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POVERTY AND PUBLIC HEALTH

A Considerable Proportion
of the Total Population of
English Men, Women & Children
haven't enough to eat.
That is the fact: this book
unmistakably proves it.

"I can heartily recommend this book to all
who desire to read reliable evidence concerning
a national problem of unsurpassed importance"

— from the Introduction by
Sir F. GOWLAND HOPKINS, O.M.
Professor in Bio-Chemistry, University of Cambridge

Figures published by the Ministry of National Service shortly after the termination of the Great War as to the extent of physical unfitness among the adult British male population disturbed the public conscience. This book traces the common defects there shown to exist in high proportion backwards through adolescence, childhood and infancy to their beginnings. By means of a series of carefully planned investigations extending over fifteen years some of the causal factors in the production of an A1 (or conversely a C3) populace are elucidated, and the preponderatingly important rôle played by Nutrition is clearly demonstrated. The fact that rehousing of a slum population in good environmental conditions may, if nutritional processes are interfered with, result in increased mortality, is shown to be the key to the elucidation of much which has, heretofore, been obscure in the theory and practice of Public Health. Study of minimum dietaries adequate to maintain health and working

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With a foreword by

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FOREWORD

THE PUBLIC CONSCIENCE is disturbed to-day by indications from many quarters that ill-health due to malnutrition is prevalent in this country. The many who desire to know the whole truth about the situation will welcome the noteworthy contribution to the evidence contained in this book. Its authors write with authority based upon knowledge acquired during many years of work in the public health service in industrial areas. This is a high qualification. It is, indeed, particularly to those thus qualified that the public must ultimately look for information and guidance. Laymen, medical practitioners, scientists and politicians alike, when seeking facts upon which action can be based, must, it seems to me, seek the help of those who, like Medical Officers of Health, are in closer contact with the realities of the situation.

In Part I of the book the authors review the statistical evidence concerning public health which is available in various published documents. They have ably analysed, for instance, the findings presented in the Report of the Ministry of National

Service, and the results of the routine medical examinations of school children carried out under arrangements made by Local Education Authorities, together with the more meticulous examinations meant to display the prevalence of specific defects. An illuminating discussion of the evidence thus made available is followed by an interesting review of data obtained a few years ago by the senior author from the reports of Child Welfare Centres in Stockton-on-Tees. It is rightly remarked that there have been too few attempts to make use of the last mentioned records.

Summing up the evidence yielded by studies of the kind so far mentioned, the authors conclude that it shows the existence of a high incidence of partially unrecorded physical defects in our population, and further that a dominant factor in the production of this state of affairs is nutritional in origin.

Chapter VII of the book is of special interest. It describes the results of a most profitable enterprise in which advantage was taken of exceptional local circumstances at Stockton-on-Tees. A few years ago, a population was transferred from slum dwellings to a modern self-contained housing estate, and kept intact without admixture with other populations; there was also a second comparable population that continued to dwell in slum houses and served as a

control. As the authors truly remark, such favourable circumstances for human field research rarely occur. The expenditure and the health of these populations were carefully compared, and interesting facts were brought to light in the comparison. The reader will find they were not altogether such as might have been expected. They leave, however, the impression that adequate nutrition may be more important than good housing, and they make clear the importance of the economic factor in the nutrition of families. The full significance of the latter is admirably illustrated in Part II of this book, which is in many ways of exceptional interest.

I have read no discussion elsewhere, dealing with family economics, which has demonstrated so convincingly how, with incomes near the poverty level, wholly unavoidable expenditure on items other than food may inevitably lead to ill nutrition. It is true that whatever sum can possibly be spared for food is almost always spent upon it; but, unfortunately, food is often the only budgetary item in which adjustments, even though unwelcome and undesirable, can be, and are, in practice, made. Many other items are much less elastic.

In these later chapters expenditure at different economic levels on fixed and inescapable necessities, such as rent, and a number of items which are here classified as "family overheads" is carefully

appraised, and its effect upon food purchasing power made clear.

Many points are brought out which do not always occur to those not in contact with the actual conditions of life at such levels; one may instance the serious hardships involved in the increased cost of fuel in winter, when the family's needs for food are at their highest. This last section of the book, indeed, is full of material significant for the expert, and of interest for the layman. The authors are clearly convinced that ill nutrition calling for remedial measures is widely spread. They make it very evident, moreover, that it is economical factors which control the situation, a conviction that all must acquire. It may be very difficult, as the authors, together with many others, have urged, to provide objective measures for degrees of malnutrition. When, however, we find that numerous families in this country can spend at the most only some sixty per cent. of what the most moderate estimates show they should spend upon food, we scarcely need further evidence for the existence of ill nutrition among us.

I can heartily recommend this book to all who desire to read reliable evidence concerning a national problem of unsurpassed importance.

F. GOWLAND HOPKINS

A BANKER'S DICTUM

MR. COLIN CAMPBELL, presiding at the annual meeting of the National Provincial Bank Ltd., on January 30th, 1936, at Southern House, Cannon Street, E.C., suggested that in order to fill the gap in our foreign trade the Government should improve the food of the under-nourished. He is reported as stating: "It has been suggested that in trying to stave off ruin from farmers, Governments have tended too much to regard the problem as one of reducing supply to fit the lower level of demand. If it were approached from another angle, and increased consumption were aimed at, this might be a more satisfactory way of spending funds now devoted to subsidies to producers or to export bounties. Our Government has already made a start through the provision of cheap milk, and it is stated that methods of extending such schemes to other sections of the population are being considered."

"It has been estimated that, if the under-nourished classes in this country were able to enjoy a full diet, there would be an increased trade in foodstuffs amounting to about £200,000,000 a year, giving revived activity to British farming without harming overseas trade or shipping."

PART I

CHAPTER I

THE WIDE SCOPE OF PUBLIC HEALTH WORK

“He [the Medical Officer of Health] should endeavour to acquire an accurate knowledge of the influences, social, environmental and industrial, which may operate prejudicially to health in the area . . .”

[Extract from a memorandum on the duties of Medical Officers of Health issued in 1925 by the Ministry of Health.]

THE MINISTRY OF HEALTH indicates, in the extract quoted above, that certain factors additional to those of an environmental nature may exert influence upon the health of a community and, further, charges medical officers of health to investigate and study this influence.

The sense of perspective shown in this instruction is so wide and comprehensive that it embraces many factors which lie outside the orbit of traditionally environmental hygiene.

This particular instruction was issued by the Ministry of Health at a singularly opportune time, for it served to focus attention upon, and stimulate research into, social and other factors which had, with increasing insistence, made their presence felt

during the years following the termination of the Great War.

Broadening of perspective in the practical application of scientific knowledge is of great value, for it tends to open up vistas of useful effort previously unseen. The breadth of perspective indicated in the Ministry's instruction had not always been appreciated by medical officers of health; consequently opportunities to widen the scope of inquiries into factors affecting health had not always been used to the full and many promising chances had been overlooked. Re-orientation of views about the scope of investigations into health and disease was greatly needed, for there appeared to be coming into being a tendency to stereotype practical hygiene on an environmental basis. The history of modern public health administration shows that a preponderatingly heavy emphasis had been laid upon environmental factors and that the major efforts had been directed towards the amelioration of such of them as appeared to exert adverse influences upon human health. Non-environmental conditions had not received the attention they deserved.

For some years prior to 1925 increasing attention had been paid to social and biological factors, and many investigations had been made into these factors by the staffs of public health departments.

The stimulus which activated many of these investigations was derived from experience gained in the administration and clinical routine work of the recently established services, school medical inspection and maternity and child welfare. The stimulating effect of experience in these two branches of public health work upon the science of hygiene cannot be overestimated, for they provided opportunities for the application of biochemical and physiological knowledge to human beings.

“Public Health” was gradually changing and was coming to connote a science based upon a broader foundation than the mere interaction between external environmental factors and human biology.

The state of the public health of a community is determined at any particular time by the interaction of many diverse influences. Some of these influences are good, some are bad; some are known, others unknown.

The task of the public health service is to take cognisance of all these influences; to assess the effects of them; to foster the good ones, and to attempt to eliminate the bad ones. It is no easy matter to assess the effects upon health of the many factors which, day by day, exert influence upon human health and human life, for modern civilisation has so complicated the lives of human beings

that the interactions between diverse factors are almost inextricably intermingled. The laboratory worker, when experimenting with animals, can control the "variables." It is rarely possible to do so when investigating human problems.

The influences affecting the maintenance of health and resistance to disease in human beings may be divided, very roughly, into two main groups. There is, firstly, the wide group of external environmental factors and, secondly, what may be designated as the personal factor, or the condition of the body in regard to its potential capacity at any particular time to resist external influences which may cause disease or death.

This division into two groups is arbitrary; for the two overlap and are closely interwoven. This difficulty of differentiation may be appreciated if it is realised that a particular adverse factor may cause death to one individual, illness in another, and produce no apparent ill effect in a third. These divergent results depend upon the capacity of the individual to resist the particular factor *at the time when it is operative*.

Modern public health practice was evolved upon the basal idea of ameliorating those external environmental factors which are, or were thought to be, detrimental to health, and in this campaign against disease and death many notable victories

have been won. It is unnecessary here to specify them. Anyone who is interested may read, in public health records and reports, the progress that has been made since the passing of the great Public Health Act of 1875.

The beneficial results of environmental improvement are fairly well understood; the only reason for the persistence of bad environmental conditions, such as insanitary and overcrowded houses, privy middens or impure and insufficient water supplies, is financial. Local Authorities recognise the desirability of correcting unhygienic conditions, but often hesitate to burden local rates with the cost of doing so.

Environmental perfection does not constitute the only desideratum for healthy life. Many other conditions exert a profound influence upon the welfare of the community. Foremost amongst these other influences is a group of factors which we lump together under the heading of "social conditions." It is a matter for regret that, in the early days of sanitary reform, the task of the study and reform of adverse social conditions was not more closely associated with the duties of the medical officer of health.

Study of the influence of social conditions upon the welfare of a population cannot proceed without a concomitant study of the economic status of

that population. As each fresh vista of investigation is scanned there looms up, dominating the problem, the question of the economic sufficiency of the group of individuals under consideration. Ignorance of the laws of health can be dissipated by education but economic stringency may negative the possibility of applying the newly acquired knowledge.

Any endeavour to acquire accurate information concerning social influences which may operate prejudicially to health in an area is inseparable from a study of poverty.

At the very beginning of the present century a study of poverty as occurring in the city of York was published by Mr. B. S. Rowntree. This volume exerted influence upon the people of the country, for it made clear that a state of poverty was all too prevalent, and it indicated many of the evils caused by that condition. The influence of this book upon the practice of public health might have been greater had it not been published at a time when the medical profession in general, and the public health service in particular, was actively engaged in re-orientating its conception of disease in terms of the young science of bacteriology.

Before the full implications of the discovery of the micro-biological cause of many diseases were thoroughly assimilated it was thought that the diseases so caused might be prevented by efforts

directed towards avoidance of the germs. Some few diseases may, possibly, be so prevented, but we now know that avoidance of most pathogenic organisms is, in practice, impossible and probably, in some instances, deleterious, in that it precludes the possibility of the manufacture by the tissues of anti-bodies which protect the individual from that particular organism. The degree of resistance of the body to infection by micro-organisms is dependent, *inter alia*, upon sub-lethal doses of infection by those organisms which act as a stimulant to the production of specific anti-bodies.

The ultimate outcome of a symbiosis between a pathogenic micro-organism and the human body depends, in any particular instance, to a large extent upon the resistance of the body.

The apotheosis of the bacteriologist was followed by a rise into prominence of the physiologist and the bio-chemist. Physiology has, during the last twenty-five years, advanced rapidly in a field of work of enormous importance to human welfare. The physiologist, with the aid of the bio-chemist, has altered many of our formerly held conceptions of disease and has placed the problem of the prevention of some of them under the ægis of the medical officer of health. A very important consequence of our modern knowledge of physiology, and particularly of the physiology of nutrition, is the

appreciation of the fact that social economics and poverty are material influences in determining the state of the public health.

A concatenation of circumstances, discoveries and opportunities has, during recent years, made available a field for social research which medical officers of health and others are busily exploring. The results so far obtained are indicative of much ultimate good to the community. There is, and of necessity there must be, a time lag between the elucidation of scientific problems and the date when they can usefully be incorporated in legislative and administrative practice. There is required a period of time for consolidation of the new knowledge, for co-ordination of individual discoveries, and for determining the most advantageous methods of applying them to the common weal.

Since 1919 the authors of this volume have been actively engaged in public health work and have endeavoured to interpret new knowledge, as it became available, in terms of practical public health, and have carried out certain investigations in an attempt to solve some of the problems that beset a public health administrator.

This book contains an account of these efforts.

CHAPTER II

THE PHYSICAL CONDITION OF THE POPULATION

THE INDIVIDUAL affected by the presence of physical defect or disease in the human body is handicapped in the battle of life.

The causes of many of the common pathological conditions are known, and it is, therefore, important that knowledge of the incidence of such conditions should be available. Without this knowledge it is impossible to assess the national importance or otherwise of the causative factors. Unfortunately our knowledge of the incidence of morbid conditions in the populace is far from complete.

Physicians have always realised that a considerable proportion of the population of all ages fall short of physical perfection and of normality. How large is this proportion, and how slight or serious are the common defects, is not precisely known; for there exists no means of medically examining the whole population to find out the nature and extent of the problem. There are records of the results of the medical examination of certain sections of the

community, and these give an insight into the physical condition of the whole population. One valuable group of records relates to the physical condition of would-be recruits to the Army during the war.

The public was alarmed and its conscience shocked when the results of the medical examination of men of military age were published.

THE MINISTRY OF NATIONAL SERVICE,
1917-1919

The Ministry of National Service (1917-1919) published in 1920 a Report (Volume I) upon the Physical Examination of Men of Military Age by National Service Medical Boards from November 1st, 1917, to October 1st, 1918. This Report contains valuable information.

The following are extracts from the Introduction to the volume.

“The primary object of the organisation of the Medical Department of the Ministry of National Service was to conduct the examination of all men of military age called up for medical examination under the Military Service Acts. . . .”

“Incidentally the fulfilment of this task afforded the opportunity to make a far-reaching medical survey of the male population of Great Britain. . . .”

The Introduction also states:

“ Experience has shown that men of military age can be sorted into four broad groups according to their physical fitness. These groups or *grades*, as they were henceforth termed, formed the foundation upon which the whole structure of the physical census was built. They were defined as follows :

“ *Grade I.* Those men who attain the full normal standard of health and strength and are capable of enduring physical exertion suitable to their age. Such men must not suffer from progressive organic disease, nor have any serious disability or deformity. Minor defects which can be remedied or adequately compensated by artificial means will not be regarded as disqualification.”

(The above definition postulates a physical condition which may fall short of perfection.)

“ *Grade II.* Those who for various causes, such as being subject to partial disabilities, do not reach the standard of Grade I. They must not suffer from progressive organic disease. They must have fair hearing and vision; be of moderate muscular development, and be able to undergo a considerable degree of physical exertion of a nature not involving severe strain.”

“ *Grade III.* Those who present marked physical disabilities or such evidence of past disease that they are not considered fit to undergo the degree of physical exertion required for the higher grades.

Examples of men suitable for this Grade are those with badly deformed toes, severe flat foot, and some cases of hernia and varicose veins."

" . . . the Third Grade will also include those who are fit only for clerical and other sedentary occupations, such as tailoring and boot-making."

" *Grade IV*. All those who are totally and permanently unfit for any form of military service."

These definitions, amplified and explained by various and detailed instructions necessitated by their application to the individual and by administrative requirements, represented the standards of each of the four grades, in one of which every man who was called up for medical examination under the Military Service Acts was placed. It will be noticed that they are concerned solely with physical considerations, and it is this characteristic which makes the records of the men examined and graded by these standards such a valuable source of information on the physical condition of our people. These records indeed constitute a physical census of men of military age upon a scale which only the urgent necessity of a war among the great nations could have rendered possible.

The following quotation is taken from the last paragraph of the Introduction to the Report: "Analysis of them [*the records*] should therefore reveal the nature and distribution of physical

disabilities among our manhood, and also show to what extent the national health falls below an attainable standard. This information once harvested and sifted should indicate unmistakably the directions in which efforts should be made to improve the national health by preventing what is preventable, and by ameliorating or palliating what is unavoidable."

Unfortunately the brave new world born on November 11th, 1918, had so soon to fight desperately against economic conditions for its own mere existence that it could not follow to its logical conclusion the wise and prophetic dictum contained in the above quotation.

One more quotation from the text of the Report: "Military requirements, even if they attach a rather higher value to certain qualities and disabilities than appear to be justified by the requirements and standards of civil life, provide a sound basis for grading men of military age if we wish to assess their physical fitness for active and useful life in the State. It is certainly difficult to suggest a better basis for the assessment of such a complex resultant of different qualities as grade. We may, therefore, regard grading results as reflecting faithfully the current opinion of the medical profession of this country upon the health and physique of the men examined estimated by standards which

represent a fair and reasonable basis for sorting them into groups according to their physical fitness.”

During the year preceding the signing of the Armistice, viz., November 1st, 1917, to November 1st, 1918, National Service Medical Boards conducted nearly two and a half million medical examinations.

The Report gives reasons why it may be assumed that the men examined in that year represented a fair sample of the manhood of the country at the ages concerned and refutes the contention that men medically examined in the earlier years of the war were of a better physical standard.

It would be possible to quote the reports of the results of medical examination of recruits in each of the preceding war years, but varying standards of fitness adopted make comparisons of little statistical value. Large numbers of men enlisting in the Army during the first year or two of the war were physically unfitted for Army training, and for this reason, among others, earlier figures are of less value than those of the National Service Medical Boards. The standards set out in the four grades adopted for the guidance of these Boards remained constant during the period of the Boards' activities and are therefore particularly valuable.

The total number of medical examinations

TABLE I

Number of men placed in			Percentage of men examined	
Grade I	..	871,769	..	36.0 %
„ II	..	546,276	..	22.5 %
„ III	..	756,859	..	31.5 %
„ IV	..	250,280	..	10.0 %
		<u>2,425,184</u>		<u>100.0%</u>

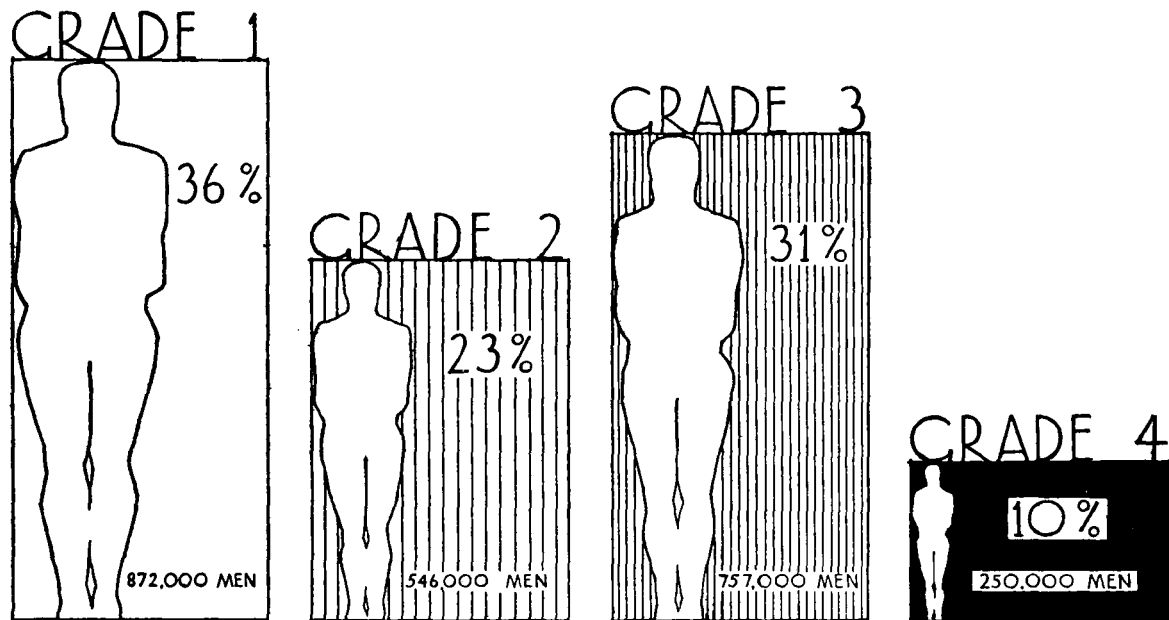
carried out by the National Service Medical Boards during the year ending November 1st, 1918, amounted to 2,425,184.

Table No. 1 gives a synopsis of the results of these examinations.

The Report comments upon this table in the following words:

“These results may be summarised by saying that medical examination showed that, of every nine men of military age in Great Britain, on the average three were perfectly fit and healthy; two were upon a definitely infirm plane of health and strength, whether from some disability or some failure in development; three were incapable of undergoing more than a very moderate degree of physical exertion and could almost (in view of their age) be described with justice as physical wrecks; and the remaining man as a chronic invalid with a precarious hold on life.”

DIAGRAM 1 TABLE 1 GRADES OF PHYSICAL FITNESS



It is a matter for regret that a final and detailed analysis of the huge mass of material collected by the Ministry of National Service relative to the physical condition of men of military age has not been published. In the absence of such an analysis it is not possible to give complete figures showing the incidence of particular defects found in the course of the 2,425,184 medical examinations carried out under the authority of that Ministry.

Some idea of the part played by various defects on the allocation of men to the various grades may be gained from Table 2, printed on pp. 34-35. This Table is taken from page 25 of the Report which was published in 1920 by the Ministry of National Service. This Table gives a summary of the results of medical examination in the London Region.

The number of men examined by the National Service Medical Boards in the London Region during the period January to October, 1918, was 160,545. Of this number 77,900 (=48·5%) were placed in Grades III and IV. In Grade III 60,031 (=37·4%) were placed; and in Grade IV 17,869 (=11·1%).

The young and early middle-aged men medically examined should have been, it was popularly supposed, the healthiest section of the community, yet the huge mass of defects enumerated above was found to exist among them.

TABLE 2

Shows in the case of 77,900 men of military age placed in Grades III and IV in the London Region during the period January to October, 1918, the disease or disability on account of which they were so graded. The Table also shows the total numbers placed in these Grades on account of each disability together with the respective percentages.

