,384	9	34	2	8	0·5
	4,422	9	72	2	16	0·5
Bombay	6,926	18	189	...	24	...
	7,250	17	165	2	23	0·3
	8,087	20	202	...	25	...
Sind	3,722	21	183	...	49	...
	3,803	24	134	2	35	0·5
	3,826	23	115	2	30	0·5
Madras	10,255	14	31	...	3	...
	11,710	15	28	2	2	0·2
	11,917	16	27	2	2	0·2
Assam	3,304	24	13	1	4	0·3
	3,566	22	8	...	2	...
	3,882	23	41	...	11	...

*The sickness and mortality figures relating to the Andamans have been dealt with in paragraph 90 of this report.

A.—Admissions; D.—Deaths.

AND MORTALITY—concl'd.

Anæmia and Debility.				All Causes.			
Actuals.		Ratios.		Actuals.		Ratios.	
A.	D.	A.	D.	A.	D.	A.	D.
912	33	8	0.3	52,328	1,002	479	9
922	32	8	0.3	57,570	1,226	493	10
1,014	38	8	0.3	68,380	1,383	561	11
32	...	6	...	2,123	44	376	8
19	...	3	...	2,468	78	399	13
36	...	6	...	3,229	78	497	12
83	1	5	0.06	7,678	105	436	6
116	4	6	0.2	8,693	172	472	9
131	4	7	0.2	12,292	235	627	12
164	5	6	0.2	12,338	203	429	7
182	3	6	0.1	13,489	228	453	8
175	4	6	0.1	15,068	239	478	8
14	2	15	0.2	2,801	95	310	11
13	1	1	0.1	3,145	117	339	13
20	2	2	0.2	3,636	159	370	16
11	...	10	...	310	18	288	17
13	...	20	...	343	9	313	8
8	...	8	...	408	14	415	14
324	8	19	0.5	15,294	179	900	11
310	5	16	0.2	17,039	226	879	12
353	9	18	0.5	19,274	235	1,004	12
45	4	11	1.0	1,417	84	355	21
27	4	6	0.9	990	75	226	17
25	3	6	0.7	1,099	63	249	14
104	2	15	0.3	3,075	55	444	8
75	4	10	0.6	2,851	72	393	10
77	3	10	0.4	4,453	71	551	9
37	1	10	0.3	2,637	53	705	14
46	...	12	...	2,851	56	750	15
27	1	7	0.3	2,762	68	722	18
44	3	4	0.3	2,396	79	234	8
69	5	6	0.4	2,414	118	206	10
56	5	7	0.4	2,863	129	240	11
39	6	12	1.8	1,155	64	350	19
34	4	10	1.1	1,411	55	396	15
61	6	16	1.5	1,869	63	481	16

NOTE.—The three figures against each administrative group are those for (1) 1938, (2) 1937 and (3) 1933-37. The rates have been calculated *per mille* of the average strength.