Disease or Disability	No. of men placed in Grade III and Grade IV	Percentage of number examined	Percentage placed in Grade IV	Percentage placed in Grade III
(1) Valvular Disease of Heart ..	12,562	7·8	1·6	6·3
(2) Deformities, Congenital and acquired (including Flat Foot, Hammer Toe, etc.)	8,605	5·3	1·0	4·3
(3) Diseases of Circulatory System (other than V.D.H.), including Varicose Veins	6,275	3·9	0·6	3·3
(4) Diseases of Lungs and Bronchi (other than T.B.) and Respiratory System	6,188	3·8	0·6	3·2
(5) Pulmonary Tuberculosis	4,327	2·6	2·0	0·6
(6) Functional Diseases of the Heart	3,385	2·1	0·1	2·0
(7) Wounds, Injuries, etc.	3,335	2·0	0·3	1·7
(8) Diseases of Ears	3,162	1·9	0·3	1·6
(9) Diseases of Nervous System (other than Insanity and Epilepsy) ..	3,066	1·9	0·5	1·4
(10) Poor Physique	2,967	1·8	0·2	1·6

(11) Defective Vision	2,020	..	1.0	..	0.2	..	1.4
(12) Rheumatism	2,445	..	1.5	..	0.1	..	1.4
(13) Hernia	2,179	..	1.3	..	0.2	..	1.1
(14) Diseases of Digestive System ..	2,170	..	1.3	..	0.2	..	1.1
(15) Diseases of Eyes	1,886	..	1.1	..	0.5	..	0.6
(16) Deafness	1,708	..	1.0	..	0.2	..	0.8
(17) Epilepsy	1,265	..	0.7	..	0.5	..	0.2
(18) Hæmorrhoids	1,140	..	0.7	..	0.05	..	0.65
(19) Skin Diseases	1,053	..	0.6	..	0.15	..	0.45
(20) Diseases of Generative Organs and Genito-urinary System (other than V.D., Albuminuria and Glycosuria)	983	..	0.6	..	0.075	..	0.525
(21) Albuminuria	951	..	0.5	..	0.3	..	0.2
(22) Tuberculosis (other than Pulmo- nary)	911	..	0.5	..	0.3	..	0.2
(23) Insanity	656	..	0.4	..	0.3	..	0.1
(24) Syphilis	556	..	0.3	..	0.1	..	0.2
(25) Glycosuria	214	..	0.1	..	0.1	..	—
(26) Venereal Diseases (other than Syphilis)	162	..	0.1	..	0.02	..	0.08
(27) Other Diseases	3,129	..	1.9	..	0.375	..	1.525
Totals	<u>77,900</u>	..	<u>48.5</u>	..	<u>11.1</u>	..	<u>37.4</u> <u>11.1</u> <u>48.5</u>

The figures are certainly disquieting.

There exists no record of similar examinations of women, but there is no reason to suppose that the female population of corresponding ages differed materially in physical condition from their brothers. In the absence of evidence to the contrary we must assume that the incidence of defects was approximately similar in both sexes. Now it is a reasonable assumption that the presence of defects and of pathological conditions in a human body renders that body less efficient than it would be were those defects non-existent. If this postulate be accepted it follows that a high percentage of the population was, at that time, physically handicapped.

The presence of heart disease may render it impossible for a man to maintain himself and his family by strenuous manual labour; defective vision closes such avenues of employment to him as certain grades of railway work, and so on.

It should be noted that there does not appear in Table 2 any heading for dental decay, though this condition must have been prevalent among the men examined.

There exists no means at the moment of determining whether the present day population of similar ages suffers to a greater or less extent from the defects found among young and early middle-aged men of the year 1918.

The results of the medical examination of would-be Army recruits in recent years give no data sufficiently reliable to apply to a wider public. The recruits at present presenting themselves for enlistment in the Army may not be a fair and true sample of the nation's manhood. Economic factors are powerful recruiting agencies, and it is not improbable that many of the would-be recruits are compelled by economic pressure to offer themselves for enlistment. How far this factor is operative is not known, but its possible operation is sufficiently probable to "weight" the sample to such an extent as to render untrustworthy generalisations from the results of medical examination of present-day recruits. There is also the further "weighting" factor of variations in the standards of fitness applied. It is thus not possible, at present, to assess the physical condition of any considerable section of the adult population, but we have data of great value concerning children.

CHAPTER III

THE PHYSICAL CONDITION OF ELEMENTARY SCHOOL CHILDREN

THE MEDICAL INSPECTION of elementary school children as carried out under arrangements made by Local Education Authorities provides our most nearly complete opportunity to assess the physical condition of almost the whole population at certain particular ages.

The number of children between the ages of 5 and 14 years in England and Wales in 1933 was 6,048,000, and 93 per cent of this number appeared on the registers of elementary schools.

No other public service presents opportunities for medical examination and assessment of any age-group on anything like the same scale, for in no other section of the community is medical examination compulsory.

The Child Welfare Service does, it is true, provide opportunities for the medical examination of a considerable proportion of the child population at ages under five years, but as neither attendance at child welfare centres nor medical examination of

children attending them is compulsory it is impossible to obtain comparable records of numbers of children as great as those examined by the staff of the school medical service.

The records of examination of children attending child welfare centres are both numerous and valuable and they do give an insight into the morbid conditions prevalent among young children, but they are based upon a less comprehensive survey than those referring to elementary school children.

The schedule of examination of school children, though leaving some latitude to the clinical acumen of the examiner, is stereotyped. This is an advantage in some ways, but a disadvantage in others. One of the disadvantages is the loose way in which the term "normality" is used. Many observers have fallen into the error of assuming that the mean of a large number of observations constitutes normality. This assumption may cause serious error. Normality when applied to anthropometrical findings does not postulate optimum measurements, but it should assume functional efficiency and not merely a mean of physical records based upon the examination of a community, however large, without regard to whether that particular community is composed of individuals a large proportion of whom may, or may not, possess definite physical

infirmities. Individuals in whom pathological conditions exist cannot be "normal." The absurdity of assuming that a "mean" is synonymous with "normality" may be appositely illustrated by a reference to dental decay. No one would maintain that a "normal" child is one with dental decay, yet if "mean" and "normality" are confused in this particular matter it would be necessary to form that conclusion. We find analogous confusions perpetuated in edition after edition of medical books, such as, for instance, the oft-repeated statement that some degree of knock-knees is "normal" in women. The explanation given is that the greater diameter of the female pelvis, compared with that of the male, renders knock-knees a mechanical necessity to counteract the greater distance between the femoral heads. A little consideration of the elementary principles of mechanics would show that this explanation is based upon a false hypothesis.

Opportunities that are lacking to members of the medical profession as a whole are vouchsafed to the school medical officer. There passes under his observation a constant stream of the childhood of the area in which he works. He knows accurately the number of school children of each year of age in his district, and he examines a definitely ascertainable proportion of them. He can, by referring to his reports, state accurately the number of

children in whom he has found certain pathological conditions.

The school medical officer can, by contrasting and comparing the findings in one area with those in another, determine the geographical distribution and incidence of defects; he can state that some defects are commoner or rarer in one district than in another and, provided always that his standards of assessment are comparable with those of his colleagues, he may, by a process of analysis and deduction, be able to indicate the fundamental differences which account for the discovered local variations in incidence.

The school medical officer can, further, study conditions, apparently slight and innocuous in themselves, which may be the precursors, the prodromata, of pathological conditions inimical to health, or even to life. He may, on the other hand, discover established states and defects which have arisen during the pre-school years.

The opportunities for research available to keen men engaged in the school medical service are almost unlimited, but, unfortunately, the optimum use is not always made of them.

Never in the history of the world have such opportunities for medical and sociological research been offered as those presented by the school medical service, and, were team work among the

members of local staffs more highly developed and directed by far-seeing, broad-minded men, problems which have baffled science for generations might be solved in the course of a decade. Individual effort is handicapped because it is individual, and mistakes are made by the individual worker which, in team work, would be avoided. Checks and counter-checks on accuracy are needed and, in the case of the isolated investigator, the personal element may assume too great an influence.

In spite of these handicaps much valuable individual work is being done. The massed results of the whole of the school medical inspection work carried out each year throughout England and Wales are published annually by the Board of Education. The annual reports entitled "The Health of the School Child" provide a mass of information which enables a general picture of the physical condition of the elementary school population to be visualised. The information in these reports is of inestimable value.

One of the most striking facts adduced from a study of these reports and of the reports of individual Local Education Authorities is that the five-year-old child, on admission to school, suffers from defects, similar in number and in kind, to those found in the eight- and twelve-year old groups of children.

The physical defects discovered in school children have originated, very largely, during the five years preceding entry into school. This is a finding of fundamental importance, for it follows that efforts directed to prevent their occurrence must be initiated during the pre-school years.

Routine medical inspection of elementary school children is carried out three times during the child's school life. Each child is medically examined at 5 years of age as an "Entrant"; at 8 years as an "Intermediate"; and at 12 years as a "Leaver."

In 1933 the average attendance at all elementary schools in England and Wales amounted to 6,049,284 children. The actual numbers on the registers of these schools was 5,639,000. The average attendance was, therefore, approximately 90% of the total number on the register. The number on the registers of elementary schools represents 93% of all children of ages ranging from 5 to 14 years.

The human material available for examination and assessment by the school medical officer represents a very large proportion of the childhood of the land.

During 1933 the number of elementary school children medically examined as "Routines" totalled 1,855,499. Of the 1,855,499 children examined that year 303,199 were found to be

TABLE 3

Percentages of Elementary School Children found at Routine Medical Inspection in 1933 to require medical treatment:

Entrants (5 years old)	..	..	16.26%
Intermediates (8 years old)	..	..	18.58%
Leavers (12 years old)	..	..	17.21%

suffering from defects of a nature requiring immediate medical treatment—a percentage of 17.33.

The percentages in the three age groups are shown in Table 3.

These findings are less than would have been discovered 30 years ago but their magnitude is disquieting. Bad as these results are, they do not present a complete picture of the physical condition of our childhood. It must not be assumed that the remainder are free from defect.

These findings do not include the results of dental inspection nor do they contain the large group of children in which defects of a less severe degree are detected. The less severe defects are recorded by the school medical officer upon the child's schedule card but are marked "for observation."

During 1933 the number of elementary school children dentally inspected by qualified dentists

totalled 3,303,983. The number found to require dental treatment was 2,263,135—a percentage of 68.5.

We have seen that 17.3% of the 1,855,499 children medically examined as routines in 1933 required immediate medical treatment; a further 261,763 of this total were discovered to be suffering from defects of a less serious nature and were scheduled “for observation.” This represents 14.0% of the total number medically examined.

If to this figure of 14.0% is added the 17.3% of children who have defects requiring immediate medical treatment it appears that 31.3% of all routine examiners possess physical defects. This figure takes no account of dental defects or of defective vision in the entrant group (five-year-olds.) The defects discovered and recorded are fairly obvious defects, and meticulous search by experts for aberrations from normality always yield a much higher figure. This will be referred to later.

A large additional number of elementary school children are examined each year. This group consists of children who for the most part suffer, or are thought to suffer, from defects that are obvious to non-medical observation. This extra group of children is known as “specials” and consists of those whom the teachers, attendance officers, or school nurses consider to require medical examination

TABLE 4

	No. of Med. Exams.	Requiring treatment	No. of Defects For observation
Special ..	1,855,499	486,777	88,706
Routine ..	1,239,427	303,199	261,763
	<u>3,094,926</u>	<u>789,976</u>	<u>350,469</u>
	Total defects=1,140,445		
	=36.8% of all children examined.		

because of some obvious or suspected defect, or who present some abnormality, such as defective hearing, that precludes them from taking full advantage of the education provided.

The number of "special examinations" during 1933 was 1,239,427. In this large group 486,777 children were found to have defects requiring treatment—a percentage of 39.0% and 88,706 (7.0%) to have defects of a less severe nature and marked "for observation."

These figures show that a total of 3,094,926 children came, during 1933, directly under the observation of the school medical officer. This represents 61% of the average attendance in elementary schools.

The results of these examinations are shown in Table 4.

There remain about 590,000 absentees. Truancy

is no longer a serious cause of absenteeism, but, especially among older girls, a considerable number remain at home to help in the housework, particularly if the mother is sick or ailing. How large this number may be is not known. The commonest cause of absence from school is illness, which may be of a temporary nature, such as a cold, influenza, infectious disease. Also a considerable number of children are temporarily excluded on account of being contacts of infectious disease. The ailments which cause absenteeism are rarely seen in the course of his work by the school medical officer. Children suffering from severe colds, influenza and infectious disease are nearly always absent from school and so do not come under his observation.

The defects discovered by special examinations are not entirely comparable with those found on routine inspections. Many of the defects found among the "specials" are of a temporary character and cannot reasonably be characterised as physical defects. For instance, inflammation of the eyes and impetigo may be of a purely temporary nature and may, if properly treated (or even if untreated), leave no permanent defect.

The conclusion may fairly be drawn that 36.8% of all children examined during 1933 presented some deviation from normal *at the time of examination*, but it is not reasonable to state that this percentage of

TABLE 5

Total Number of Routine Inspections: 1,855,499.

Defect	No. of Defects requiring treatment	Incidence per 1,000 inspections	No. of Defects requiring observation	Incidence per 1,000 inspections
Malnutrition	20,579	11.1	23,760	12.8
Skin Diseases	17,747	9.6	3,652	2.0
Defects of Vision	102,318*	80.6*	51,581*	40.6*
Squint	14,469	7.8	7,919	4.3
Other Eye Diseases	13,762	7.4	4,261	2.3
Defects of Hearing	6,158	3.3	4,587	2.5
Otitis Media	8,589	4.6	2,399	1.3
Chronic Tonsillitis only	37,275	20.1	83,052	44.8
Adenoids only	5,717	3.1	6,717	3.6
Chronic Tonsillitis and Adenoids	30,234	16.3	20,408	11.0
Other Nose and Throat Defects	13,261	7.1	14,287	7.7
Defects of Speech	1,962	1.1	4,967	2.7

Organic Heart Disease	..	3,018	..	1.6	..	6,513	..	3.5
D^H Pulmonary Tuberculosis :								
(a) Definite	.. ..	255	..	0.1	..	280	..	0.2
(b) Suspected	.. ..	854	..	0.5	..	1,362	..	0.7
Non-Pulmonary Tuberculosis		1,129	..	0.6	..	1,702	..	0.9
Epilepsy	.. ..	507	..	0.3	..	824	..	0.4
Chorea	.. ..	849	..	0.5	..	779	..	0.4
Other Nervous Conditions	..	2,197	..	1.2	..	3,795	..	2.0
<i>Deformities</i>								
Rickets	.. ..	2,228	..	1.2	..	4,901	..	2.6
Spinal	.. ..	4,634	..	2.5	..	3,191	..	1.7
Other Forms	.. ..	12,788	..	6.9	..	10,826	..	5.8

*Does not include the entrant group of children.

The above table is extracted from the tables on pages 71 and 72 of *The Health of the School Child for the Year 1933*, published by the Board of Education.

school children suffer from permanent physical defects. It is a very difficult matter (and, in practice, impossible) to separate permanent from temporary conditions.

In the course of ordinary routine medical inspection it is almost impossible to determine the incidence of a condition, such as rheumatism, which may ultimately cause permanent injury to the heart. Where special rheumatic clinics for school children have been established, the number of children found to be afflicted with this complaint is greater than the number discovered during routine medical inspection.

Table 5 shows for each scheduled pathological condition the number of defects discovered at Routine Medical Inspection in England and Wales during the year 1933 and scheduled for treatment and the incidence per 1,000; it shows also the number and incidence per 1,000 of defects scheduled for observation.

CHAPTER IV

SPECIAL INVESTIGATIONS AMONG ELEMENTARY SCHOOL CHILDREN

ROUTINE MEDICAL INSPECTION of school children is a general survey of their physical condition. When special surveys are undertaken, directed towards the investigation of some particular condition or defect, a higher incidence is discovered than at routine inspection. This does not necessarily mean that routine medical inspection is carried out in a perfunctory or careless manner, but that the nature and scope of the investigations vary.

It is impracticable to make detailed comparisons between the nature and incidence of the defects found among school children in 1933 and those present in the men examined for the Army in 1918, but certain generalisations are of interest. (It must be remembered that the school medical officer does not see all cases of heart disease, chorea, tuberculosis, bronchitis, etc., at routine inspections. Severe cases of these conditions are not likely to be at school.)

Defects in the circulatory system (valvular disease

of the heart, varicose veins, hæmorrhoids and functional diseases of the heart) are as a group much commoner in adults than in children. Varicose veins and hæmorrhoids are very rare among children.

Naso-pharyngeal conditions (chronic tonsillitis only, adenoids only, chronic tonsillitis and adenoids) are common in children but are not included in the list of disabilities found in recruits, though it is certain that some of them must have suffered from one or other of this group of conditions. Rheumatism and chronic tonsillitis are, in some proportion of cases, probably closely interconnected, and there is ground for supposing that some of the cases of heart trouble of adults may be attributed to chronic tonsillitis with streptococcal infections occurring in childhood.

There is present here an important field of research which has been left almost unexplored. How far and in what respects are the common defects of childhood associated with the disabilities of adult life?

SPECIAL INVESTIGATIONS

The picture of our elementary school children as shown by routine medical inspection is bad. The fact that this picture is better in 1933 than it was in 1913 is a matter for congratulation, but should not

be used as an argument that the condition of affairs in 1933 is satisfactory. It is not.

When regard is given to the results of meticulous special investigations, which take into account the minutiae of defects, the physical condition of elementary school children is found to be even worse than is indicated by routine medical inspection.

This statement may be illustrated by reference to the results of certain special surveys. During 1933 the school medical staffs of most Local Education Authorities carried out a special survey of the nutritional condition of elementary school children.

It has been shown above (*see* Table 5) that the routine medical inspection of 1,855,499 children caused 11.1 per 1,000 to be scheduled as suffering from malnutrition of a sufficient degree to require treatment, and a further 12.8 per 1,000 to be marked for observation, because of a less degree of the same condition. (It is difficult to understand why any recognisable degree of malnutrition should be "observed" and not recommended for treatment.) These two figures give a total of 23.9 per 1,000 children discovered at routine medical inspection to be suffering from some degree of malnutrition.

Special surveys carried out for the express purpose of detecting malnutrition during the financial year 1932-1933 resulted in 399,377 individual children

receiving meals provided by Local Education Authorities. This represents 79 per 1,000 children in average attendance, which figure is three and a third times as great as the total proportion discovered during routine medical inspection, and is, moreover, slightly more than seven times the proportion recommended for treatment. Either the medical officers who conducted the special survey recommended children for meals without adequate reason *or the standards of assessment of malnutrition varied.*

During the financial year 1932-1933 the total number of meals provided amounted to 68,843,281. The gross expenditure on this wholesale catering was £567,847, from which should be deducted £56,654, being the amount received from parents, and £7,644 miscellaneous receipts.

Variations in standards for assessing defects are important. Though the schedule for the examination of school children is stereotyped, much variation in findings is recorded. One of the authors (G. C. M. M'G.) of this volume drew attention to this in an article published in *The Medical Officer* of July 16th, 1927, under the title of "The Geographical Distribution of Defects Among School Children." The following are quotations from the article:

“ ‘ The most pressing need in school medicine is the establishing of standards and the determination

of physiological variations' (Dr. Dunstan Brewer, 1926, annual report of the school medical officer for the borough of Swindon)."

"The absence of standards has seriously limited the usefulness of the huge mass of clinical data accumulated by the numerous school medical officers throughout the country."

"The geographical distribution of disease and defect is a matter of great importance, and a consideration of the annual reports of school medical officers indicates great variation in the incidence of defects in various localities. Before drawing any definite conclusions from a comparison of such figures, the searcher after truth asks himself whether the figures compiled in the different districts are really comparable. The personal factor in the compilation of clinical records must always constitute a factor of error, but if to this error is added the further factor of imperfect standards, the value of the conclusions reached by a comparison of the data supplied by the school medical officers of the various Local Education Authorities is problematical. No one who reads the reports of school medical officers can fail to be impressed by the enormous variation exhibited in the incidence of defects. The figures in the subjoined table are taken from the reports of fifteen school medical officers. The reports were not specially selected: "

TABLE 6

County Council or Borough.	Percentage of Children Requiring Treatment. Routine Inspection only			Per 1,000 Children Examined			
	1 Entrants	2 Inter- mediate	3 Leavers	4 Requiring treatment	5 To be kept under obser- vation	6 Requiring treatment	7 To be kept under ob- servation
Swindon ..	27.9	29.8	31.0	12.2	11.0	3.2	0.4
Sheffield ..	15.6	19.5	17.5	42.1	24.9	1.9	1.2
Sunderland ..	36.9	30.6	24.5	122.4	254.2	2.6	14.0
Jarrow ..	27.2	27.4	22.3	39.9	102.7	0.9	0.9
Bradford ..	35.4	37.2	37.2	90.5	59.5	8.9	5.8
Essex C.C. ..	8.9	10.9	10.4	39.7	41.5	0.08	0.7
Leeds ..	22.2	31.9	27.9	34.6	47.7	8.3	8.3
Hartlepool ..	15.5	12.9	14.2	14.5	66.8	2.5	5.1
North Riding C.C.	18.06	22.9	21.1	43.2	20.0	2.7	0.9
East Riding C.C. ..	7.7	9.5	8.6	95.8	33.9	0.4	—
Tynemouth ..	13.6	16.3	14.5	10.2	46.5	1.5	0.6
Bath ..	17.5	21.9	17.1	27.6	33.1	1.2	3.3
Birmingham ..	28.9	29.07	27.3	69.9	30.7	6.0	5.1
Gateshead ..	21.7	34.4	25.2	86.6	—	9.4	1.8
London C.C. (1925)	46.9	45.0	39.5	58.9	42.0	0.5	0.19

The article further stated:

“ From the figures given in the reports of school medical officers it would appear that tonsils, adenoids, and tonsils and adenoids, requiring treatment are twelve times more common in Sunderland than in Tynemouth, while Swindon is in the fortunate position of having only one-twenty-third the cases occurring in Sunderland which have to be kept under observation.”

“ If the figures quoted are arrived at by strictly comparable methods of ascertainment, there surely exists a great need for a careful inquiry into the local circumstances which produce such variations.”

“ Enough examples have been given to show that very large variations in the incidence of defects among school children are reported in different areas. Are these variations due to local causes or to imperfect standardisation of clinical methods? Until this question is answered, comparison of the findings of school medical officers is of but little value.”

After publication of the article quoted above attention was drawn to the fact that the returns for the London County Council contained children referred for medical treatment on account of dental defects, and in this way differs from the table as compiled by the school medical officers of other local authorities.

There are probably local variations in the

incidence of some defects but it is not possible to differentiate between true geographical variations and differences attributable to non-comparable clinical standards. These latter differences are considerable, for, when special surveys are made, the incidence of the particular defect sought for is found, as previously stated, to be higher than that recorded in ordinary routine medical inspection.

DENTAL DEFECTS

Dental defects are not generally recorded by the school medical officer. This work is carried out by the dental surgeons employed by the Local Education Authorities. During 1933 dental inspections of elementary school children totalled 3,303,983. Of this number 2,263,135 were recorded as requiring dental treatment. This represents 68·5% of the children inspected.

It must not be assumed that the remaining 31·5% of children had perfect teeth. As the total number dentally inspected includes children of all ages in attendance at elementary schools, a certain proportion will have had previous dental treatment. For instance, a child may have had teeth extracted or have had cavities filled and not require further treatment. Such a child would be included in the 31·5% and not in the 68·5%.

Were it possible to obtain for the whole country

figures of the incidence of dental decay among five-year-old children entering elementary schools, such statistics would be of great interest and value. Unfortunately the returns of school dental officers do not show either the incidence of dental caries or the percentage of children possessing, at the time of inspection, perfect dentition. They merely show the number and percentage of children requiring dental treatment.

The actual percentage of elementary school children with perfect dentition is, as mentioned above, not precisely known but it is certainly very small.

Information of value on this and certain other aspects of the physical condition of five-year-old elementary school children is contained in the second Interim Report of the Board of Education Committee on Adenoids and Enlarged Tonsils, published by His Majesty's Stationery Office in 1931.

The prefatory note to this Report by the Chief Medical Officer (Sir George Newman) to the Board of Education states: "The investigation was carried out under conditions carefully devised to exclude the bias which is inseparable from the 'personal factor' where all examinations are carried out by a single observer." The inquiry was spread over 33 public elementary schools in

London representing a wide variety of social conditions, and the examination was confined to five-year-old children.

Examination of the teeth was conducted by Mrs. Mellanby whose work in connection with dental structure is too well known to require comment here. Mrs. Mellanby inspected by means of probe and mirror the teeth of 1,293 five-year-old unselected children. Her findings (summarised) were as follows:

“*Caries.* Of the 1,293 children examined only 61 (4·7%) were found to be free from caries; caries was present in a slight degree in 150 children (11·7%). In the remainder caries was present in a severe degree (83·6%).” Mrs. Mellanby classified the degree of carious involvement of the teeth in six groups according to the severity and extent of the caries present. Groups 5 and 6 of her classification consisted of children having five or more badly carious teeth, or a larger number of teeth with a slightly less degree of caries; 813 children fell within these two groups. Compare this figure with the 68·5% of children found by school dentists in England and Wales to require dental treatment.

It is difficult to find figures relative to similar investigations carried out elsewhere. In 1923-24 one of us (G. C. M. M'G.) examined the dental condition of 794 five-year-old elementary school

children in the County of Durham. 417 of these children were boys, and of this number no dental decay was observed in 11%; 377 were girls and of this group 16.5% were noted as free from decay. These figures are not strictly comparable with those of Mrs. Mellanby, for the observer did not use a probe and mirror in conducting his dental examinations, and it is almost certain that some cases of caries were missed. The 11% and the 16.5% are, therefore, probably overstatements.

It is interesting to compare the results of dental inspection in recent years in Stockton-on-Tees. Since 1931 the Stockton-on-Tees school dental officer has paid special attention to the condition of the teeth of the five-year-old entrants to the public elementary schools in the town. He reports as follows: "Five-year-old elementary school children possessing *entirely sound and complete deciduous dentitions* amounted to the following percentages:

1931	.....	5.6%
1932	.....	6.4%
1933	.....	7.0%
1934	.....	8.2%

This is a severer test than the enumeration of the presence of carious teeth, for it postulates not only absence of caries in the teeth but complete dentition. No child was included in these percentages who had

lost a tooth, even though teeth lost might have been free from caries.

These figures indicate that freedom from caries in Stockton-on-Tees five-year-old elementary school children is not greatly different from the proportion found by Mrs. Mellanby in London in 1930.

The Stockton-on-Tees figures indicate a slight but gratifyingly steady increase in the percentage of children possessing entirely sound and complete deciduous dentitions.

It cannot but be admitted that the dental condition of our child population is far from satisfactory. The causation of dental caries is closely associated with dietetic deficiencies of the child or of its mother during pregnancy, or of both.

The presence of dental decay in an individual is indicative of sub-optimal nutrition at some time or other during that individual's life.

CHAPTER V

RICKETS AND SOME OTHER DEFECTS OF CHILDHOOD

RICKETS is an exceedingly common disease among young children in this country. This disease is characterised by (*inter alia*) changes in the bones which, according to the degree of interaction of several factors, may be so severe as to cause serious crippling and deformity or be so slight that bony changes may escape all but the most careful clinical observation specifically directed to their discovery. The cause of rickets is now well understood, the main factor in its production being certain dietary deficiencies. The bony changes caused by this disease vary according to the age at which the causative factors are operative. This fact is not always given sufficient weight when diagnosing minor degrees of deformity. Thus the condition known as knock-knees is hardly likely to arise in an infant before it has walked, and bossing of the parietal bones does not arise, however severe the disease may be, in children of more than a few weeks old. Active rickets, recognisable by X-ray

examination, may be a transient phenomenon, but may leave deformities which persist long after the active rickets has ceased to be recognisable as such.

The percentage of English children who have, at one time or other in their lives, suffered from rickets is much higher than is generally recognised.

Acceptance of the returns of routine medical inspection as carried out by school medical officers as to the incidence of rickets would give an imperfect picture of the actual state of affairs in relation to this morbid condition. Reference to the annual report of the Chief Medical Officer to the Board of Education for the year 1933 shows that 1.2% of scholars in elementary schools in England and Wales were recorded as requiring treatment for rickets and 2.6% were noted for observation. It is certain that these percentages refer only to cases presenting marked and obvious deformities.

Absence of accepted clinical standards for determining the presence or absence of rachitic stigmata has given rise to conflicting estimates of the degree of ricketisation of the English people. This absence of standards has proved a serious hindrance to the field study of the incidence of this disease. During the year 1921 to 1923 one of us (G. C. M. M'G.) was particularly interested in investigating the incidence of rickets among elementary school children

in the County of Durham. This work followed upon that of Dr. J. W. MacIntosh in the same district. One of the difficulties which had confronted Dr. MacIntosh was the absence of commonly accepted clinical standards for the determination of degrees of rachitic bony changes of a less marked degree than obvious deformity. He had adopted seven standard signs, but as two of these signs occurred somewhat infrequently, and were not readily capable of precise definition, it was decided to reduce them to five.

The five standard signs used were:

1. Bossing of the parietal bones.
2. Bossing of the frontal bone.
3. Bony changes in the chest wall.
4. Knock-knees.
5. Bow-legs.

These five signs are capable of some measure of standardisation and have been adopted in other inquiries. Those interested will find a detailed description in the Second Interim Report of the Board of Education Committee on Adenoids and Enlarged Tonsils.

There are, of course, other bony changes caused by rickets, but such signs as enlarged radial epiphysis and beaded ribs are incapable of standardisation and were not included in the "standard signs."

It is no easy matter to distinguish between pathological stigmata and physiological variations, but the standardisation of the five signs described in detail above is an attempt to do so.

These five signs were those used in the investigations among elementary school children in the County of Durham. Careful records were made of 2,676 children. When two or more of the five signs were present, or where one sign was present in a very marked degree, the child was regarded as presenting rachitic stigmata. No claim was made that the child was, at the time of examination, suffering from active rickets; but it is maintained that the presence of these signs postulates that at some time during its life it had so suffered.

The 2,676 children were approximately equally distributed in the 5-, 8- and 12-year age groups. Of the total number 83% (2,221) were found to be definitely rickety according to the standard adopted; 11% (294) to be slightly rickety—what might fairly be described as a “rickets query” group; and 6% (161) to be free from rickets.

These figures are at variance with the routine returns of school medical officers throughout the country, but it must be remembered that the standards used for measurement of the defects are also at variance and that detailed comparison between the two sets of figures would be of no value.

In the course of this investigation attempts were made to ascertain the extent, if any, of the correlation between the presence of rickets as determined by the standards adopted and some other defects such as enlarged tonsils and adenoids or dental decay. There appeared to be a correlation between them, but one great difficulty was to find any considerable number of children without defects to form a normal group. The disadvantage of clinical study of this nature carried out in the field by a single individual is that there may operate a personal factor the weighting effect of which cannot be judged with accuracy. Clinical observations of the kind and scope of the County Durham investigation are peculiarly liable to this error, for it is not possible to use, in extensive work of this nature, instruments of precision or to have the findings checked by other observers.

The personal opinion and clinical standards of the observer should, whenever possible, be checked by comparison with the findings of other observers using comparable standards.

For the reasons stated in the preceding paragraphs, the full report of the Durham investigation was not published, though extracts from it appeared in *The Medical Officer* on July the 4th and 11th, 1925.

Certain other observers, notably Dr. Lawson Dick, had found very high percentages of children

to show evidence of rickets, but so far as could be ascertained there have been no series of investigations in which strictly comparable standards of clinical signs have been used.

Even if the element of error due to the personal factor in the Durham investigation had been high, the conclusion must, nevertheless, be drawn that the incidence of rachitic bony changes among children was considerable.

An opportunity for a check upon this work occurred when the Board of Education set up a special committee to consider the causation of adenoids and enlarged tonsils. Early in 1927 this Committee considered the report of the investigations in Durham County, and it was decided to carry out an investigation on somewhat similar lines.

It was decided to have medical examinations undertaken of approximately 1,500 five-year-old elementary school children attending schools in the London County Council area. The Committee accepted the five standard signs of rickets previously described, but decided also to include certain other bony abnormalities. The additional signs were: enlargement of the radial epiphysis, spinal curvature, bowing of the tibia and beading of the ribs. These added signs were, later, found to be of less frequent occurrence than the five standard signs,

and, further, they proved to be less capable of standardisation.

The Committee was fortunate in securing the cordial co-operation of the London County Council. This local authority placed at the Committee's disposal the services of three experienced medical officers who carried out the medical examinations to determine the incidence of rachitic stigmata in accordance with the nine signs decided upon. The Council also lent the services of its chief aurist who undertook the examinations of nose and throat. Each of the three medical officers conducted his examinations independently, so that the final results were of three groups of children in the examination of which there had been no collaboration.

The children examined were unselected five-year-old children of varying social conditions attending 33 different schools. The total number of children examined was 1,638.

THE FINDINGS

The grouped findings of the three medical officers are shown in Table 7.

If it is accepted that the signs noted in the course of the medical examination of the children are in fact indicative of rickets, the conclusion must be faced that some degree of rickets existed in 87·5%

TABLE 7
Number of Children Examined 1,638

12.5%	were free from any sign of rickets
21.4%	showed 1 sign of rickets
25.7%	„ 2 signs of rickets
28.9%	„ 3 „ „
9.8%	„ 4 „ „
1.7%	„ 5 or more signs of rickets

of the children examined. It also appears that 66.1% showed two or more signs.

From these data it must be deduced that two out of every three children examined showed evidence of rickets and, as rickets is a condition due to certain dietary deficiencies, it follows that these children must have suffered, at some time or another, from an incomplete diet.

Through the courtesy of the London County Council the Committee was able to avail itself of the services of Dr. C. G. Wells, the chief aurist to the Council. Dr. Wells examined the naso-pharynx of 1,364 of the 1,638 children. He actually made a digital examination of the naso-pharynx of each child and so was able, by actual palpation, to determine whether adenoid tissue was, or was not, present. 174 of the 1,361 children examined by him had previously been operated on for the removal of

adenoids. Of the remainder the naso-pharynx was found by him to be normal in only 237 (17·4%). Tonsillar enlargement, with or without sepsis but without adenoids, was found in 193 (14·2%) and tonsillar sepsis without enlargement and without adenoids in 10 (0·7%). Adenoids in some degree, with or without tonsillar enlargement, was present in 747 (54·9%). Including those whose adenoids had been removed, the proportion of unselected five-year-old children in whom adenoids were, or had been, present was 67·7%.

82·6% of the 1,361 children presented some abnormality of the naso-pharynx.

Sir George Newman's annual report on *The Health of the School Child* for 1933 gives 9·89% of elementary school children as possessing an abnormal naso-pharynx. The two sets of figures cannot be compared, as it is obvious that the standards of assessment are at variance. During routine medical inspection it is neither practical nor desirable to make a digital examination of the posterior naso-pharynx of each child examined. Minor degrees of adenoids can be diagnosed by this method only.

The figures quoted above relative to tonsils and adenoids indicate once more that meticulous examination by a specialist brings to light a higher incidence of defect than is ascertained during the course of a general examination.

TABLE 8

	33 L.C.C. Schools	Durham C.C. Schools
Free from all signs ..	12.5 %	6.0 %
One sign only ..	21.4 %	11.0 %
Two or more signs ..	66.1 %	83.0 %
	100.0 %	100.0 %

The conclusion of the Board of Education Committee was that the findings suggested some association between rickets and the presence of adenoids and enlarged tonsils. The findings did not prove a very close relationship between these conditions. That must be admitted; yet this failure does not negative the value of the investigation. This carefully planned and conducted series of medical examinations showed that normality in unselected five-year-old elementary school children is incomparably rarer than had previously been suspected. In this respect the results did confirm the findings among children in the County of Durham. This is shown in the following paragraphs.

INCIDENCE OF THE SIGNS OF RICKETS

The 33 schools in the London County Council area in which the 1,638 children were examined varied according to their general level in the social

scale. The proportion of children free from signs of rickets was 22·3% in the best group of schools and 8·7% in the worst group; the proportion showing two or more signs was 52·3% in the best and 75·4% in the worst group. In the worst group of schools the proportions approximated those in the County of Durham.

Rickets occurring in a young girl child may alter the shape of the pelvic bones and cause difficult labours when the girl has children of her own. There are other causes of alteration in the shape of the pelvic bones but rickets is the commonest.

The normal adult female pelvis should attain certain measurements. Obstetricians regard variations from the normal measurements as indicative of narrowing or misshape of the bony pelvic canal. As a rough guide to normality it is generally accepted that there should be one inch difference between the interspinous and intercrystal diameters. If the difference between these two measurements is less than one inch, some narrowing of the pelvis may be suspected. In 1935 one hundred women attending consecutively an ante-natal centre in Stockton-on-Tees showed measurements as follows: 59% showed the normal ratio between the two measurements mentioned above; 36% had a difference of three-quarters of an inch between the two instead of one inch, and 5% had only half an inch

difference. The presumption is that the abnormal measurements indicated some degree of pelvic abnormality and that rickets in childhood was the causal factor.

INCIDENCE OF DENTAL DISEASE

Only 4.7% of the London County Council school children examined by Mrs. Mellanby were found to be free from caries; 11.7% had slight caries and extensive caries was present in 62.8%. In the Durham investigation the percentage of children of five years of age recorded as being without obvious dental caries was 13.6%. This percentage may be less than the true proportion, for in the Durham investigation a probe and dental mirror were not used in making the dental examinations, and it is probable that some mouths were recorded as being free from carious teeth that in fact were not.

This picture of the incidence of certain defects among unselected elementary school children reveals a condition of affairs which is disquieting. It is probable that similar groups of children in other parts of the country do not differ greatly from those examined in the County of Durham and in London.

Both rickets and dental decay are conditions attributed to nutritional causes.

It may be argued that the defects discovered are slight in degree and are not of great importance.

Perhaps this is so, but they do constitute deviations from the normal and, as such, should not occur. Though not in themselves, perhaps, of very great moment, they may indirectly be the cause of illness, suffering, loss of efficiency and death. Dental decay does give rise to much ill health, its treatment and the provision of artificial dentures is expensive, and the condition is preventable and should be prevented.

Septic tonsils and an abnormal naso-pharynx may cause various troubles. Otitis media, acute mastoid infection, rheumatism and permanent heart disease are major disabilities which may have their origin in naso-pharyngeal conditions. Sore throats, rhinitis, sinus infection may be less serious results of the same conditions, but they are responsible for much illness and loss of working time with reduction of earnings. Rickets even of a minor degree may cause some narrowing of the pelvis which, in the case of girls, may cause difficulties in childbirth and be responsible for some maternal morbidity and for a considerable number of stillbirths and infant deaths occurring within a few days of birth. Such results are serious. Rickets can be, and should be, prevented.

Whether the defects are slight or serious, they do represent pathological findings and are departures from normal. They may, and often do, disqualify

individuals for certain vocations, such as the police force, the armed forces of the Crown, certain grades of railway work, and of the mercantile marine, aviation, professional singing and dancing, the ranks of the theatrical chorus, the cinema, civil and municipal service, where medical examination is a condition of appointment, and so on.

Life Insurance Companies are well aware of the dangers to longevity of even minor defects, and the unfortunate possessors of defects may be required to pay a weighted premium in order to be accepted for insurance.

It is not suggested that the nation should attempt to raise a race of supermen, but it is desirable, and not beyond the bounds of possibility, to bring up a generation of individuals who are free from those pathological conditions which, even with our present knowledge, are actually preventable.

Regret must again be expressed that we possess no means, at present, of assessing the physical condition of the population at ages other than the school age. We do possess some knowledge and information of the people at other ages, but such knowledge is incomplete.

CHAPTER VI

CHILD WELFARE RECORDS

TH**ERE** **H**A**V**E **B**E**E**N, unfortunately, too few attempts to analyse and make use of the extensive data available in the records of the child welfare service.

There must be hundreds of thousands of child welfare record cards throughout the country, containing information as to the physical condition of infants and young children, which have been laboriously compiled by the medical officers in charge of the centres, of which regrettably little collective use has, so far, been made.

An attempt was made to use some of the material collected in the child welfare centres in Stockton-on-Tees, and the results of the investigation were published in Volume 32, No. 4 of *The Journal of Hygiene*.

One of us (G. C. M. M'G.) carries out his own child welfare work in the Borough of Stockton-on-Tees, and the recording of conditions and defects found in infants and young children attending the child welfare centres during 1928 was done by him personally upon the children's record cards. The

expert statistical knowledge of Dr. P. L. McKinlay became available and it was therefore possible to publish the results of the analysis of 741 schedule cards of children who had attended the Stockton-on-Tees centres for a year or more.

It appeared probable that an examination of the data recorded upon a group of the Stockton-on-Tees record cards might throw some light on the action and interaction of certain factors upon the health and welfare of children. It had previously become obvious, by a study of the returns of school medical officers, that the majority of defects discovered in the five-year-old group of elementary school entrants had originated prior to the children's entry into school. By tracing these defects backwards to their beginnings it was hoped to determine the ages at which they, severally, originated and, perhaps, to determine the factors responsible for their creation.

The material investigated consisted of the record cards of 741 children who had attended the child welfare centres in Stockton-on-Tees for a period of one year or more, together with the health visitors' cards of the same group of children. The health visitors' cards contained valuable information relative to the home conditions of the children.

This number (741) fell considerably short of the number of children who had attended the various

centres in the period of time during which the 741 cards had been in process of compilation. The selection of certain cards and the rejection of others may raise the objection that the population under review was not a true sample of those children attending the centres but was a weighted population. This objection may be partly met by explaining that the actual selection of cards was based upon the continuity and length of the record appearing upon them. Many cards were rejected because of gross irregularity of attendance, and some because the data recorded upon them were insufficient to give a consecutive record of the child's progress and physical condition. The children whose cards were selected for analysis had been under observation at the centres for at least twelve months. In many cases the period was double, or more than double, that length of time. The number (741) is sufficiently large to provide a representative sample.

It will be appreciated by anyone who has had practical experience of medical work at child welfare centres that continual and detailed examination and note-taking at crowded centres are attended with considerable difficulty; as a result of such practical difficulties the available records fall below the standard which, to a statistician, appears desirable.

Routine medical inspection of elementary school

children has revealed that between 17% and 20% of children of school age, throughout the country, suffer from physical defects so serious in nature as to require medical treatment at the time they are discovered. It has previously been shown in this volume that this percentage is an understatement of the actual incidence of defects. Every school medical officer knows that a much higher percentage of children present defects than those recorded as requiring immediate medical treatment, and that, though many additional defects are observed, they are referred for observation and not for immediate treatment. It must also be kept in mind that careful examination by experts will bring to light a still higher incidence of defects. Most of the minor defects recorded as requiring "observation" are of the same nature as those which are referred for treatment, though less in degree.

By tracing obvious and serious defects backwards through smaller and smaller degrees of the same to normality, some estimate may be formed of the average age of onset of these defects; and also, by correlating the beginnings of these conditions with other factors, their causation and the means of preventing them may be elucidated.

The major (and minor) physical defects prevalent in elementary school children are, broadly speaking, equally present at all periods of elementary school

life. There is no very marked increase in the frequency of their occurrence in older, as compared with younger, children. The reasonable inference is, therefore, that the bulk of those defects have their origin during the pre-school years, i.e. before five years of age. The school medical service is frequently referred to as a great agent in preventive medicine. So it is. Yet this service is mainly concerned with the detection and correction of established pathological conditions. So great is the total mass of pathology with which the school medical officer has to cope that a child presenting no obvious signs of abnormality can receive but little attention from him. The school medical service is concerned largely with actual deviations from normality, with their correction and with the avoidance of the physical disabilities which may result from such abnormalities.

The child welfare service differs from the school medical service in that it deals primarily with the normal child, and its main object is the maintenance of normality and not the correction of the abnormal. Very few of the conditions found in five-year-old children exist at birth.

There has been a tendency to measure the success of the child welfare service by the decline in the infant mortality rate, though the influence of the one upon the other is not clear. Many of the claims

made for the service in this connection are incapable of support by statistical proof. A much more valuable scale by which to assess the value of the work done for children in the pre-school years is to be found in the returns of the school medical officer when he records the physical condition of five-year-old children on their admission to school.

The 741 children attending the Stockton-on-Tees child welfare centres, whose records formed the subject of the inquiry previously referred to, varied in age from a few months over one year to four years of age. The majority fell, at the time of analysis, between one and three years of age. All had been under fairly regular observation for at least a year.

The whole of the data recorded upon the medical record cards had been observed and entered by one observer, so that it is not possible entirely to exclude the factor of personal bias. Efforts were made to reduce this factor to the minimum, but it is only fair to note that it may have exerted some (unknown) influence upon the recorded facts. The health visitors' cards, which were analysed in conjunction with the medical record cards, had been filled in by the five health visitors in the employment of the local authority.

Particular attention was directed to certain conditions in these young children.

TABLE 9

Incidence of conditions noted in 741 Stockton-on-Tees children attending child welfare centres in the Borough during 1928:

Condition	Incidence
1. Diet unsatisfactory	49·8%
2. Bone conditions (rickety stigmata)	43·0%
3. Pharyngeal conditions (tonsils, etc.) ..	17·0%
4. Dental decay	27·0%
5. Squint	3·8%
6. Anæmia	31·2%
7. Diarrhœa	39·0%
8. Bronchitis	36·7%
9. Otorrhœa	11·5%

The subjoined table shows the incidence of certain conditions noted among the 741 children whose records were under review. It must be remembered that the records were made in 1928. There is reason to suppose that the incidence of defects may not be the same in a similar group of children to-day, for from clinical experience (not statistical) it appears that the incidence of certain defects, and particularly of rachitic stigmata, has decreased. This generalisation also applies to anæmia, diarrhœa, bronchitis and dental decay.

Certain explanatory notes are necessary if the

significance of the above incidences is to be appreciated. The percentages in this table indicate that the particular condition had been noted *at some time or other* on the record cards. Some of the conditions noted are more or less permanent, others merely transitory. Under the latter category are placed diarrhoea, bronchitis, and much of the otorrhœa which was noted in very young children. For the purposes of this inquiry very little loss would have ensued from the deletion of diarrhoea and bronchitis, which may have been present for a day or two only during a period of observation exceeding a year. It is obvious that a single mild attack of diarrhoea of a day or two's duration is of much less importance in assessing the physical condition of a young child than is the presence of a permanent defect such as dental decay or squint.

NOTES ON THE STANDARDS USED FOR THE
DETERMINATION OF THE PRESENCE OF
DEFECTS

(1) *Diet Unsatisfactory*

The diet was considered to be unsatisfactory, and was recorded as such, when the mother admitted having deviated from the standard diet taught at the Stockton-on-Tees child welfare

centres, or when the health visitor who visited the home recorded such deviations upon her record card. The commonest error (according to local teaching) was an excess of carbohydrate food (usually cereals) in the child's diet. It appeared that such excesses were associated with a corresponding decreased intake of fresh foods, and particularly of proteins of animal origin. Very strong emphasis is laid, in the local child welfare centres, on the importance of avoiding such excess. Each child attending the centres is provided with a small card, showing its weight and having a space for instructions on feeding. All instructions as to the food-stuffs to be given are written by hand in black ink, and a list of items to be avoided is added in red ink:

It is probable that the quantity of carbohydrate and cereals which, according to local teaching, is considered excessive, may, by many child welfare medical officers, be thought to lie within the bounds of reasonableness. Experience in Stockton-on-Tees before the year 1928 showed that reduction in the quantity of carbohydrate foods and increase in the protein fat and vegetable constituents of young children's diets were followed by a reduction of rickets and other defects attributable to sub-optimal nutrition. This early experience has been amply confirmed in succeeding years.

Sir George Newman, in his annual report on The State of the Public Health for the year 1933, states on page 163:

“Starvation is no doubt extremely rare in England, yet although the population is as a whole obviously much better nourished than in former days, there can be no doubt that many people suffer by starving the body of certain constituents of a wholesome and efficient dietary. The evidence of this is indisputable, and can be witnessed by all men who see cases of under-nourishment, of anæmia, of rickets, or of dental decay. The availability and cheapness of certain articles of food is, of course, partly responsible for their wide consumption as compared with proteins, animal fat, and fresh fruit and vegetables. The effects of inadequate ingestion of single food constituents would depend on the rôle played by the particular food factor in the living body. The individual constituents which are most likely, so far as our knowledge goes, to be deficient in human diets in this country are protein of high biological value, calcium, iron and the essential vitamins A and D.”

A young and rapidly growing infant requires a high proportion of animal protein and of minerals and vitamins in its diet.

The feeding of infants and young children is taught in Stockton-on-Tees on the following lines :

Breast-feeding is urged in all cases when possible. When not possible entirely, supplementary feeds of a good dried milk are given. When breast-feeding is impossible, reliance is placed on dried milk. In most cases cod liver oil emulsion is given in addition. The use of fruit juice—such as orange or tomato—is recommended.

At six months of age, whether the infant is breast- or bottle-fed, additional items are added to the dietary. The additions are recommended to be given immediately before the milk feed when the child is hungry. At six months the additions are : brown bread and butter (not soaked bread); soups, stews, broth, bone marrow, egg, liver, vegetables (potato, carrot, turnip, cabbage, cauliflower, brussels sprouts, etc.), fruit (orange, stewed apple, tomato, etc.). It is quite unnecessary to sieve the vegetables. The mother is strongly advised not to give rusks, biscuits, white bread, arrowroot, rice, sago, tapioca, groats, porridge, or any of the breakfast preparations of cereals.

At 8 months fish is added. The fish may be of almost any kind, and it does not appear to matter in what way it is cooked.

At 9 to 10 months of age meat, bacon and cheese are added.

Neither digestive disturbance nor diarrhoea follows this regime. At all times the mothers are impressed with the importance of avoiding carbohydrate foods and with the need of the child for proteins, animal fats, vegetables and fruits.

The numerous articles of diet are advised to be given immediately before the milk feed, whether this be breast-milk or milk from a feeding-bottle. In this way it follows that as the child takes more and more of the solids, it takes less and less of the liquid second course, and weaning occurs very gradually and slowly without fuss or disturbance. The same diet is advised during the following years.

In 1928 less emphasis was laid upon the advisability of the early consumption of bone marrow and liver than subsequently. It appears, from clinical observation, that the earlier administration of these two articles has reduced the incidence of anæmia very considerably.

(2) *Bone Conditions*

Under this heading were included changes in the chest-wall, bow-legs and knock-knees.

The omission of parietal and frontal bossing requires some explanation. The observer's clinical experience is that parietal bossing occurs very early in life. It is present in a very high percentage of infants brought to the centres for the first time

when they are about four weeks old. No case has been observed in which the condition developed after this age in an infant who did not present it on its first attendance at the centres. It appears probable that pre-natal influences play a considerable (if not the whole) part in the production of this sign. The child welfare records were not primarily made for the purpose of the inquiry here described, and, after the above observation had been made on the age of incidence of the condition, during a period which preceded the accumulation of the data used here, further notes on the point were discontinued. Had records been kept of the occurrence of parietal bossing among the 741 children who were the subject of this inquiry, and had its occurrence been merged among the other bony conditions which were attributable to faulty feeding after birth, the issue would, almost certainly, have been confused in certain respects, and particularly when determining the extent of the correlation between the presence of rachitic phenomena and dietetic conditions.

The recording of the presence of frontal bossing had also been discontinued before the series of cards used in this particular investigation was begun, owing to pressure of work at the centres. For the same reason certain interesting observations on flat foot, dental hypoplasia and high-arched palate had,

of necessity, to be discontinued. Radiological examination of the bones was not made. The clinical methods of examination for the various bony changes recorded were made in the manner described in the Second Interim Report of the Board of Education Committee on Adenoids and Enlarged Tonsils.

(3) *Pharyngeal Conditions*

These refer mainly to enlarged tonsils. It was recognised that a diagnosis of adenoids without a digital examination of the posterior naso-pharynx was not justified.

(4) *Dental Decay*

Diagnosed by ordinary visual inspection without the aid of a probe and mirror.

(5) *Squint*

Diagnosed by inspection only.

(6) *Anæmia*

Judged by the appearance of the skin and mucous membranes.

(7 and 8) *Diarrhæa and Bronchitis*

The occurrence of these conditions had to be judged, in most cases, from the mothers' statements.

(9) *Otorrhæa*

In almost all cases the discharge was actually seen.

COMPARISON OF INCIDENCE OF DEFECTS
AMONG SCHOOL CHILDREN

It is of interest to compare the incidence of certain of the conditions set out in Table 9 with that found throughout the country among elementary school children, as shown in the Annual Report of the Chief Medical Officer to the Board of Education for the year 1928.

(1) *Dietetic conditions* cannot be compared, as no records on lines similar to those used in Stockton-on-Tees are made by school medical officers.

(2) *Bone conditions* cannot be compared, for the 4.3% of bony phenomena recorded by school medical officers under the heading of "Rickets" refer only to conditions of such severity as cause some degree of crippling and deformity. (But see Interim Report of Board of Education Committee on Adenoids and Enlarged Tonsils, extracts from which appear in an earlier chapter of this volume.)

(3) *Pharyngeal conditions*. The incidence 17.0% is much below that reported in school children (6.0%), but again reference should be made to the Interim Report referred to above.

(4) *Dental decay*. This, as would be expected, owing largely to the lower ages of the child welfare children, is much lower than is found among school children.

(5) *Squint*. 3·8% among the child welfare centre children as against 0·89% recorded among school children in 1928.

(6), (7) and (8). *Anæmia, diarrhæa and bronchitis*. The incidence of these conditions is not comparable.

(9) *Otorrhæa*. Among the 741 child welfare children otorrhœa had been present (in some cases for a few days only) in 11·5%. In the school the incidence was 0·54%.

This 0·54% probably consists of chronic cases only and does not include those who had had otorrhœa previously, but in whom there is no discharge at the time of examination. In connection with these figures it is interesting to refer to the investigations into auditory acuity carried out by Dr. G. P. Crowden of the London School of Hygiene and Tropical Medicine. (*Proceedings of the Royal Society of Medicine*, February 1934. Vol. XXVII.)

This observer tested the hearing of numbers of children in public elementary schools in or near London by means of a special apparatus. In the Borough of Hornsey 2,608 children were tested by means of the special audiometer. The percentage failing in the test (the standard of failure being a loss of 9 or more units of hearing in one or both ears) was 6·8.

During 1933 testing by an audiometer was undertaken in some of the London schools, and of 2,083

children tested 13·7% showed a hearing loss of 9 or more units. The corresponding figure for ears instead of children was 11·0%. It is interesting to compare this figure with the 11·5% of otorrhœa noted as having occurred among the Stockton-on-Tees child welfare children. It is curious that these percentages correspond so closely. Many cases of otorrhœa occurring in young children are of short duration, but it is possible that some permanent damage to auditory acuity may result.

AGE INCIDENCE OF THE DEFECTS DISCOVERED

One of the objects of the inquiry was to determine, if possible, the ages at which various defects first made their appearance. The determination of the actual dates when certain defects first occur is far from simple. The date when they are first noticed and recorded is not necessarily the same as the date of origin. Attendance at child welfare centres is voluntary and not compulsory, and some children attend irregularly, so that there may be irregular time gaps between attendances. Careful and conscientious mothers bring children to the centres at regular intervals, but even conscientious parents tend to show less regular attendance as the child increases in age. Some women are inclined to omit periodical visits if their children appear healthy,

while others fail to attend because of illness in the child or in another member of the family, or because of a subsequent pregnancy or other domestic cause.

A result of irregularities in attendance is that the age at which any particular condition was first noticed and recorded is not necessarily the age at which it began. It was not possible, from the available data, to assess this time lag.

A table was prepared which showed the time of first observation of defects at each age period of 12 weeks, from 1 week to 301 weeks. It is probable that these periods are sufficiently large to cover the time lag referred to above.

From the table the following deductions are drawn:

Faults in Diet

Examination of this table showed that the critical period for the incidence of dietetic errors was the six months preceding the child's first anniversary of its birth. That this should be the critical age is not surprising when it is remembered that it is during these months that the infant's diet changes over from fluid to solid foodstuffs.

Bone Conditions

The second year of life was the period when the largest number of bone defects was first noticed.

Pharyngeal Conditions

The period of life during which pharyngeal defects were most frequently detected was considerably later than the age of maximum incidence of bone defects. It is probable that the time lag between occurrence and detection may be, in pharyngeal conditions, greater than for other defects, for the examination of the buccal cavity cannot be carried out in very young children without distress, unless some slight degree of co-operation on the part of the child is accorded.

Dental Decay

It is obvious that dental decay need not be sought for during the first year, but there does occur in newly erupted incisors a condition of hypoplasia and deficiency of enamel which has, obviously, originated during the period before the tooth became visible.

Approximately 20 per cent of the cases of dental decay noted were found during the second year of life. With older children the time lag between occurrence and detection may be considerable.

Squint

Half the recorded cases of squint discovered were noted in the age period between eighteen months and three years.

Anæmia

The age period during which anæmia was commonly noted, approximated fairly closely to that in which the maximum incidence of dietetic errors was noted, but it also extended beyond this age.

Otorrhœa

The frequency of otorrhœa during the first year of life is a striking feature. The replies of the mothers to inquiries as to antecedent illnesses among members of the household suggest that influenza, sore throats and "colds" among older members of the family are liable to be followed in a few days or a week by otorrhœa in the infant. Measles and other exanthemata could almost always be excluded in the case of children under one year of age.

The duration of visible discharge from the ear in these infants was, in most cases, short. Discharge usually ceased within a fortnight, but in some cases recurred at intervals and in a few became chronic.




CORRELATION BETWEEN THE
OBSERVED CONDITIONS









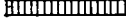















The principal object of the inquiry was to determine what, if any, correlation existed between the various physical conditions recorded, and also if any relationship were demonstrable between the

TABLE 10

Condition	Diet Satisfactory	Diet Unsatisfactory	Difference	Standard Deviation	Difference s.d.
Bone Defects	31·18	55·01	23·83	3·64	6·5
Pharyngeal Conditions	10·22	23·83	13·63	2·76	4·9
Dental Decay	17·47	36·59	19·12	3·26	5·9
Squint	1·34	6·23	4·89	1·40	3·5
Anæmia	21·51	40·92	19·41	3·40	5·7
Diarrhœa	39·52	38·48	-1·04	3·58	-0·3
Bronchitis	33·33	40·11	6·78	3·54	1·9
Otorrhœa	9·14	13·82	4·68	2·34	2·0

DIAGRAM 2 TABLE 10 EFFECT OF DIET ON PHYSICAL CONDITIONS

KEY . GROUP WITH SATISFACTORY DIET 
 GROUP WITH UNSATISFACTORY DIET 
 DIFFERENCE BETWEEN GROUPS 

BONE DEFECTS	DIFFERENCE
31% 	
55% 	24 
PHARYNGEAL CONDITIONS	
10% 	
24% 	14 
DENTAL DECAY	
18% 	
37% 	19 
SQUINT	
1% 	
6% 	5 
ANAEMIA	
22% 	
41% 	19 
DIARRHOEA	
40% 	-1 
39% 	
BRONCHITIS	
33% 	
40% 	7 
OTORRHOEA	
9% 	
14% 	5 

presence of these conditions, severally and collectively, and certain environmental factors.

Table 10 shows the correlation between unsatisfactory diet and the eight physical conditions recorded.

From a consideration of this table it appeared that there existed a substantial correlation between faults in diet and bone defects, pharyngeal conditions, dental decay, squint and anæmia. There was a very slight negative correlation between unsatisfactory diet and diarrhœa, but this was so trifling as to be without significance. At first glance this result may appear contrary to all reason, but it must be taken into account that the unsatisfactory diet here considered was not a mere temporary indiscretion but a deviation from certain standards. Bronchitis and unsatisfactory diet showed no significant correlation, and that between diet and otorrhœa was also within the bounds of fortuitous occurrence. One may say that there was substantial correlation between unsatisfactory diet and the group of defects not due to infection, but no correlation was evident with that group attributable to infection. (Diarrhœa in infants and young children is a common result of infection—rarely of dietetic errors.)

The original report contained tables which showed the correlation existing between the various

TABLE II

Condition	Correlation with	Difference S.D.	No Correlation with	Difference S.D.
<i>Unsatisfactory Diet</i>	Bone Defects ..	6.5	Diarrhoea ..	.. -0.3
	Pharyngeal conditions	4.9	Bronchitis ..	.. 1.9
	Dental Decay ..	5.9	Otorrhoea ..	.. 2.0
	Squint	3.5		
	Anæmia ..	5.7		
<i>Bone Defects</i> ..	Diet unsatisfactory..	6.5	Diarrhoea ..	.. -2.0
	Pharyngeal conditions	6.5	Bronchitis ..	.. 2.3
	Dental Decay ..	7.8	Otorrhoea ..	.. 0.3
	Squint	5.4		
	Anæmia	4.4		
<i>Dental Decay</i> ..	Diet unsatisfactory..	5.9	Diarrhoea ..	.. 1.7
	Bone Defects ..	7.8	Bronchitis ..	.. 1.1
	Pharyngeal conditions	5.1	Otorrhoea ..	.. -0.2
	Squint	3.7	Anæmia ..	.. 1.7
<i>Squint</i> ..	Diet unsatisfactory..	3.5	Pharyngeal conditions	2.2
	Bone Defects ..	5.4		

		Dental Decay	..	3·7	Anæmia	..	..	1·8
					Diarrhœa	..	..	-1·2
					Bronchitis	..	..	-0·9
					Otorrhœa	..	..	-0·1
<i>Anæmia</i>	..	Diet unsatisfactory	..	5·7	Pharyngeal conditions			-0·5
		Bone Defects	..	4·4	Dental Decay	..	..	1·7
					Bronchitis	..	..	0·7
					Otorrhœa	..	..	-0·1
					Diarrhœa	..	..	0·1
					Squint	..	..	1·8
<i>Diarrhœa</i>	}		..	—	Diet unsatisfactory			
<i>Bronchitis</i>			..	—	Bone Defects			
<i>Otorrhœa</i>			..	—	Squint			
			..	—	Anæmia			
					Dental Decay			
					Pharyngeal conditions			

defects. It is unnecessary to reproduce them in full here. These tables showed a substantial correlation between the presence of bone defects and pharyngeal conditions. Correlation of a very high degree (7·8) was shown between bone defects and dental decay; also a substantial relationship between bone defects and squint. The relationship between bone conditions and anæmia was also substantial. Diarrhœa, bronchitis and otorrhœa showed no definite correlations with bone defects.

The relationship between pharyngeal conditions and dental decay was substantial. Apart from squint, the differences in which may be significant, this was the only condition showing significant correlation with pharyngeal conditions. It was somewhat surprising that anæmia, bronchitis and otorrhœa presented no apparent relationship with the presence or absence of pharyngeal conditions.

The various relationships are readily apparent on glancing at the subjoined schema (pp. 100-101).

These findings are of interest in that they indicate the important rôle played by nutrition in the causation of the common permanent defects of childhood. It is a matter for regret that investigations planned on similar lines have not been carried out elsewhere. It is important that these findings should be corroborated or refuted.

The preceding data show a definite association

between dietetic errors and the incidence of certain physical deviations from the normal, and an inter-relation between the incidence of some of these physical deviations. Emphasis was, in an earlier page, placed upon the possibility of the operation of personal bias in recording the data upon the cards. Consideration of the influence of certain environmental factors upon the incidence of these defects is, fortunately, free from the possibility of influence by personal factors. The environmental data were extracted from the home visit cards of five health visitors, who were unaware that their records would be analysed as they have been in this investigation.

The information recorded on the health visitors' cards made it possible to take account of differences in size of family, of air space (defined as the number of rooms per person, and calculated without taking into account differences in age of the inmates), of the health and of the efficiency of the mother.

The average air space per person and size of family was calculated and correlated with respect to the nature of the feeding, the presence or absence of bone changes, pharyngeal conditions, etc. In the original paper, detailed tables were set out containing the actual figures showing the differences between the groups and the probable

errors. It is unnecessary to reproduce them here in detail.

It was quite clear, from consideration of the statistical data, that the differences were, in no individual instance, sufficient to justify one in attributing any significance to them.

So far as these results go, we are entitled to infer that overcrowding was no worse in those families where the child under observation was unsatisfactorily fed, or had rickets, or any of the remaining specified conditions and, consequently, that overcrowding was an unimportant factor in determining the incidence of these defects.

The influence of the size of the family was similarly considered, and gave similarly negative results. With the exception of anæmic children, who seemed, on the average, to belong to large size families, no substantial divergence among the several groups could be pointed out. The inference to be drawn was that size of family was not of much importance in determining the differences in incidence of the conditions under review.

It does seem clear from the above series of results that, of the factors examined in their relation to rickets and so on, the only one of substantial importance is difference in the manner of feeding. The absence of a definite association with overcrowding may surprise many people.

In the preceding pages an attempt has been made to determine which of several possible causes has the greatest association with the presence or absence of certain deviations from the physically normal. The evidence available pointed strongly to diet as the factor mainly responsible.

Records of the weights of the 734 children covered by the inquiry appeared on the charts. The number of recorded weighings for each child varied, but in some cases as many as fifty were recorded upon one chart. It was considered that it would be of value to correlate the variations in child weight with differences in dietetic and other factors, in order to show their interrelations with one another.

DIET

The weights of the children in the two groups previously made with respect to this factor (namely, those fed in a satisfactory and those fed in an unsatisfactory manner) were contrasted. The average weights of children in each of these two groups were calculated for each week of life up to the sixtieth. After that age the weighings were fewer and were spaced at greater time intervals, so that averages based upon them fluctuate and are, therefore, less reliable than those of the younger children.

The average weights of the two groups of children,

males and females separately, were shown in the original paper in graph form. Consideration of these data enabled the following conclusions to be drawn:

In the male sex, the weights of children in whom no deficiencies in the diet were recorded was, if anything, somewhat lower than those of the other group of children. The differences were not large, and the conclusion seemed justified that dietetic faults (as here understood) did not affect adversely the weights of the male children. In females during the first six months of life there was very little difference in the average weights of the two groups. From the age of six months onwards, however, the children whose feeding was considered satisfactory showed somewhat higher average weights. Taking the two sexes together it seemed reasonable to conclude that the differences in weights between the two groups were not significant.

Statistical examination of the relation of child weights to overcrowding, size of family, maternal health, and maternal efficiency showed that no one of these factors exerted any really significant influence on child weight, but there was some indication that maternal efficiency had a slight influence.

It would appear not unreasonable to conclude, from the evidence so far set out, that there exists

a very high incidence of partially unrecorded physical defects in our population and, further, that a dominant factor in the production of this state of affairs is nutritional in origin.

As will be shown in subsequent chapters, the principal cause of sub-optimal nutrition is poverty, which precludes the purchase of a diet adequate to promote normal growth and to maintain health.

Circumstances connected with the demolition of slum property in the Borough of Stockton-on-Tees and the rehousing of the displaced tenants provided an opportunity to assess the relative values of food intake and environment upon the vital statistics of certain groups of people. The results of the investigation into these matters are set out in the next chapter.

CHAPTER VII

POVERTY, NUTRITION AND THE PUBLIC HEALTH

IN 1927 an "unhealthy area" in the Borough of Stockton-on-Tees was demolished. The inhabitants of this area (710 in number) were rehoused on a self-contained municipal housing estate, which had been specially built for the purpose. It was realised at the time that a study of the subsequent progress of this population would be of interest and might be of value in elucidating some of the problems which were then being investigated by the authors. Arrangements were accordingly made to keep careful records of the vital statistics of this group of people.

The "unhealthy area" which was demolished, formed, originally, a portion of a much larger area. It was decided that the original area was too large to be dealt with under one scheme, and it was therefore divided into two portions. For convenience a line of division was decided upon which ran along a street called "Smithfield." The portion lying to the south of this line was known as "The Housewife

Lane Area," and that to the north of it as "The Riverside Area."

The Housewife Lane Area was dealt with under the usual procedure of an official representation followed by a public inquiry. The scheme was confirmed, after the public inquiry, by the Ministry of Health, and in the late autumn of 1927 the population, comprising 152 families and 710 individuals, was moved to the Mount Pleasant Estate. The portion of the original area which lay to the north of the boundary line running along Smithfield, and known as the Riverside Area, contained 289 families and 1,298 individuals. No official action under the Housing Acts was, at that time, taken in this area.

It will be seen that the conditions were very favourable for investigation. There was, in the first place, a population transferred from slum dwellings to a modern, self-contained housing estate, and kept intact without admixture with other populations. There was, further, a second population that continued to dwell in slum houses and served as a control.

Such favourable circumstances for human field research rarely occur.

In anticipation of action under the provisions of the Housing Acts, certain data as to death-rates, etc., had been collected for these populations for

the quinquennium 1923-1927, and these were of considerable value in making the investigation now to be described. *Crude death-rates* prior to transfer of the Housewife Lane Area population were as follows:—

TABLE 12

District	Crude Death-rate Quinquennium (1923-1927)
England and Wales	.. 12.00 per 1,000
Stockton-on-Tees ..	.. 13.96 „
Housewife Lane Area	.. 18.75 „
Riverside Area ..	.. 22.16 „

The crude death-rate for the Riverside Area for this period was, as shown above, higher than that for the Housewife Lane Area, and both these rates were considerably higher than for the Borough of Stockton-on-Tees and for the whole of England and Wales.

The succeeding quinquennium (1928-1932) showed certain changes in these rates. The crude death-rate for the Borough of Stockton-on-Tees for this five-year period was 13.28 per 1,000 of the town's population; that of the population transferred from the Housewife Lane Area to the Mount Pleasant Estate had increased from 18.75 to 26.71 per 1,000, while that of the Riverside Area population decreased from 22.16 to 20.45.

The very considerable increase in the crude

death-rate of the population which had been moved to the Mount Pleasant Estate obviously required careful investigation. It did not appear that the estate itself could be blamed for the higher mortality, for it possessed all the advantages of a carefully planned and well-built estate. The actual houses were soundly constructed and possessed up-to-date sanitary arrangements. Each house was fitted with a bath, an efficient kitchen range, a well-ventilated food store, wash boiler, and so on. No fault could be found with the estate as a whole or with the individual houses.

Crude death-rates of a population do not necessarily give a record which can be truly compared with those of other populations; for, unless the age and sex distributions of the individuals forming the population are similar, a wrong impression may be given. For instance, the normal death-rate in a home for aged persons would be preposterously high in a residential school for boys. In order that comparisons may be made it is necessary to calculate the "standard death-rates." The fact that the general census was taken in the year 1931 was fortunate, in that it enabled standardising factors to be calculated for the populations here under review. A special local census was also taken of the populations of the Mount Pleasant Estate and the Riverside Area.

When 'standardised' the quinquennial death-rates were:

TABLE 13

		Stockton-on-Tees	Housewife Lane	Riverside Area
1923-1927	..	12.32	22.91	26.10
			Mount Pleasant.	
1928-1932	..	12.07	33.55	22.78

EFFECTS OF STANDARDISATION

The effect of applying the standardising factor to the crude death-rate was to show that the fatality rate per 1,000 of the population on the Mount Pleasant Estate for the five-year period 1928-32, namely 33.53 per 1,000, was extraordinarily high. This rate represented an increase of 46.0% over the mean standardised rate for the same families in the previous quinquennium. Standardisation of the death-rates for the Borough of Stockton-on-Tees as a whole and for the Riverside Area showed a reduction in the second five-year period when compared with the first five-year period. It must be remembered that the population of the Riverside Area continued to dwell under slum conditions and that in the Housewife Lane Area people dwelt, during the second quinquennium, in environmental circumstances apparently approaching the ideal.

The population of the Mount Pleasant Estate contained a high proportion of young persons and consequently gave rise to the expectation of a low death-rate. Calculations based on the age and sex distribution of this group of people show that the "expected" mean death-rate for the five-year period 1928-32 would have been 8.12 per 1,000 of the population. Actually it amounted to 33.55. This constituted approximately a four-fold increase on a normal expected death-rate.

BIRTH-RATES AND INFANT MORTALITY

One curious fact in the vital statistics of the population transferred to the Mount Pleasant Estate was a considerable increase in the birth-rate during the quinquennium 1928-32 compared with the previous five-year period. This increase occurred during a period of general decline in the birth-rate.

This is shown in Table 14, p. 114.

This change in the birth-rate in this and certain other "closed" populations is at present the subject of study by the authors.

It may be stated here that the increase in the birth-rate was not consequent upon a higher marriage-rate, a larger proportion of first births, or an increase in the illegitimate birth-rate.

TABLE 14
Birth-rate per 1,000 Population

Mean	England and Wales	Stockton- on-Tees	Housewife Lane	Riverside
1923-27 ..	18.24	22.99	35.08	36.51
Mean			Mount Pleasant	
1928-32 ..	16.27*	21.29	44.25	32.02

*Mean of 4 years.

INFANT MORTALITY RATE

It is a matter of considerable interest that the very high birth-rate on the Mount Pleasant Estate was not accompanied by an increase in the infant mortality rate as compared with the rate for the previous five years when the population was living in the Housewife Lane Area and when the birth-rate was lower. The Mount Pleasant Infant mortality rate for 1928-32 was considerably higher than for England and Wales during the same period, and also than the rate for the Borough of Stockton-on-Tees, but it did show a substantial reduction on the mean rate for the Housewife Lane Area.

NEO-NATAL MORTALITY RATE

The neo-natal mortality rate, expressed as a percentage of the total infantile mortality rate, was, for the five-year period 1928-32, 26.3% for the Mount Pleasant Estate (neo-natal deaths are deaths

TABLE 15
 Infant Mortality Rate per 1,000 Live-Births

Mean	England and Wales	Stockton- on-Tees	Housewife Lane	Riverside
1923-27 ..	71.8	91.8	172.6	173.2
Mean			Mount Pleasant	
1928-32 ..	66.2*	78.8	117.8	134.0

*Mean of 4 years.

of infants occurring within four weeks of birth). This percentage of 26.3 on the Mount Pleasant Estate compares favourably with the percentage for England and Wales, which amounts to 31.5, and with 34.2 for the Borough of Stockton-on-Tees during the same period. These figures are of some interest, in that they indicate that the viability of infants born on the Mount Pleasant Estate is not less than that of infants born elsewhere. No part of the increase in the general death-rate of the Mount Pleasant population can be attributed to an increase in the infant mortality rate.

The still-birth-rate was high and amounted to 61 per 1,000 live-births on the Mount Pleasant Estate, compared with 40.5 per 1,000 for England and Wales.

PERCENTAGE OF DEATHS IN AGE - GROUPS

It might have been expected that the increased fatality rate of the group of persons living on the

Mount Pleasant Estate would have affected most severely individuals at the extremes of life. This expectation was not confirmed, for the increased fatality rate bore most heavily on those not at the extremes of life. There was a net increased death-rate of 9·2% among children from birth to 10 years of age; of 18·4% from 10 years of age to 65 years; and of 16·9 among those over 65 years old.

MORBIDITY AND SICKNESS RATES

It would have been of interest to have obtained figures as to the morbidity and sickness rates of the Mount Pleasant and Riverside populations and to have compared them with the rates from other areas, but it was not found possible to collect reliable figures.

Extracts were made from the School Medical Inspection Schedule Cards of 160 children on the Mount Pleasant Estate and of 241 children on the Riverside Area. These extracts showed that the incidence of defects as ordinarily recorded at routine medical inspection was, in the case of both the Mount Pleasant Estate and Riverside Area children, rather more than double the figure for the whole of the elementary school children in the Borough of Stockton-on-Tees.

Consideration of the data summarised in the

preceding pages made it appear reasonable to assume that the increase in the death-rate of the population of the Housewife Lane Area subsequent to its transfer to the Mount Pleasant Estate was a real increase and was beyond the probable extent of fortuitous variation. The data may further be assumed to be indicative of the operation among the Mount Pleasant population of some factor or factors inimical to the health of that population and, further, a factor or factors not operative among the population of the Riverside slum area.

It became a matter of importance to determine the nature of the factor or factors at work, and, consequently, investigations were made into several matters which, it was thought, might throw light upon the problem. Among those investigated were certain aspects of the economic circumstances of the two populations.

In both areas the families were poor, and the sums of money available for all purposes was so small as to bring them down to or below the poverty line.

RENTS

Housewife Lane Area

The population of the old Housewife Lane Area enjoyed the advantage of low rents. In 1927 the mean "all in" rent (i.e. rent and rates) in that

area was four shillings and eightpence (4s. 8d.) per family per week.

Riverside Area

In this area the rents paid in 1927 amounted to four shillings and sevenpence three farthings (4s. 7 $\frac{3}{4}$ d.), a sum almost identical with the amount paid in the Housewife Lane Area at the same date.

Mount Pleasant Estate, 1928-1932

In 1928 the mean rent on the Mount Pleasant Estate was nine shillings (9s. 0d.) per family per week. On their transfer to Mount Pleasant the commitments of the translated families were, by reason of higher rentals, increased by four shillings and fourpence (4s. 4d.) per week.

Riverside Area, 1932

In 1932 the weekly rent per family amounted to four shillings and tenpence three farthings (4s. 10 $\frac{3}{4}$ d.), an increase of threepence (3d.) per week over the sum paid in 1927.

These facts concerning rents led to the detailed investigation of family budgets. (Consideration of known facts had led to the exclusion of such extrinsic environmental factors as housing, drainage, overcrowding or insanitary factors from responsibility for the increased death-rate on the Mount Pleasant Estate.)

A large proportion of the families (over 90%) dwelling on the estate were, and in many instances had been for prolonged periods, unemployed. As a result of unemployment the weekly income available for all purposes was, among these families, strictly limited. Those families who continued to be domiciled in the Riverside Area were in a similar position, but they had the advantage over the Mount Pleasant population in that the average amount of money which had, weekly, to be earmarked for rent was approximately half what the Mount Pleasant Estate families had to pay.

It was therefore decided to make an attempt to determine the sums of money available for the purchase of food by groups of families in each area and to assess, if possible, the quantity and quality of the foodstuffs purchased. It appeared that the best method of obtaining the desired information was to collect complete family budgets from each area of as many families as possible.

The obtaining of accurate and complete weekly budgets was dependent upon the goodwill and co-operation of the heads of the families concerned. Complete weekly budgets were obtained from 28 families on the Mount Pleasant Estate and from 27 in the Riverside Area. These numbers represented 18% of the families living at Mount Pleasant and 10% of those in the Riverside Area.

TABLE 16
Analysis of Expenditure of Income extracted from Family Budgets

	Mount Pleasant Estate		Riverside Area	
	1 Employed families	2 Unemployed families	1 Employed families	2 Unemployed families
Number of families	.. 6	.. 31	.. 8	.. 22
Mean man value .. ..	.. 3·87%	.. 3·8%	.. 4·81%	.. 3·5%
Mean income per family .. ..	.. 47s. 1d.	.. 30s. 5d.	.. 44s. 7d.	.. 30s. 9d.
Rent as % of income .. ..	.. 20·5%	.. 31·3%	.. 14·7%	.. 20·8%
Mean of other necessary expenditure	30·7%	.. 29·3%	.. 32·6%	.. 33·3%
Food .. .. .	.. 42·9%	.. 36·7%	.. 46·3%	.. 43·3%
Food per man per week in pence	.. 62·6d.	.. 34·7d.	.. 51·5d.	.. 45·6d.

DIAGRAM 3 TABLE 16

ANALYSIS OF EXPENDITURE OF INCOME EXTRACTED FROM FAMILY BUDGETS

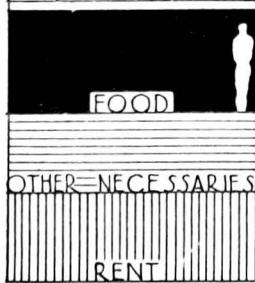
MT. PLEASANT ESTATE
EMPLOYED UNEMPLOYED

RIVERSIDE AREA
EMPLOYED UNEMPLOYED

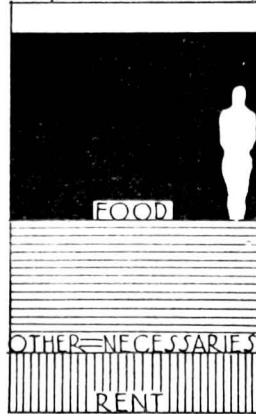
47/1_d INCOME PER FAMILY



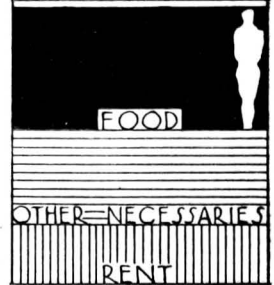
30/5_d INCOME PER FAMILY



44/7_d INCOME PER FAMILY



30/9_d INCOME PER FAMILY



NOTE : THE LITTLE FIGURE IS PROPORTIONATE IN HEIGHT TO FOOD AVAILABLE PER MAN PER WEEK

Analysis of these budgets yielded valuable information (*see* Table 16, p. 120).

It will be noted that this table contains an item, "other necessary expenditure." This is made up of several items of which one is "fuel and light." The amount of money spent on fuel and light varied, being, in the case of the unemployed budget families on Mount Pleasant, 3s. 1d. per week, and rising to 3s. 9½d. among the employed budget families in the Riverside Area.

The next item included in "other necessary expenditure" was that of clothing and insurances. It is the custom in the North, and probably elsewhere, for the poor to purchase clothing and footwear by paying into a "clothing club" a weekly sum of one, two or more shillings per week. Insurances are nearly all small "industrial policies" which are maintained even at the cost of great personal sacrifice in order that a sum of money may be available at death sufficient to cover funeral expenses. Further, medical attention for dependants is usually obtained by weekly payments to a doctor's club, but with the unemployed families membership of these medical clubs has, in many instances, lapsed.

Clothing and other club payments and insurances totalled 8s. 1d. with the employed budget families on Mount Pleasant and 7s. with the Riverside Area

employed families. The unemployed families had cut these amounts down to 4s. 3*d.* on Mount Pleasant and 4s. 2½*d.* in the Riverside Area.

A further item which swells the total of "other necessary expenditure" was entered under the heading of "Etceteras" and varied from 1s. 7*d.* per week among the Mount Pleasant unemployed to 2s. 10*d.* in the case of the Riverside employed. The items entered under this heading consist of small household necessities such as crockery, pans, needles, thread and soap.

It will be seen that the items of rent, fuel and light, clothing clubs and insurances, and so on, absorbed a very considerable proportion of the family income; and it will be noted that the unemployed families on the Mount Pleasant Estate spent on food only 2s. 10½*d.* per man per week. Further consideration will be given in a subsequent chapter to the proportions of income expended on these items.

FOOD PURCHASED BY THE BUDGET FAMILIES

The next step in the analysis of the budgets was to determine the quantities of the various food-stuffs purchased. Table 16 set out a summary of the quantities of first-class protein, total protein, fat and

TABLE 17

Food purchased per man in grammes and total calories

" Normal Diet "		Mount Pleasant		Riverside Area	
		Employed	Un- employed	Employed	Un- employed
First class Protein	37	29.5	22.78	34.1	28.1
Total Protein	100	87.4	65.79	82.9	74.6
Fat	100	117.4	73.72	101.1	85.2
Carbohydrates	400	573.5	410.8	496.3	452.6
Calories ..	3,000	4,277	2,696	3,223	2,910

TABLE 18

Quantities contained in Table 17 expressed as percentages of "Normal Diet," after deducting 10 per cent for wastage

	Mount Pleasant		Riverside Area	
	Employed	Unemployed	Employed	Unemployed
First class Protein	71.7%	55.4%	82.9%	68.3%
Total Protein ..	78.6%	59.2%	74.6%	67.1%
Fat	105.6%	66.3%	91.0%	76.7%
Carbohydrates ..	129.0%	92.0%	111.0%	102.0%
Calories	128.0%	80.0%	97.0%	87.0%

carbohydrates, and the number of calories calculated per "man value."

Some months after the publication of the report upon the Mount Pleasant Estate the British Medical Association appointed a Committee "To determine the minimum weekly expenditure on foodstuffs which must be incurred by families of varying size

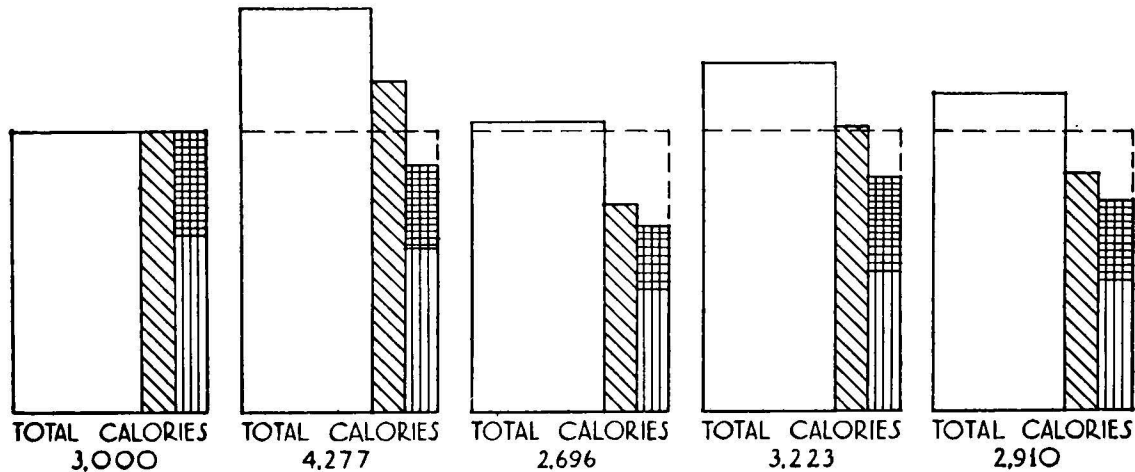
DIAGRAM 4 TABLE 17 FOOD PURCHASED PER MAN

KEY . FAT  1ST CLASS PROTEIN 
 CARBOHYDRATE  OTHER PROTEIN  TOTAL AREA IS PROPORTIONATE TO TOTAL CALORIES

NORMAL
DIET

MT. PLEASANT ESTATE
EMPLOYED UNEMPLOYED

RIVERSIDE AREA
EMPLOYED UNEMPLOYED



if health and working capacity are to be maintained, and to construct specimen diets." This Committee found it necessary to reconsider the question of a minimum "normal diet." After careful deliberation it decided that a total of 3,400 calories as purchased was necessary to maintain health and working capacity, and that the various constituents of the diet should be made up as follows: first-class protein 50 grammes, total protein 100 grammes, fat 100 grammes and carbohydrate 500 grammes.

Table 19 sets out the percentages of the various constituents of the diets purchased by the budget families in relation to the British Medical Association scale.

Whether these dietaries be judged in comparison with the "normal" or the British Medical Association minimum scale, the conclusion cannot be avoided that there existed a serious shortage in the quantity of first-class protein in all the groups of family budgets analysed, and that the greatest deficiency occurred in those groups of families who were unemployed and who had less money available for the purchase of food than those who were fortunate in being in work.

The two groups of unemployed families show a woeful shortage of all dietary constituents except carbohydrates. These shortages were more extreme in the group of families living upon the Mount

TABLE 19
Quantities purchased as percentages of the
British Medical Association Scale of
Minimum Diets

	Mount Pleasant		Riverside Area	
	Employed	Unemployed	Employed	Unemployed
First-class Protein	59·0%	45·5%	68·0%	56·0%
Total Protein	87·0%	65·0%	83·0%	74·0%
Fats	117·0%	73·0%	101·0%	85·0%
Carbohydrate	114·0%	82·0%	99·0%	90·0%
Calories	125·0%	79·0%	94·0%	85·0%

Pleasant Estate. The percentage of unemployed families on this estate was fully 90% and it was on this estate that the increase in the death-rate, was noted.

The increased death-rate cannot be attributed to any devastating epidemic, such as influenza, for in the five-year period during which the population of the estate was kept under observation there was no undue incidence of infectious disease. During this period increased deaths were attributable to measles, cancer, heart conditions, bronchitis, pneumonia, diarrhoea, nephritis and puerperal sepsis. The increase in the death-rate due to measles amounted to 1.15 per 1,000 of the population of the estate; in the case of cancer to 0.87; heart conditions to 2.59; bronchitis and pneumonia to 3.74. Increases due to other causes of death were trifling. In each case the percentage increases shown above are relative to the rates for the same population during the five-year period prior to its removal to the Mount Pleasant Estate.

It is of interest to record that, during its five-year occupancy of the Mount Pleasant Estate, the population suffered fewer deaths from whooping cough, diphtheria, cerebro-spinal meningitis, tuberculosis, appendicitis and congenital debility than in the previous five years.

A point to be remembered is that the deficiencies

in the diets cannot be attributed to temporary causes but that, owing to prolonged unemployment, the deprivations were, in the majority of cases, of long standing. By "long standing" is meant a period of two or more years.

It is difficult to come to any other conclusion than that the increased mortality was associated with the dietary deficiencies.

The findings of the investigation discussed in this chapter were included in a paper entitled "Poverty, Nutrition and the Public Health," which was read by one of the authors (G. C. M. M'G.) before the Section of Epidemiology and State Medicine of the Royal Society of Medicine on February 24th, 1933. The paper was published in full in the April number of the *Proceedings* of that Society in the same year.

This inquiry is of peculiar interest in that it was of a nature and scope which precluded the influence of personal bias. It is a matter for regret that no similar inquiry elsewhere has yet been undertaken. Certain inquiries into the vital statistics of Municipal Housing Estates have, it is true, been published, but they were planned on different lines, and so cannot, unfortunately, be used for purposes of comparison.

CHAPTER VIII

A NEWCASTLE INVESTIGATION

THE CITY OF NEWCASTLE-UPON-TYNE is a large industrial city in the North-East of England. It has been severely hit by the industrial depression, and unemployment has reached a high figure.

There exists in that city an ancient medical charity known as the Newcastle-upon-Tyne Dispensary, which has a long and honourable record in the medical history of the North of England. This organisation publishes an annual report, and in that for the year 1931 the following statement appeared :
“... the Committee are gravely concerned about the great increase in poverty, sickness and malnutrition amongst the poorest classes in the City.”

Dr. J. C. Charles, Medical Officer of Health to the City of Newcastle-upon-Tyne, drew the attention of the City Corporation to this statement, and as a result the Corporation charged Dr. J. C. Spence, M.D., F.R.C.P., with the responsibility of conducting an independent inquiry into the health and nutrition of certain children in the city.

Dr. Spence's report was published in the Annual

Report of the Medical Officer of Health of the City of Newcastle-upon-Tyne for the Year 1933, together with certain comments upon it by Dr. J. C. Charles, the Medical Officer of Health.

Dr. Charles says: "The authors of the Annual Reports of the Newcastle Dispensary have rarely been content with a formal statistical statement of the activities of the charity. From time to time, in a few words of incisive comment, they have drawn attention to the unenviable circumstances under which its clients live, or have indicated the injurious effects of disease upon its patients." Dr. Charles goes on to quote the statement about the great increase in poverty, sickness and malnutrition amongst the poorest classes in the city, which had appeared in the Annual Report of the Dispensary. He continues: "A pronouncement so serious could not be denied full investigation and inquiry."

Dr. Spence's investigation, limited though it was in extent, was nevertheless truly directed.

The first and main conclusion of the investigation carried out by Dr. Spence was, to quote his own words, "... at least 36·0% of the children from the poor districts of the city which I have examined were unhealthy or physically unfit, and as a result of this they appeared mal-nourished."

Dr. Spence, in his report, states that the scope of the investigation was necessarily limited, but he

was satisfied that its results gave a fair and accurate indication of the state of health of the children from the poor districts of the city, for it dealt with matters concerning which there are adequate normal standards and controls for comparison.

The investigation consisted of the clinical examination of representative samples of groups of children. Dr. Spence states that the groups of children were chosen for examination in a manner which gave fair samples of the families of the labouring and artisan classes of the city. Care was taken to exclude any children who were known recently to have had serious illnesses. 125 children were examined, all between the ages of one and five years of age. The parents of 105 were unemployed.

A peculiarly valuable feature of the report is that, for purposes of contrast and comparison, records were collected of the heights and weights and illnesses of 124 children of better-class families. These were children of parents engaged in professions or in commerce, living under good conditions in the residential districts of the city. For purposes of distinction this group of children was referred to in the report as the "Professional Families Class." The other group, consisting of children of poor parents, was referred to as the "City Children."

The following data are extracted from the report:

WEIGHT

The children were weighed to the nearest ounce, either naked or clad in one thin undergarment. The weights were plotted on squared paper with the normal zone of weights for age marked thereon. This graphic method reveals how wide is the variation in weight of children at any given age, and how misleading it may be to assess the condition of an individual by a comparison of his weight with an expected "average" standard.

The zone of normal weight was constituted by using the following figures :

TABLE 20

At 12 months	At 24 months	At 36 months	At 48 months	At 60 months
Upper limit of normality				
21lbs.	28lbs.	33lbs.	37lbs.	41lbs.
Lower limit of normality				
19lbs.	25lbs.	29lbs.	33lbs.	36lbs.

Within the "normal zone" fall most of the "normal weight" lines in common use. The zone was wide enough to be used for both sexes.

The advantages of using a zone instead of a line to measure "normality" in weight are obvious.

Expressed in percentages the weights of the "City

Children" and of the "Professional Families Class" were:

TABLE 21

	% above normal zone	% within normal zone	% below normal zone
Professional classes (124 children)	48·4	38·7	12·9
City children (125 children)	11·2	33·6	55·2

From these records it is evident that the Professional classes children are, age for age, heavier than the City children.

HEIGHT

For recording graphically the heights of the two groups of children a "normal height" zone was plotted. The results obtained were:

TABLE 22

	% above normal zone	% within normal zone	% below normal zone
Professional classes	25·0	70·2	4·8
City children	1·7	51·3	47·0

From this it appears that the children of the Professional classes have a decided advantage in height, as in weight, over the City children.

RICKETS

From the city group of children 103 were examined for the presence of active rickets by means of X-rays. Five children were thus shown to have active rickets. In sixteen other children there was X-ray evidence of slight bony changes, suggesting recent rickets of a mild degree, which had reached the healing stage, but these could not be classified as cases of active rickets.

With regard to the diagnosis of rickets by means of X-ray examination of the bones, Dr. Spence makes a very important statement. His statement is here quoted *in extenso*, for it may provide the key towards reconciliation of the many divergent statements which have, from time to time, appeared as to the incidence of rickets among children in this country.

Dr. Spence says: "The results of this part of the investigation can be summarised by saying that of 103 children examined, 5 had active rickets, and that the remainder were free from the condition. The bone changes seen in the X-rays of the five children with (active) rickets were all of the same advanced degree, with a minimal healing reaction. The evidence of the X-rays revealed a fact which may be of great significance, and demands further investigation, namely, that there was no graduation

TABLE
HÆMOGLOBIN

	90/85	84/80	79/75
Professional classes children			
% in each group ..	4%	44%	36%
City children			
% in each group ..	—	7%	12%

of results between the five cases of advanced rickets on the one hand and the complete absence of active rickets on the other.”

This paragraph is of considerable importance for it indicates that X-rays may be able to determine only the presence of *active rickets*. Such method of examination might not, for instance (in the absence of gross deformity), have confirmed the presence of rickets as diagnosed by the clinical standards accepted by the Board of Education Committee on Adenoids and Enlarged Tonsils if such X-ray examination had been carried out at the time the clinical examination was made. It is contended that minor degrees of bony deformity are definable by clinical examination; they do not necessarily connote active rickets, but they do indicate that, at some earlier period, rickets had been active.

23

PERCENTAGES

74/70	69/65	64/60	59/55	54/50
16%	—	—	—	—
36%	23%	10%	8%	4%

ANÆMIA

A healthy and well-nourished child has a hæmoglobin index between 85 and 75%. Estimation of the hæmoglobin index was made in 25 of the Professional classes children and in 121 of the City children. The results are shown in Table 23.

If the hæmoglobin index below which a child should not fall is assumed to be 75, it appears from the data contained in Table 23 that only 16% of the Professional families children presented any degree of anæmia, and that only 19% of the City children were free from it.

The difference between the two groups is certainly striking. Even if a lower level (say 70%) of normality is accepted for the hæmoglobin index, the percentage of City children falling below that figure is disturbing. Reference to the work of Helen

MacKay will show that anæmia in young children is far from uncommon.

INCIDENCE OF ILLNESS

Records were made of the various illnesses through which the two groups of children had passed. These records showed that infections and other diseases were more frequent and occurred at an earlier age in the City group than in the Professional families group.

Amongst the 124 well-off children, 2 had suffered from pneumonia, 1 from pleurisy, and 2 others from chronic and recurrent cough, sufficient in degree to arouse the parents' anxiety and to need treatment.

Amongst the 125 City children, 17 had had pneumonia and, in addition, 32 were or had been affected by chronic or recurrent bronchitis. History of bronchial infection was, therefore, ten times as common among the poor children as among those who were well off. These figures do not take into account deaths from pulmonary conditions of children belonging to the families from which the two groups were drawn. It must be remembered that each group represented the survivors.

Only in 6 of the better-class children was a record obtained of an attack of measles. Amongst the poor children there was a history of measles in 46—a difference of nearly 1 to 8.

The housing conditions of the City group of children was inquired into. Dr. Spence came to the following conclusion:

“These results denote that there are children who can be brought up in a state of relatively good health in poor housing conditions, where no doubt the fault is compensated by good mother-craft, efficient housekeeping, and their good fortune in escaping serious illness at an early age. On the other hand, this examination of the housing conditions shows that there is a direct relationship between overcrowding and ill-health or nutrition. If serious illness and improper diet be accepted as the prime cause of these, the overcrowding in bad housing conditions must be looked upon as an important contributory factor, fostering as it does the chance of mass infection, and impairing the efficiency of the parents in their task of providing a proper and adequate diet for their children.”

Dr. Spence's final conclusion was that the main factors which promote and perpetuate the physical damage are probably:

(a) The housing conditions, which permit mass-infections of young children at susceptible ages.

(b) Improper and inadequate diet, which prevents satisfactory recovery from their illnesses.

He further states: “It is probable that these two factors are of equal importance; but I would

suggest that opinion on this matter should be reserved until a full inquiry, carried out by competent observers in a scientific manner, has studied the problem more closely."

Dr. Spence also states: "That, since the high incidence of apparent malnutrition is not found in the children of better-class families, it is due to preventable causes."

CHAPTER IX

THE MEANING OF MALNUTRITION

THE PRECEDING CHAPTERS have indicated some parts of the rôle played by nutrition in human health and human well-being. That the part it plays is an important one is becoming, year by year, more obvious. Apart from the Newcastle survey by Dr. Spence and the report of the National Service Medical Boards of the physical condition of recruits for the Army during the latter part of the Great War, the authors of this volume have been closely associated with all the investigations so far quoted or described in the earlier pages of this book. These investigations and observations, with numerous others on a smaller scale, together with personal experience each year of public health work, administrative and clinical, have forced the conclusion that three main factors are responsible for man's health or ill-health—normality or abnormality—nutrition, infection and external environmental factors. These three factors are here placed in what appears to be their order of relative importance.

This volume does not attempt to be a text-book

of the social implications of public health, but merely to record those experiences which have compelled recognition of the important part played by nutrition and poverty in the public health.

There has been, during recent years, much talk about nutrition and malnutrition. Much confusion, political feeling and not a little bitterness have been manifested by apparently opposed schools of thought on this subject. There are those who maintain that the incidence of malnutrition is trifling—others see it everywhere. One explanation of the apparently contradictory views expressed by men of science and able clinical observers is to be found in the loose and confused manner in which the word “malnutrition” has been used. This confusion is unfortunate, for it has given rise, in the public mind, to doubts as to the motives activating the savants.

The word “malnutrition” has, by many, been used in its narrow sense to indicate a bodily state resulting from an insufficient intake of food and characterised by loss of body weight. If the word “malnutrition” is used to connote this condition, then those who assert that malnutrition is rare are correct. Weight, *per se*, is however an imperfect indicator of nutritional status.

An interesting example of the fallacy of relying upon increase in weight to indicate improvement

in nutrition occurred in local clinical experience some little time ago. A number of marasmic and ill-thriving infants and young children were under treatment in hospital. A small girl between two and three years of age was admitted in a very debilitated condition. After about ten days of treatment her weight started to increase rapidly. At first it was presumed that she was responding to the dietetic treatment provided. During succeeding days her weight increased at an alarming rate and, finally, she was found to have developed œdema due to nephritis. Her increase in weight, instead of constituting a sign of improved health, was actually the first indication of the onset of a morbid condition superimposed upon that for which she had been admitted to hospital.

The word "malnutrition" is used by others in a different sense. These people use the word to signify deviations from normal bodily growth or function attributable to qualitative defects of diet rather than to insufficiency in the total of food eaten. If this latter interpretation of the word is accepted, it follows that a high percentage of the population of this country must be categorised as having been at one time or another the victims of "malnutrition."

If it be accepted that dental decay is, in its primary cause, attributable to certain dietetic

deficiencies and imbalance, and that this morbid condition of dental structure can be prevented by nutritional means, it follows unequivocally that all persons who have dental decay must, at some time, have suffered from malnutrition. The same reasoning applies to rickets and equally whether the rachitic bony changes are so gross as to cause crippling and serious deformity or are so slight as to require meticulous clinical search for their discovery.

Certain phenomena are easily capable of statistical proof. Others may also be capable of this form of proof, but the difficulties of collecting the data, of their standardisation and analysis, or of their separation from uncontrollable variables, may be so great as to render the prospects of obtaining that proof remote.

The assessment of the nutritional condition of an individual has not yet reached the stage of precision desirable for accurate statistical treatment. The personal factor of the examiner cannot yet be excluded. We have to deal with opinions and impressions rather than with scientific data capable of accurate determination. To this state of affairs may be attributed much of the confusion at present existing as to the true nutritional state of sections of the populace. It is not possible to compare or contrast many of the published statements as to the

extent of malnutrition, for but few of the observers give in detail the standards they have used in the assessment of normal or subnormal nutritional states.

The Ministry of Health published recently (1935) a "Report of An Inquiry into the Effects of Existing Economic Circumstances on the Health of the Community in the County Borough of Sunderland and Certain Districts of County Durham."

The two medical officers who conducted the inquiry (Dr. J. Pearse, C.B.E., M.D., of the Ministry of Health, and Dr. J. A. Glover, O.B.E., M.D., F.R.C.P., D.P.H., of the Board of Education) investigated, *inter alia*, the nutritional condition of certain sections of the community in the areas in which the inquiry was conducted.

Table 24 gives the findings as to nutrition, which are summarised on pages 41 and 42 of the official report.

These figures are of considerable interest in that they indicate that, *in the opinion of the two observers*, there existed at the time of the inquiry an appreciable number of individuals whose nutrition deviated from the normal. Unfortunately the two observers do not give detailed criteria of their methods of nutritional assessment. For this reason their findings cannot be compared or contrasted with the findings of other observers. Other examiners might have

TABLE 24

Summary of nutritional assessment of groups of persons in Sunderland and part of Durham County taken from the Report of an inquiry published by the Ministry of Health in 1932

	Sunderland			Co. Durham		
	N.N. %	S.N. %	M.N. %	N.N. %	S.N. %	M.N. %
700 Children at Welfare Centres ..	71·6	21·5	6·9	77·4	21·2	1·4
2,200 School Children	79·0	18·7	2·2	78·0	20·4	1·3
Adolescent Youths	71·2	25·1	3·7	77·5	19·5	3·0
Adolescent Girls	73·9	24·8	1·3	—	—	—
Ante-natal Women	73·0	20·0	7·0	77·0	23·0	nil
Mothers of Young Children ..	66·0	26·0	8·0	79·0	19·0	2·0

In the table, Normal Nutrition is indicated by N.N., Subnormal Nutrition by S.N., Malnutrition by M.N.

recorded a higher or a lower percentage as "normal."

The three influences of diet, infection and environment are so interwoven and complicated that it is a matter of extreme difficulty to assign to each its legitimate effect upon health. Field research work among human beings presents many difficulties which the research worker experimenting with animals may avoid. Working with small caged animals an investigator can control many of those variables that would interfere with the progress of his experiments. Much painstaking field work among human beings is invalidated by the operation of uncontrollable variable factors.

The accumulated evidence—statistical, clinical and observational—appears to warrant the conclusion that nutrition has, in the practice of clinical and State medicine, received less recognition than it deserves. There has been confusion between mean, or average, nutritional states and normal nutrition. It appears to the authors that "normal nutrition" is a great deal nearer to "optimum nutrition" than to "mean" or "average nutrition."

There are three influences at work—nutrition, infection and environment (heredity is not included here, for its influence has little to do with the actual *functioning* of the bodily mechanism). Each plays a

part in the life-history of the individual, and each is influenced, or can be influenced, by poverty or riches. The economic factor will be considered in some detail in later chapters of this book.

Children may, and in fact not infrequently do, grow up healthily in spite of a bad material environment. They may avoid clinical illnesses due to infections, though exposed to the infections; they may survive, undamaged, illnesses resulting from the invasion of their tissues by pathogenic microorganisms, but they cannot survive unscathed prolonged deprivations or deficiencies of certain essentials for normal nutrition. There is some evidence that individuals in a good state of nutrition are less severely damaged by many infectious processes than are those in a bad nutritional state. It is difficult to obtain unequivocal statistical proof of this statement, but there exists a considerable weight of evidence in its favour.

Bad environment must be taken seriously. It is not suggested that environmental factors do not play an important part in the deterioration of health of those subjected to them. But environment is not the only factor so operative, and possibly not the most important one. Most medical officers who served in France during the Great War were impressed by the healthiness of the troops who lived, often for long periods, under environmental

conditions which, even at their best, could only be described as unsatisfactory.

Some workers in the domain of public health, when faced with the present-day incidence of physical defects, point, with legitimate pride, to the improvement in the condition of the poorer classes during the past thirty or forty years. There has, unquestionably, been a great improvement, but perfection is not yet attained. It is merely begging the question to side-track a present evil by recounting a greater evil of days gone by. To strive for perfection is to advance some little way along the path of improvement. Each succeeding local civilisation has striven for improvement without always attaining it.

There appear to have been certain fairly-well-marked stages of development in the civilisation of mankind. These stages have not been chronologically consecutive or separate, but have progressed at different rates in various parts of the world. We still have, in remote parts of Australia, aborigines living under the conditions of the early Stone-age, and similar conditions exist in parts of the land lying within the Arctic circle.

The stages of human civilisation may be roughly divided as follows:

There was first, it may be presumed, the nomadic hunter, whose food-supply depended upon what he

could catch or find. Some of the aborigines of Australia still live in this fashion. They have no fixed dwelling-place and very little impedimenta beyond implements used in the chase. They are unable to store foodstuffs and, at times, suffer from a shortage of food. They eat no cereals, and their carbohydrate food consists of honey and small seeds collected in season by the women. Their diet consists largely of animal fats and proteins, together with a few roots and other vegetable products. There is some evidence to show that they are healthy (but often underfed), and under their natural methods of life do not suffer from rickets or dental decay.

Consideration of the dietary habits of those Esquimaux tribes who have not adopted civilised (*sic*) diets, indicates that there appears to be no limit to the proportions of animal protein and fat which the human being can eat over prolonged periods without physical injury, and, further, that carbohydrates are not an essential constituent of human dietaries. The dietetic experiences of Stefansson suggest that there is no physiological difference in these respects between "civilised" man and the Esquimaux. Information as to the physical condition of the Esquimaux is scanty, but rickets and dental decay seem to be non-existent among those tribes who have retained the native dietary.

The next stage in the process of man's "civilisation" appears to be that he domesticated animals—the cow, the goat, the sheep and the camel and, probably, the ancestors of the domestic fowl. In times of danger the family or tribe could move to places of safety and could take their domestic animals with them. Though, in this stage of development, still probably partially dependent upon wild animals for food, the pastoral tribe could depend upon its domesticated animals for milk, butter, cheese and also part of its meat supply. The rudiments of economics became part of tribal custom and it became taboo (or uneconomic) to kill for food the heifer calf or the bint. Fruits, roots and vegetable products formed part of the diet but the cereal fraction remained low. The nomadic Arab tribes still live (dietetically) in this phase of civilisation. This particular stage is usually termed the pastoral age.

Increasing local stability and security enabled peoples to settle permanently in certain districts and to till the ground. As the density of the population in any area increases man becomes more and more dependent upon the products of cultivation, and particularly upon those that are relatively non-perishable. In this way there develops a progressive dependence upon cereals. The transitional period between a purely pastoral epoch and that of intense

dependence upon cereals is usually long-drawn-out, but it was rapid in certain parts of England during the nineteenth century. Certain parts of Egypt contained, during some of the dynasties, a population so numerous that cereals had perforce to form a considerable proportion of the dietary. There is some evidence that dental decay was prevalent at that period in Egypt.

England provides an example of rapid change in the food habits of a nation. The middle period of the nineteenth century was marked by the rapid industrialisation of England. This process proceeded apace and the population rapidly outgrew its home-grown food supplies. The importation of food became necessary, and as cereals are not readily perishable they were imported in large quantities. Wheat had the further advantage of being cheap.

By the sixties and seventies of last century the cereal stage of England's civilisation was well established. The development of ships with accommodation for the cold storage of perishable foods—meat, fish, fruits, dairy produce, etc.—has somewhat relieved the situation, but the country appears to be passing into a period when sugar forms a considerable percentage of the national dietary.

A further change in the national dietary occurred when steam-power began to be widely used for driving flour-milling machinery. The supersession

of millstones by steel rollers made possible an increased fineness of milling, so that the white flour generally eaten to-day consists almost entirely of starch. Bread has lost much of its former mineral and vitamin content. This feature of modern dietetics may prove to be of great importance.

Now it is a curious fact that we have a far from complete knowledge of what constitutes the ideal dietary for mankind at various stages of his growth and maturity. We know that herbivorous animals are capable of reproducing, of attaining full growth, and of maintaining health on a purely vegetarian diet. We know that carnivoræ subsist satisfactorily on a diet derived almost, if not entirely, from animal tissues. We think that the ideal diet for human beings lies somewhere between these two extremes, but we do not know definitely and accurately the limits of variation in dietetic constituents with which the human body can cope without ill effect.

So far as present knowledge extends it seems certain that deficiencies of necessary constituents of a satisfactory diet are of much greater importance than excesses. Excessive quantities of particular substances appear to act harmfully largely because they crowd out other necessary constituents. When the amount of carbohydrate foodstuffs (starch and sugar) approach, as they sometimes do, two-thirds of the total food eaten per day, the necessary

minerals and vitamins must be almost entirely concentrated in the remaining third. If, as is probable, insufficient of these substances are contained in one-third of the daily intake of food, deficiency conditions result in the body. The white flour and the sugar are indirectly responsible for this state of affairs, not directly by any toxic effect inherent in them.

CHAPTER X

MINIMUM FOOD REQUIREMENTS

MANY AND VARYING OPINIONS have been expressed as to the minimum quantities of food necessary to maintain health in human beings.

For countless centuries, before arithmetical tables were compiled as a result of the examination of scientific data, mankind decided by the use of two of his senses the quality and quantity of the foodstuffs he should eat. These two senses were taste and appetite. So long as there was available a sufficiency of foodstuffs and adequate variety these two senses provided a sound guide to the maintenance of a satisfactory nutritional state. When there occurred a shortage of some particular item taste had to be subordinated to necessity, and man had to substitute what he could get for what his taste told him he needed. Taste constitutes the sensory indication of physiological needs. A surfeit of a particular food depresses the taste appreciation for that food, and deprivation of an item for a period may exalt the taste appreciation for that item into

a pica, for the satisfaction of which man will brave dangers and undergo hardships that he would ordinarily avoid. This latter statement is aptly illustrated by the continuation of the salt traffic under great difficulties on the north-eastern frontier of India.

Appetite constitutes man's measuring scale for quantity and has served as adequately as our grammes, ounces, and calories.

It is commonly assumed that these two senses have failed us amidst the complexities of our complicated civilisation. This supposition is only partly true, if at all, for the range of foods available is so often limited by purchasing power that free choice of food by taste is not commonly possible.

An interesting experiment carried out in the United States of America allowed free choice of foodstuffs to certain infants and young children for a period exceeding a year.

The unaided and unguided choice of foodstuffs by these children resulted in satisfactory nutrition.

Appetite has, similarly, become debased, not because it is no longer a physiological guide but because, the variety of foodstuffs being limited, man has sometimes to eat larger quantities than he needs in order to obtain a sufficiency of some particular constituent of food. The economical practice of spreading bread very thinly with butter necessitates

the consumption of a large amount of bread in order to obtain the requisite quantity of butter. Similarly the old Yorkshire habit of serving the Yorkshire pudding as a preliminary course was done with the object of reducing the appetite for meat which was a more expensive item in the menu than the pudding.

Taste and appetite still remain the only physiological guides we have to the nature and quantity of the foods we eat. Were sufficient quantity and quality always available they would still prove to be satisfactory guides. They still prove satisfactory guides to animals.

The fact has to be faced, however, that unlimited variety and quantity of foods are not usually available, or if available are not procurable by those whose purchasing power is limited. Catering has, nowadays, to be done for the many by the few. In former days the man procured the actual food; to-day the woman purchases it according to the amount of money available. It is therefore necessary that there should be some guide as to the quantities of the various food elements required.

The average housewife, by rule-of-thumb methods, knows approximately what foods to buy, and roughly in what quantities. Her limits are determined not so much by ignorance as by purchasing power. It is possible to teach what constitutes a

theoretically ideal dietary (if this teaching is needed, and of this there is some doubt), but the application of this knowledge is dependent upon purchasing power.

There is not, so far as we have been able to ascertain, any scientific confirmation of the oft-expressed opinion that hurried meals, or meals eaten at irregular intervals, or even badly-cooked meals, reduce the nutritional value of the foods consumed.

THE BRITISH MEDICAL ASSOCIATION
NUTRITION COMMITTEE

During 1932 realisation by the British public of the importance of satisfactory nutrition gave rise to anxiety whether, in the then state of trade depression, the unemployed and the poorer-paid workers were in fact suffering from malnutrition; and whether, if this were the case, the purchasing power of these people was sufficient to procure adequate food for themselves and their families. Divergent expressions of opinion on these and related matters had appeared in the Press.

The Council of the British Medical Association, realising the national importance of nutrition as a factor in the health of the populace, set up a special committee with the following terms of reference :

“ To determine the minimum weekly expenditure which must be incurred by families of varying

size if health and working capacity are to be maintained, and to construct specimen diets.”

One of the authors (G. C. M. M'G.) of this volume was invited to become a member of the committee and acted as its honorary secretary.

Though the terms of reference appeared to be, from their very conciseness, extremely simple and capable of facile discharge, a number of interconnected problems were of a complex nature. It was no part of the committee's duty to determine whether malnutrition was widespread or not among any section of the community, yet a knowledge of the actual facts would have been extremely useful. The committee did place on record the opinion that knowledge of the extent, or absence, of malnutrition among varied social groups would, if considered in conjunction with data as to the food intake of those groups, prove of great value and public interest.

The committee further placed on record its regret that there exists no satisfactory and accepted routine method by which the nutritional condition or state of an individual can be assessed, and by which the findings of different observers can be compared.

Before any attempt could be made to assess the actual cost of a diet “adequate to maintain health and working capacity,” it was necessary to define the nature of the essential constituents of a diet

which would fulfil the requirements, and, further, to agree upon the quantities necessary at varying ages.

The committee agreed upon the number of grams of protein, fat and carbohydrate, and the number of calories required by a "man" per day. It recognised that a diet in order to be satisfactory must contain many other constituents, particularly numerous minerals and several vitamins. It was not practicable (or even definitely possible) to assess the quantities of these substances. It was postulated that a diet containing the requisite quantities of protein, fat and carbohydrate and supplemented by fruits and vegetables would, if sufficiently varied, supply enough of the numerous substances needed for the satisfactory nutrition of the human body.

MAN-VALUES¹

It is obvious that a man requires a greater quantity of food per day than a child of, say, five years of age. The difficulty lies in determining the ratio. It must be realised that any figures agreed upon can only be in the nature of approximations, and must be interpreted as generalisations for any

¹ *Man-value.* In nutritional studies the food need of the adult male is taken as the measure of unity. A woman or a child requires only a certain fraction of the food necessary for an adult male. This fraction is known as the "man-value." For instance, a child of six to eight years of age requires six-tenths of the calories needed by an adult male, and its man-value is said to be 0.6.

particular age. The physical variations that exist between human beings of equal ages cannot be covered by any fixed scale of values; and, moreover, in the case of adults, the nature of their occupation may profoundly influence the individual's food needs. A fixed scale of quantities may be correctly applicable to people in the mass but not necessarily so to any one individual constituent of that mass.

A man of five feet in height, weighing nine stones, and employed in a sedentary occupation, can maintain health and working capacity on a lower food intake than is required by a man of six feet in height, weighing fourteen stones, who works as a navy.

THE MEASURE OF THE ENERGY VALUE OF FOODS

The energy value of a food is commonly expressed as the number of "calories" yielded by each gram of the food. The caloric value of different types of food varies. Thus one gram of protein yields 4.1 calories; one gram of fat yields 9.2 calories, and one gram of carbohydrate yields the same number of calories as the same weight of protein, namely 4.1. By means of these figures it is possible to assess the energy value, in terms of calories, of a mixed diet.

Calculations made by various workers in the field of nutrition differ somewhat as to the total number of calories required daily by the adult male of average stature, doing a moderate amount of work, but this has usually been assessed at or about 3,000. This figure cannot be considered as more than an approximate mean. Certain objections can be raised against this figure, such as that it makes no allowance for waste; that, though a mean, it is not necessarily the optimum quantity or that it is probably lower than the amount the average healthy and active man would instinctively take. Many of the data used by different investigators were based upon the quantities consumed by unskilled, poorly-paid and unemployed families during times of industrial depression.

From consideration of available information it appeared to the members of the British Medical Association Committee that 3,000 calories gross supply—that is, food as purchased—per “man” per day is adequate to maintain health and body-weight of the average man, provided that his energy output is trifling in amount—in other words, that he is leading a life of comparative idleness. The committee was doubtful whether 3,000 calories are sufficient to maintain “working capacity” if the work entails any considerable amount of muscular exertion.

After careful consideration the committee decided that 3,400 calories in the food as purchased is a safe figure for the daily requirements of a man of average stature leading a healthy life and in the habit of expending a moderate amount of muscular exertion. This figure, after allowing for wastage in the preparation, cooking and serving of the food should ensure that 3,000 calories are actually consumed.

Regard must always be given to the fact that the 3,400 calories gross can be in the nature of an approximation only. This figure is slightly lower than the "standard ration" of Army troops at home stations (1933) and is considerably lower than the standard ration supplied to Territorial soldiers during their annual Army training. It is considerably lower than the Active Service Field Ration. It is of interest to note that in the course of studies on the dietaries and working capacity of civil prisoners in Scotland, 3,700 calories per day were found necessary to enable prisoners doing moderately hard work to maintain health, weight and working capacity.

In 1925 the Medical Research Council issued a report upon the "Nutrition of Miners and their Families," in which it was stated: "We shall therefore assume that the daily net energy requirement of a coal-miner certainly does not exceed, and

probably falls a good deal short of, 3,500 calories. The probability is that the average daily net expenditure throughout the week, i.e. working days only, is about 3,100 calories." The report based the caloric requirements upon the assumption that the average work-output of a coal-miner during a shift of eight hours is of the order of 80,000 kilogram-metres, or 10,000 kilogram-metres per hour. Professor K. Neville Moss, O.B.E., M.Sc., criticised this report in an article, "The Food Requirements of Coal-miners" published in the *Transactions of the Institution of Mining Engineers*, 1924-25, Vol. LXVIII, pp. 370-376. This observer has recently carried out experiments to determine the energy output of coal-miners, and his conclusions are published in Vol. LXXXIX, Part 3 (pp. 132 *et seq.*), of the *Transactions of the Institution of Mining Engineers*, 1935. His experiments show that a "collier's work-output during a shift of 5½ hours available working-time (full shift in stall less snapping time) is at the rate of over 34,000 kilogram-metres per hour. Thus since the energy output per minute during walking to and from the coal face from the shaft bottom" (usually in a half or full stooping position) "is not likely to be less than when working in the stall, one can assume that the work-output of these colliers whilst below ground is about 240,000 kilogram-metres. This is three times greater than the figure

assumed by the signatories to the Medical Research Council report as the basis for determining the food requirements of a collier."

Professor Moss estimated as a result of his investigations that a collier will expend about 4,500 calories in energy per day of 24 hours. He states: "The average amount of food actually consumed by 60 colliers was found by me to be 4,711 calories (*Trans. Inst. Min. E.* 1923-24, LXVI, p. 285), and so this present investigation confirms my previous work."

In 1932 the Ministry of Health published a memorandum on "Diets in Poor Law Children's Homes," prepared by the Ministry's Advisory Committee on Nutrition. On pages 13 and 14 of that Report there appeared a table setting out in detail the total food required for 200 children of various ages for eight days. The table included such details as the estimated cost of the specified quantities of the various foodstuffs and the number of grams of protein, fat and carbohydrate. The cost per child per week was estimated at 4s. 6½d. (at the contract prices then ruling).

The daily average allowance per child was:

Protein, 76 grams. Animal protein, 42 grams.

Fat, 108 grams. Carbohydrate, 349 grams.

Daily average calories per child, 2,749.

The Report does not state the number of children at each age contained in the "200 children of varying ages," but it may be assumed that the ages ranged from 3 to 16 years (*see* page 3 of the Report).

If the sexes were equally divided, and there was an equal number of children at each age from 3 to 16 years, the mean man-value amounts to 0.75.

The quantities of protein, etc., recommended in the Report and quoted above were per child and not per unit man-value. As the mean man-value in the group of 200 children amounts to 0.75 the quantities per unit man-value were:

Protein	101 grams
Fat	144 "
Carbohydrate	465 "
Animal protein	53 "
Calories	3,663 "

The quantities are in excess of those suggested by the British Medical Association Nutrition Committee. It is, therefore, somewhat difficult to understand why the Ministry of Health's Committee objected to the British Medical Association Committee's scale as being too generous.

For the energy requirements of the population as a whole 3,400 calories gross per man-value per day (as purchased) appears to be a not unreasonable allowance. During the Great War, when rationing

of the population was in force in England, bread was not rationed, and anyone in need of calories additional to what were supplied by the rationed diet might supplement them with extra bread.

MAN-VALUE OF WOMEN AND CHILDREN

Common sense tells us that a small child requires less food (fewer calories) per day than a man, and, further, that the quantity requisite will vary according to the age of the child. The determination of the fraction of unity calories required by a child is not just a simple matter of multiplying the number of pounds of its body-weight by a fixed number of calories; for though an adult requires somewhere in the neighbourhood of 20 calories per day per pound of body-weight, a young infant needs about 50 calories per day per pound of its body-weight. The fraction of unity which represents a child's daily caloric requirements is known as its equivalent man-value.

The generally accepted scale of man-values is that composed by Cathcart and Murray. The British Medical Association Committee adopted this scale.

From this Table (25) the man-value of a family or other group of individuals can easily be calculated.

TABLE 25
Man-values at various ages. (B.M.A.)

Ages				Man-value	Calories required per day	
Adult male	..	..	..	1.00	3,400	
„ female	..	..	..	0.83	2,822	
Child	1 and under	2 years	..	0.30	1,020	
„	2	„	3	„	0.40	1,360
„	3	„	6	„	0.50	1,700
„	6	„	8	„	0.60	2,040
„	8	„	10	„	0.70	2,380
„	10	„	12	„	0.80	2,720
„	12	„	14	„	0.90	3,060
Old person	(65 or over)		..	0.75	2,550	

THE CONSTITUENTS OF A DIET

Having determined the number of calories, or the measure of energy units requisite to make up a satisfactory diet, the next step is to inquire as to the constituents of it. If the caloric requirements were all that had to be satisfied, the economics of nutrition would be extremely simple. The composition of a human dietary must follow certain well-known general principles. A satisfactory diet must contain protein, fat and carbohydrate in certain approximate proportions, and must, in addition, contain a sufficiency of minerals and vitamins. No single item of food meets all these requirements, and variety is,

therefore, necessary to assure a sufficiency of the numerous substances which the body requires. (Breast-milk does provide in one single foodstuff all the requisites for infant nutrition.)

PROTEIN, FAT AND CARBOHYDRATE

Physiologists agree that between 10 and 15 per cent of the total daily requirements should be derived from protein. Any smaller proportion appears to be insufficient to promote growth and tissue repair. It would appear, at first sight, a simple matter to supply this quantity of protein, but a complication is introduced by the fact that the nutritional or "biological" value of proteins varies according to their source. Proteins of animal origin—those contained in dairy produce, eggs, meat and fish—have a higher nutritional value, and can be more readily and completely assimilated and made use of in the body than the protein contained in vegetables—such as peas, beans, grain, roots, nuts.

There have been, and still are, wide differences of opinion as to the quantity of first-class protein—that is, protein derived from animal sources—required daily by the human body. The minimum requisite daily quantity has been assessed at 37 grams per day. This quantity is much less than that provided in the standard ration for Army troops in times of peace. The soldier receives 62·7

grams. Proportionately a child requires more first-class protein per day than an adult, for the child has to build up his body tissues—in other words, grow—and the building materials of human tissues are largely derived from first-class protein. The Nutrition Committee of the British Medical Association, after careful consideration, came to the conclusion that 50 grams of first-class protein per day is a safe quantity for ensuring the maintenance of health and working capacity of the average man.

When the Report of the British Medical Association Nutrition Committee was published much criticism was directed against the finding that the daily requirements in calories of the average man had been assessed at 3,400 instead of 3,000, but there was comparatively little comment, adverse or otherwise, on the raising of the daily quantity of first-class protein from 37 to 50 grams per day.

Table 26 shows the daily requirements of proteins, fat and carbohydrate decided upon by the British Medical Association Nutrition Committee as being the minimum requisite to maintain health and working capacity in the average man, together with the number of calories from each source.

The proportions of protein, fat and carbohydrate set out are those suitable for adults. In the case of breast-fed infants the proportions are somewhat different, for the ratio of calories in their

TABLE 26

Daily requirements of an adult male in calories, proteins, fat and carbohydrate.

Total calories required, 3,400 in food as purchased.

	Quantity	Percentage of total calories	Number of calories
First-class Protein ..	50 grams	6%	205
Vegetable „ ..	50 „	6%	205
Fat	100 „	27%	930
Carbohydrate ..	500 „	61%	2,050
Total	700 „	100%	3,390

diet derived from fat is considerably higher, and from carbohydrates somewhat lower. Also the whole of the protein they consume is first-class protein. It cannot be assumed that it is a correct physiological procedure to alter these ratios to the adult proportions immediately the infant is weaned. Experience of the feeding of infants and young children shows that satisfactory growth is most readily attained if this change is a gradual one, and is not completed until somewhere between the ages of 3 and 5. This factor has an all-important bearing upon the cost of feeding infants and young children.

TABLE 27

	Man-value calorie co- efficients	Cost per head per week (June 1933)				Mean cost co- efficients
		B.M.A. scale		Stockton scale		
		<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	
Adult males ..	1.00	5	11	5	0	1.00
Boy over 14 years ..	1.00	5	11	5	0	1.00
Adult females ..	0.83	4	11	4	2	0.83
Girl over 14 years ..	0.83	4	11	4	2	0.83
Child 12-14 years	0.9	5	4	4	6	0.90
" 10-12 "	0.8	4	9	4	0	0.80
" 8-10 "	0.7	4	2	3	7	0.71
" 6-8 "	0.6	3	7	3	0	0.60
" 3-6 "	0.5	3	5	3	0	0.59
" 2-3 "	0.4	3	1	2	10	0.54
" 1-2 "	0.3	2	8	2	6	0.57

The committee constructed a number of specimen diets and worked out the cost of them. Prices were based upon information obtained in various districts in England. As there were available particularly detailed costs of a wide range of food-stuffs collected over a period of two years in Stockton-on-Tees, and as these costs were, for a variety of reasons, somewhat lower than the mean of those collected elsewhere, a Table was inserted in the committee's Report showing the man-value-calorie-coefficients and cost-coefficients both for

Stockton-on-Tees and for the other districts from which food prices had been obtained, together with the mean cost-coefficients for various ages. (See Table 27.)

The food required by young children is, as shown in the foregoing Table, more expensive per calorie than that of an adult. Though a child may require only one-third of the calories needed by an adult the cost is approximately one-half, and not one-third, of the adult's diet.

The prices quoted in the British Medical Association Nutrition Report were those ruling in cheap markets during the summer of 1933. Local, seasonal and other factors cause fluctuations in the prices of many of the individual foodstuffs, and these should be taken into account when applying the data. The prices given for the items contained in the various diets were those at which they could be purchased by a careful and discriminating housewife.

The Ministry of Labour in its weekly *Gazette* publishes the retail prices of various foodstuffs. These prices represent an average for the country. Unfortunately the items of which the prices are quoted in the Ministry of Labour *Gazette* are much fewer than would be purchased weekly by the housewife, and the prices cannot, therefore, be used as a guide for detailed family budgeting. The prices ruling in the Ministry of Labour's *Gazette* are generally

TABLE 28

Diet No. 16. Designed for a family consisting of man, wife, and three children, aged 6 to 8 years, 10 to 12 years and 12 to 14 years. The man-value of this family is 4.13

1 Item	2 Quantity	3 Price, B.M.A. mean		4 Price, Stock- ton mean		5 Protein (grams)	6 Fat (grams)	7 Carbohydrates (grams)	8 Calories
		<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>				
Beef ..	3lbs.	1	6	1	6	255.9	250.5	—	3,378
Mutton ..	2 „	10		1	0	100.8	338.4	—	3,560
Minced Meat	1lb.	5		5		85.3	83.5	—	1,126
Bacon ..	1 „	6		5		46.7	245.8	—	2,478
Corned Beef..	2lbs.	1	0	1	0	238.4	169.6	—	2,556
Cheese ..	3 „	1	7½	1	6	349.8	476.4	42.3	6,033
Milk ..	14pts.	3	2½	3	2½	261.8	285.6	380.8	5,292
Kipper ..	1¼lbs.	6½		5		80.0	63.0	—	913
Butter ..	½lb.	5		4¾		0.4	188.2	—	1,751
Suet ..	¼ „	1½		1½		1.3	105.8	—	989
Lard ..	½ „	3		2½		—	226.8	—	2,109
Margarine ..	½ „	2		2		0.4	192.3	—	1,789

{ Flour (or)	24½lbs.	—	2 3½	1,122·1	178·8	8,391·2	40,070
{ Bread ..	39½ „	5 8½	—	(1,283·5)	(36·3)	(8,564·4)	(40,702)
Sugar ..	6½ „	1 2¾	1 2¼	—	—	2,948·4	12,090
Jam	1lb.	4½	4	1·4	—	314·8	1,296
Potatoes ..	10½lbs.	7½	4½	90·3	1·1	862·1	3,917
Peas (split) ..	1lb.	1½	1	92·1	3·2	285·8	1,579
Yeast	¼ „	—	2	—	—	—	—
Tea	½ „	6	5	—	—	—	—
Oatmeal ..	½ „	1½	1	27·0	19·5	158·7	943
Rice	1 „	2½	2	26·8	1·8	364·2	1,620
Treacle.. ..	¾ „	3½	3	5·5	—	203·8	858
Beans (butter)	½ „	1½	1	42·2	1·6	141·0	766
Barley	1 „	2	1¾	31·7	3·6	362·4	1,650
Fresh Fruit and Green Vegetables	—	2 6	2 6	—	—	—	500
Total weekly quantities ..	—	22 6½	18 5½	2,859·9	2,835·5	14,455·5	97,863
Daily quanti- ties per man	—	—	—	98·9	98·1	500	3,385

higher than those at which goods can be purchased if care be taken to seek out the cheap markets.

The specimen budgets included in the Report were 16 in number and were designed for families of various sizes and containing individuals of various ages. The dietaries contained no luxuries. The minimum quantities of a sufficient variety of food-stuffs to fulfil the requirements of an adequate and balanced diet were included, and there was little margin for error or for the exercise of individual tastes, likes and dislikes.

A specimen diet (No. 16 in the Report) is reproduced on pp. 174-175. It must be borne in mind that such items as milk, fruit and fresh vegetables are not, as some people seem to think, luxuries, but are in fact essential constituents of a satisfactory and adequate dietary.

The total first-class protein in the above diet amounts to 1,420·4 grams.

The daily first-class protein per man = 49·1 grams. Cost of food per man per week at Stockton-on-Tees mean prices = 53·6 pence, or at B.M.A. mean prices, 65·5 pence.

In attempting to fulfil the terms of reference, "To determine the minimum weekly expenditure on foodstuffs which must be incurred by families of varying size if health and working capacity are to be maintained, and to construct specimen diets,"

the committee endeavoured to formulate a workable interpretation of available data, proved experience, and the recommendations of authorities about the quantitative and qualitative requirements of children and adults.

It has long been recognised that it is necessary for purposes of comparison and for bulk estimation of food and rations to adopt some standard unit food requirement, such as the number of food calories and quantities of protein, fat and carbohydrate sufficient to supply the needs of a normal man of average stature, performing moderate muscular work. The individual and family dietaries have been compiled to give the required balance, variety, palatability, and roughage, and to ensure that adequate supplies of mineral salts and vitamins are present. Stress is laid on the adequate provision of milk for children, and on the invariable inclusion of dairy produce, fruits and green vegetables in the family diet in order to ensure a sufficiency of foodstuffs containing vitamins and mineral constituents.

Publication of the results of the medical examination of recruits during the Great War shocked British national complacency. As a sports-loving people the English had prided themselves on the possession of physical fitness; and when it was shown that only about one in three of the young

men was physically suitable for active war service there occurred a humbling of that pride.

There has been no opportunity since the War to review extensively the physical condition of our young adult population, but the data set out in the preceding chapters indicate that the adolescents and young children of to-day, who are the young adults of the near future, fall, in many instances, short of physical perfection. It must be admitted that many children of to-day are the victims of physical defects, and that these defects cannot but lower their efficiency and must, in some cases, shorten their lives.

The evidence that has been adduced indicates that suboptimal nutrition plays a predominatingly important part in the production of mass defects. Remedial treatment, medical or dental, may ameliorate the lot of many of those having defects but cannot make C₃ individuals A₁. The prevention of many of the stigmata of mass ill-health is theoretically and practically possible, for knowledge of the basal principles and of many details of nutritional science is now fairly comprehensive. The application of this knowledge is not within the power of hygienists, for the fundamental causes of suboptimal nutrition are to be found within the realm of economic circumstances. The dietician can advise as to dietary but cannot supply the

wherewithal to purchase the quantity and quality of foodstuffs recommended.

There is now available, as has been shown in the preceding pages, knowledge of the physical state of the younger portions of the population; there is, further, knowledge of the constituents, quantities and prices of satisfactory diets. The trouble is to apply this knowledge and to translate it into practical teaching for everyday life. Consider, for a moment, the problem of dental decay. This condition is preventable by dietetic means and, so far as we know, by no other means. Decayed teeth constitute a danger to health and, indirectly, may cause death. Dental treatment is expensive and, moreover, can never be curative. Though the cause and the methods of preventing decay of the teeth are known, little has been done to prevent this defect, for the simple reason that a diet adequate for the formation of perfect teeth is beyond the purchasing power of a high proportion of the public. The same general argument applies to rickets. The surgeon can correct the deformity of ill-shaped legs which were bent in childhood by this food deficiency disease, but he cannot restore a misshapen pelvis to normal and so remove one of the causes of maternal mortality and still-births.

The physical condition of our population is now less unsatisfactory than it was 30 years ago but,

whatever degree of improvement has taken place should not be allowed to blind us to the present state of affairs which, as has been shown, still remains unsatisfactory.

PART II

CHAPTER XI

FOOD AND FAMILY BUDGETS

THE STUDY of human, animal and vegetable life shows that, unless the intake of food is adequate in all respects, imperfect physical development must result, and the organism suffers structurally and functionally.

Malthus came to the conclusion that the human population of the world would rapidly outstrip the world's capacity for food production. This hypothesis has proved illusory; for production of food-stuffs suitable for human nutrition has not yet reached its limits, and the actual present-day production of some commodities is apparently in excess of consumption. The potential production capacity of food is, as yet, unknown, but examination of our present knowledge of the subject makes it appear not unreasonable to assume that, from the point of view of providing adequate food supplies for the present world population, no one need starve. One of the greatest problems facing mankind to-day is that of an abundance of food on the one hand and, on the other, of masses of people who are unable to

obtain a sufficiency of suitable nutriment to keep them in health. Methods of production, conservation, preservation, transport and distribution of all essential foodstuffs are adequate, or are capable of being made adequate, to bring within the physical reach of all a sufficiency of the requisite foods; but civilisation has, as yet, found no means, other than our present economic system, for the transfer of ownership from the producer who has too much, to the consumer who requires more than he has the purchasing power to acquire. The experiment which is being carried on in Russia to overcome this difficulty is of great interest and will, of necessity, be keenly watched by economists.

Study of world history, so far as it effects mankind, reveals that one of the major tasks which has faced all Governments throughout the ages is to secure adequate supplies of suitable foodstuffs for the community.

The headman of a small tribe in the early days of civilisation maintained his position as chief by his capacity (*a*) to lead his fighting men to victory over tribal enemies, and (*b*) to assure, for all the members of the community under his dominance, a sufficiency of food to maintain life and, if possible, health. As a matter of practical concern (*b*) probably ranked higher in public opinion and importance than (*a*), for sanguinary conflicts with other

tribes (though possibly productive of glory, loot and food) were not of everyday occurrence, while the continuance of the tribal food-supply was a matter of daily moment to each member of the community. Failure to procure sufficient food for the tribal needs was, frequently, the determining factor leading to hostilities.

Primitive communities were, from time to time, faced with a local shortage of food and, as transport facilities were inadequate to move surplus food from one district to another, the only alternative to famine was migration. Migration of a tribe from a district in which food-supplies were short to another in which there was a surplus could not be carried out without conflict with other tribes—either those on the route of migration or those already occupying the area in which it was proposed to settle, or probably both. These basal factors have been responsible for most of the great movements, invasions and settlements of the various branches of the human race and, incidentally, for most of the wars.

While tribes were still of small size they were mobile, and such movements as those indicated in the preceding paragraph could be carried out without much difficulty, provided that the opposition from other tribes could be overcome. During the early stages of civilisation these migrations were,

probably, part of the natural order of tribal life.

The passage of time and developments in civilisation brought about changes in community existence. During the pastoral stage of development the tribe, or large conglomeration of people, depended upon flesh and other products of domesticated animals. This stage of civilisation added greatly to the responsibilities of the headmen or whatever form of government was in charge of the community's interests. In order to safeguard the food-supplies it was necessary to defeat raids from other tribes or peoples, to secure adequate water and pasturage for the animals and to introduce taboos or laws to ensure that a sufficiency of stock should be allowed to breed in order to provide for the future a sufficiency of animals to meet the needs of the people. The maintenance of adequate food-supplies was still the most important function of government.

The march of civilisation brought with it more settled conditions, and the cultivation of cereal crops became an important factor in the provisioning of the populace. The cultivation of cereal crops in any particular locality is dependent upon certain natural phenomena such as rainfall, soil, sunshine, etc. Flood or drought might cause a total or partial failure of crops, and the natural and inevitable result was a shortage of food. Inadequacy of transport prevented local famine conditions from being

relieved by the carriage of food from one district to another and, unless the populace could move to a land of plenty, deaths from starvation occurred.

The possibility of the failure of crops and consequent famine greatly exercised the minds of those entrusted with the government of the land. Much public money was spent by the Egyptians and the Romans, for instance, on the erection and plenishing of national storehouses in which surplus grain from years of plenty could be stored for use during lean years. The provision of adequate supplies of food still remained a major preoccupation of governments, and had not yet become merely a question of the ability of the populace to pay for it.

The mechanical advances of the past hundred years have given to mankind the means of bulk transport of commodities, so that local shortage of food need no longer mean local famine. Transport no longer constitutes a check upon distribution. To-day the limiting factor in this direction is an economic one. Local purchasing power, not local shortage of food commodities, determines to-day the nutritional condition of the people. The cheapest, most easily preservable and transportable foodstuffs are cereals and sugar; in localities where purchasing capacity is low, carbohydrate foods occupy a disproportionate position in the dietary. It is unfortunate that, physiologically, man has not

advanced far beyond the pastoral food substances, and much of our present nutritional difficulty is due to this stubborn physiological fact.

The importance of this fact is not sufficiently realised. The attainment of normal growth and the maintenance of health are impossible if we continue to attempt to nourish an animal—man—on a preponderatingly carbohydrate diet when, physiologically, he is incapable of thriving on it.

Undernourishment may be due to a shortage of intake of total foods or to a deficiency of one constituent of a normal diet or more. The latter condition may be as important as the former. A very considerable proportion of the people of this country suffer from a shortage of some of the constituents of a satisfactory diet.

The investigations made in an attempt to determine the cause of the increased death-rate in the slum population rehoused in the Mount Pleasant Estate at Stockton-on-Tees brought to light the fact that many of the families included in that population were existing on diets which showed considerable quantitative and qualitative deficiencies. Analysis of the weekly budgets of these families indicated that such deficiencies as were shown to exist were involuntary, and that the overhead financial obligations of these people were such that they were attaining the maximum

weekly expenditure on foodstuffs permitted by their incomes.

Examined from the viewpoint of a dietician the food-supply of the Mount Pleasant families was woefully deficient but, after careful analysis of all relevant factors, it did not appear possible, except in a very small minority of families, to improve their food intake either in quantity or quality, unless purchasing power was increased.

Consideration of additional family budgets confirmed this view.

Families, whose total income is so low that they are unable to purchase a diet reasonable both in quantity and quality, do not deprive themselves of food in order to purchase other goods. Analysis of family budgets shows that the expenditure on items other than food is reduced to the lowest possible figure. From available evidence it may be inferred that as large a proportion as possible of the family income is spent on food. This applies to families who habitually obtain smaller quantities and less variety of food than are sufficient to satisfy their full bodily needs. The proportion of the general population which cannot or does not spend sufficient to obtain a fully satisfactory diet is much higher than is generally realised.

Subsequent chapters of this book set out the data on which the above conclusion is based, but, as a

preliminary, it may be here stated that families with low incomes have no option but to subsist on less than the minimum quantity and quality of foodstuffs necessary to promote normal growth and to maintain health and working capacity.

Sir John Boyd Orr, Director of the Rowett Institute of Animal Nutrition, Aberdeen, is reported as stating in the Chadwick Lecture, 1934:

“Recently a committee of the British Medical Association was appointed to work out the cheapest diet which would maintain health. They found that a bare ration which is on the verge of qualitative deficiency, and which provides for no variety, can be obtained at present prices for 4s. 10d. for a man for a week. It cannot be expected, of course, that an ordinary housewife could manage her food budget with the same skill as a committee of experts. Some margin would need to be allowed for ignorance and inefficiency. To allow for some variety and a margin of safety, 6s. would be a safer minimum.

“Inquiries into the amount of money available in the households of the poor have shown that in many instances the amount available for food falls below this level. Both in industrial and rural districts there have been found many families whose incomes are so low that after deducting fixed

charges for rent, fuel, etc., the amount left for the purchase of food is less than 4s. 10d. a week per man. Here again our information is inadequate. We do not know what proportion of the community is so poor that it is unable to purchase a diet which will maintain them in health. So far as the evidence goes, it suggests that people living at the economic level of the dole are living near or below the threshold of adequate nutrition. The number at this economic level must run to nearly 20% of the population, somewhere in the neighbourhood of ten millions.

“One may remark in passing, that at the same time as the committee of medical experts were working out the minimum diet on which health could be maintained, the agricultural experts were wrestling with the problem of the glut of food.”

Sir John Boyd Orr's estimate of ten million people in Great Britain living at or below the threshold of adequate nutrition is, as will be shown later, an underestimate.

A “poor” family cannot each week purchase what food is required for its members and devote the balance of income to other items. In actual fact it works the other way round. Each family has certain standing charges—rent, fuel and light, etc.—which must first be met. When they have been,

and not until then, the balance can be expended upon food. For the unemployed and lower-paid worker the overhead costs of living, apart from food, are largely beyond the power of the family to control.

Rent and other necessary expenditure make up a large proportion of the total expenditure of "poor" families. This was illustrated by Table 16, which is reproduced from "Poverty, Nutrition and the Public Health," in which, as previously explained, there were described investigations into the increased death-rate in a population moved from a slum area to a modern housing estate. Figure 16 shows these facts in diagrammatic form.

From these figures it is evident that in the employed families dwelling on the Mount Pleasant Estate 51·2% of their total income is claimed by rent and "other necessary expenditure." In unemployed families on the same estate the percentage expenditure under these two headings has risen to 60·6%. In the Riverside Area these percentages are, in the employed families, 47·3% and for the unemployed 54·1%. The amounts which these groups of families are able to spend on food are, in three out of four instances, well below the minimum considered necessary by the British Medical Association Nutrition Committee.

Unemployed and poorly-paid families make

strenuous endeavours to reduce expenditure on items other than food in order to have as much as possible for food purchase, but from Table 16, it will be seen that even those out-of-work families dwelling in slum conditions in the Riverside Area, where they had the advantage of low rents, were unable to reduce their overhead charges below 54·8 per cent of their income. As this sum cannot be reduced by them they must, of necessity, limit the amount spent on food.

The statement is frequently made that more advantageous spending of small incomes is possible and that much existing undernourishment is due to ignorance of marketing and of food values, combined with lack of skill in cooking. Careful analysis of family budgets shows that such statements are, to a very large extent, wide of the mark.

Attempts have been made in Stockton-on-Tees to gain some idea of how families at various income levels spend their money, and to determine at what income level there appears a balance of money, after paying overhead charges, sufficient to enable the British Medical Association minimum diet to be purchased. The method of investigation was to collect as many family budgets as possible and then to analyse them. The collection of accurate and detailed family budgets is far from easy. There exists a natural disinclination on the part of the

head of a family to disclose intimate domestic details to others, and this, added to a reasonable suspicion as to the motives behind the investigator and doubt as to the use which may be made of the information given, renders the collection of data a matter of difficulty.

The investigation covered a total of 141 employed families containing a total of 745 persons. Almost double this number of budgets were collected, but many were obviously incomplete or otherwise untrustworthy and were rejected, leaving 141 on which reliance could be placed.

It is realised that 141 budgets present but a small sample from which to make deductions; but this sample, though admittedly small, appeared from internal evidence to be fairly representative of the classes of people from whom they were collected.

The weekly expenditure of a family with a low or moderate income falls naturally under certain well-defined headings. The schedule used for the collection of information was accordingly prepared in such a form as to include these headings.

A specimen schedule form is set out on the opposite page, and this form was used in each case.

It will be noticed that the form does not include a heading or space for insertion of the amount spent on food. It is assumed that whatever balance of income there may be, after deducting the sum of

BUDGET INQUIRY SCHEDULE FORM

To ensure privacy please enclose this Form in the envelope provided.

Number of persons in house.....

Ages of males

Ages of females

Occupation

	£	s.	d.
Income			
Trades Unions, etc.			
Other deductions from wages			
Travelling expenses in connection with work			

Regular Weekly Expenditure.

	£	s.	d.
Rent			
Water			
Coal			
Coke			
Gas			
Electricity			
Insurance			
Doctor			
Household Utensils			
" Cleaning			
Clubs, clothing			
Other Clubs			
Hire purchase			
Contributions			
Any other regular expenditure			

Other information.

.....

.....

.....

the items in the schedule form from the total net income, is available for food. In actual fact it is improbable that the whole of such balance would be expended upon food. Small items of expenditure, such as newspapers, cigarettes and amusements, would normally be taken from the amount theoretically available for food. Individual tastes vary so much and habits of carefulness or extravagance are so purely personal that it was not found possible to assess what sum could or should be allotted for these little extravagances or amenities. The whole balance was therefore assessed as being "available for the purchase of food," though it is unlikely that it was all so spent.

The net incomes of the 141 families varied from 25s. to 80s. per week. In the course of the analysis of the budgets the families were arranged in groups according to income. Each group income was ten shillings per week in excess of the next lower group. The groups comprised:

Families	Per week
46 with a net income between	25s. and 35s.
40 " " " " "	35s. " 45s.
31 " " " " "	45s. " 55s.
17 " " " " "	55s. " 65s.
7 " " " " "	70s. " 80s.

It will be noted that the phrase "net income per week" is used. The gross income as shown on the

wages sheets at the workers' place of employment is higher than the amount shown here as net income. From the gross income calculated at so much an hour or so much a week certain statutory deductions are made. These deductions are Unemployment Insurance Contribution 10*d.* per week and National Health Insurance 10*d.* per week. These sums are deducted by the employer and the worker does not regard them as part of his wages, but when considering the spending power of a workman it is important that this differentiation between gross and net wage should be kept in mind. The deductions of 10*d.* and 10*d.* (1*s.* 8*d.*) do not necessarily represent the total deductions from his gross wage. The worker may authorise his employer to deduct additional weekly sums as contributions to hospitals, convalescent homes and other charitable or semi-charitable institutions. These sums vary much according to locality, trade, etc. In addition, a high proportion of workers pay voluntarily a weekly or fortnightly sum in the form of Trade Union subscription. The amount so paid varies with the Trade Union to which he belongs and usually with the amount he earns.

Travelling expenses to and from work constitute expenditure outside the ordinary domestic expenses. In the 141 Stockton-on-Tees families whose budgets are under review the mean average amount spent

weekly in journeying to and from work was as follows:

Group (1) 1s. 2½*d.*, Group (2) 10*d.*, Group (3) 1s. 4*d.*, Group (4) 1s. 4*d.*, Group (5) 1s. 3½*d.*

The "net income" consists therefore of the gross income less statutory and voluntary deductions and travelling expenses.

Table 29 shows for each group the gross and net incomes.

The mean net income per head of the families in each group is as follows:

Group	Mean net Income per Head per Week
(1)	.. 6s. 8¾ <i>d.</i>
(2)	.. 7s. 7 <i>d.</i>
(3)	.. 8s. 5½ <i>d.</i>
(4)	.. 12s. 4½ <i>d.</i>
(5)	.. 13s. 11¾ <i>d.</i>

On superficial consideration it may appear unreasonable to take as the basis of investigation the net income. A little thought will, however, make it clear that the net income, that is the amount of money available each week for domestic purposes, constitutes the true measure of the family's spending power. It is for this reason that the various percentages allocated to specific headings of expenditure in this investigation have been calculated on the net and not on the gross income. These net incomes represent a full week's work. Time lost

TABLE 29

Group		Gross Income			Total Deductions			Net Income		
		£	s.	d.				£	s.	d.
(1)	25s.-35s. per week	1	13	11½	2	9½	1	11	2	
(2)	35s.-45s. „	2	2	5½	2	5	2	0	0½	
(3)	45s.-55s. „	2	12	3½	2	11	2	9	4½	
(4)	55s.-65s. „	3	2	7½	2	11	2	19	8½	
(5)	70s.-80s. „	3	18	8	2	10½	3	15	9½	
							Mean	£2 11 2½		

through public holidays, bad weather, etc., means a reduction in the total yearly earnings. Odd days of idleness do not rank for unemployment benefit, and in the case of a man who earns £2 12s. per week a loss of seven non-consecutive days' work represents a reduction in his earnings of one shilling per week for the remaining 51 weeks of the year.

TRADE UNION SUBSCRIPTIONS

Trade Union subscriptions vary in different unions and also with the amount earned. Membership of a union is not compulsory but is usual. The sum of one shilling per week is not a high average amount to pay in Trade Union subscriptions and the varying levies which may accompany membership. This shilling has not been deducted from the gross income in Table 29, and in practice the net income would be usually less by one shilling than the sum shown.

The total number of persons in the 141 families is 745, the average number per family being 5·2.

Unemployment benefit (at levels current in July 1935) for a family consisting of husband, wife and three children is 32s. per week.

TRAVELLING EXPENSES

The worker who dwells within reasonable walking distance of his work is fortunate in that travelling

expenses do not constitute a drain upon his earnings. In the town of Stockton-on-Tees the drain from this source is light compared with that in larger towns* and in London. Among the 141 employed families whose financial circumstances are here under review the average amount spent on journeying to and from work by the wage-earner amounted to 1s. 2d. per week. Some men find it possible to cycle to and from work, but it must be remembered that the capital cost of the bicycle (probably bought on the hire-purchase system) constitutes, for a long time, a drain upon the family income.

It might be imagined that the distance from home to work is a matter within the control of the worker. This may be so in some areas but is certainly not so in all. The outskirts of our industrial towns are rapidly developing into municipal and private housing estates, and thousands of working-class families have been transferred from the centres of our towns and cities to the outskirts, but the works and factories have not (at any rate in the North of England) followed the workers to the neighbourhood of their new homes. For families displaced from insanitary dwellings by slum-clearance schemes the alternative accommodation offered by the Local Authority constitutes, usually, the only houses available. In theory it is possible for families to find alternative dwellings for themselves and to

refuse to occupy the new houses built for them by the Local Authority. Actually, in most instances, they have no alternative but to accept the provision officially made for them. Some families accept unwillingly, because they realise that their transfer to a suburb will add a sum, which may amount to half-a-crown a week, to their unavoidable expenditure. It is not uncommon to find people continuing to reside in unsatisfactory houses in the vicinity of their work rather than incur the additional expense of travelling costs from a suburb where housing conditions are vastly superior.

CHAPTER XII

FAMILY OVERHEADS

THE BUDGETS of the 141 employed families show the sums paid weekly in rent. The information under this heading is set out in Table 30.

This Table is of very considerable interest to the student of social conditions, for it indicates clearly the tendency of families to occupy better houses as their incomes increase. The knowledge of social conditions among the working-classes, gained by the authors during many years' work in the public-health service in industrial areas, has impressed this point upon them, and it is clearly seen how the tendency is emphasised among the small groups of unselected employed families comprising the material for this series of observations.

Housing accommodation is a necessity for every family. There has been, and there still exists, a shortage of houses suitable for occupation by the working-classes at rents within their capacity to pay. This fact has been recognised by successive post-war Parliaments, and several Acts of Parliament have made provision for the payment of

TABLE 30

Mean rent per week paid by groups of families having various incomes
and percentage of net income so spent

Group	Income	Mean Rent		% of Net Income
		s.	d.	
(1)	25s.-35s. per week	7	10½	25.27%
(2)	35s.-45s. "	9	2½	23.00%
(3)	45s.-55s. "	10	0	20.24%
(4)	55s.-65s. "	11	9½	19.98%
(5)	70s.-80s. "	15	3½	20.20%
	Means	10	10	21.73%

subsidies, or bonuses, for the building of approved types of houses.

It is possible to calculate the approximate cost of a minimum satisfactory diet, but it is much more difficult to perform a similar calculation for housing. In the first place it is difficult to set up a "standard" of adequate and satisfactory housing and, further, great fluctuations have occurred in building and loan costs during recent years. Added to these difficulties there are wide local differences in the cost of land for housing sites, in the additional items for roads and sewers and in the price of building materials. All items other than a standard of accommodation and amenities are, really, extraneous to the task of determining what shall constitute a minimum standard of accommodation, but actually these factors play a prominent part in settling the minimum standard. It is not easy to set a general standard which shall constitute a minimum for all areas.

The Ministry of Health has established for "subsidy houses" a general standard which is not unreasonable, even though it is subject to modification according to particular local circumstances. Though in general the ministerial standard must be maintained for new houses, it does not follow that all existing houses that do not in all respects conform to this standard are entirely unsatisfactory.

Though the standard has not actually been defined in detail by Act of Parliament, the layout plans of proposed new estates and details of the designs of the actual houses must obtain the approval of the Ministry of Health in order to rank for subsidy. In this way a reasonable degree of suitability of the houses for the families they are intended to accommodate is assured. The density of the houses per acre is controlled; this may be 12, 16 or 20 per acre, or such other figure as the Ministry may approve, according to existing local circumstances. The number of rooms required for families of various sizes is fixed and the provision of a water supply, sink, sanitary convenience, bath and clothes-washing boiler is usually required. Unless the standards required by the Ministry of Health are attained, approval for subsidy will be withheld.

The ministerial standards are reasonable. They do provide for adequate air space, light, size and amenities, and these desiderata are eagerly sought after by the people. Owing to local and other variations in the cost of building houses, fulfilling the above requirements, their economic rents vary. For the moment let us accept houses of this type as representing the minimum requirements for working-class families.

Calculations made in December 1933 determined the economic rent of houses built in Stockton-on-Tees

at the prices then ruling. They applied to the north-east coast at that time but will, of course, fluctuate with the cost of labour and material and with the rate of interest at which money for house-building can be borrowed. Rates of interest and redemption have a profound influence upon the economic rent of houses built by Local Authorities, for each 1% in such rates represents approximately 1s. 6d. per week in rent upon a house the all-in cost of which is £350.

The types of houses discussed in the previous paragraphs are all what is known as "kitchen houses," which means that they have a combined kitchen and living-room. If a family has the not unreasonable desire to inhabit a house containing a sitting-room as well as a kitchen, it must pay more rent than for a kitchen house.

The Housing Act of 1930 set out in Section 62^a the accommodation to be provided for families of various sizes, as under:

(1) A two-roomed house shall be suitable for a family of two persons.

(2) A three-roomed house shall be suitable for a family of four persons.

(3) A four-roomed house shall be suitable for a family of five persons.

(4) A five-roomed house shall be suitable for a family of seven or more persons.

In actual practice these sizes of houses do not always work out satisfactorily. In the three-roomed house there are two bedrooms and a living-room, and the Act lays down that it shall be suitable for a family of four persons. This works out all right if the family consists of a husband and wife and two children of the same sex or of two young children of opposite sexes, but if the two children are a boy and a girl of 17 and 18 years of age respectively, the boy must sleep in the kitchen living-room.

The calculations made in Stockton-on-Tees in December 1933 showed that the economic rent and rates of houses built in the town, at the prices ruling then, would be:

For a two-bedroom house, 11s. 8½d.

For a three-bedroom house, 12s. 10d.

For a four-bedroom parlour house, 14s. 4½d.

As these figures may be questioned, and there may be some who would like to know how they are made up, a summary of the relevant data is reproduced on pp. 210-211.

The larger the house the more people it can accommodate without overcrowding, but as the size increases so does the rent. It is unfortunate

that income does not automatically correspond with size of family. The large family requires a larger house than does a small family; it also requires more food and more clothing and therefore more income, but there is no sliding scale of wages to meet the increased need for commodities.

Many responsible and highly-placed individuals have stated publicly that an urgent need is that of houses suitable for the working-classes which can be let at an all-in rent not exceeding 10s. per week. Unfortunately these individuals have not realised that a rent of 10s. per week is beyond the capacity to pay of a large proportion of the working-classes.

It is highly desirable that every family should have reasonably suitable housing accommodation. The Government, members of the public health service, social workers and the general public are unanimous in this matter.

If the accommodation is to consist of new houses built by the Local Authorities and not ranking for subsidy under slum-clearance schemes, the minimum charges in the most favourable circumstances will be:

(1) For a family consisting of a man and wife and one or two children, a rent of at least 11s. 8½d. per week for a two-roomed house.

(2) For a family of husband and wife and three

OH

ESTIMATED ALL-IN COST

	KITCHEN TYPE				PARLOUR TYPE			
	Two Bedrooms		Three Bedrooms		Two Bedrooms		Three Bedrooms	
	£		£		£		£	
Land	25	25	25	25	25	25	25	
Roads	27	27	27	27	27	27	27	
Sewers	8	8	8	8	8	8	8	
Houses (including Architect)	270	290	290	290	330	330	330	
	<u>£330</u>	<u>£350</u>	<u>£350</u>	<u>£350</u>	<u>£390</u>	<u>£390</u>	<u>£390</u>	

Annual Redemption Charges
for first 20 years (3% Sink-
ing Fund)

	£	s.	d.		£	s.	d.		£	s.	d.
Land (80 years) ..	1	7		..	1	7		..	1	7	
Roads (20 years) ..	1	0	1	..	1	0	1	..	1	0	1
Sewers (30 years) ..	3	5		..	3	5		..	3	5	
House (60 years) ..	1	13	2	..	1	15	7	..	2	0	6
Interest at 3½% ..	11	11	0	..	12	5	0	..	13	13	0
	<u>£14</u>	<u>9</u>	<u>3</u>	..	<u>£15</u>	<u>5</u>	<u>8</u>	..	<u>£16</u>	<u>18</u>	<u>7</u>

Equivalent to a weekly sum of	5 6½ ..	5 10½ ..	6 6
Add 30% of Gross Rent for Repairs, Management, Losses in Collection, etc.	<u>2 4½ ..</u>	<u>2 6½ ..</u>	<u>2 9½</u>
Total Rent ..	<u>7 11 ..</u>	<u>8 4½ ..</u>	<u>9 3½</u>

Rates.

The Rateable Value is assumed as being ..	11 0 0 ..	13 0 0 ..	15 0 0
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With Rates at 15/4 per year the sums due for Rates would be	8 8 8 ..	9 19 4 ..	11 10 0
Water Rate	<u>1 7 10 ..</u>	<u>1 11 0 ..</u>	<u>1 14 6</u>
	<u>£9 16 6 ..</u>	<u>£11 10 4 ..</u>	<u>£13 4 6</u>

Equivalent to a weekly amount of	<u>3 9½ ..</u>	<u>4 5½ ..</u>	<u>5 1</u>
Making a total all-in Rent of	<u>11 8½ ..</u>	<u>12 10 ..</u>	<u>14 4½</u>

Though the rates in this instance are high the cost of land is very low.

FAMILY OVERHEADS

or more children, a rent of at least 12*s.* 10*d.* per week for a house of three rooms.

(3) For a family desiring a parlour house, a rent of at least 14*s.* 4½*d.* per week for a four-roomed house.

Not all Council Houses have been built cheaply enough to permit of the rents quoted above being charged. When building costs were high, various Exchequer and Rate subsidies were authorised in order to provide for reductions on the economic rents. The mean average rent for all Council Houses (except those built under slum-clearance schemes) amounts in Stockton-on-Tees to approximately the same figures as those quoted above. Though most of the Council Houses have the advantage of a subsidy, the higher cost of construction and rates of interest bring the all-in rent to approximately the same sums as those set out above.

Working-class families have to regard rent as the first charge upon income. Families with a low income endeavour to find accommodation at as low a rent as possible. Many families are constrained to put up with a standard of housing unsuitable as regards accommodation, convenience and amenities because they cannot afford to pay sufficient rent to secure these things. It is for this reason that

many "slum-dwellers" remain in congested areas and are reluctant to move to better houses.

Rents vary, not only according to the type of house and its amenities, but also in relation to its surroundings and locality. Families whose budgets cannot be made to show an unexpended balance after the purchase of "necessities" can only pay more for one "necessity" or group of "necessities" by decreasing the amounts spent on other essentials. This is what must happen to families with low incomes who are faced with an unavoidable increase in rent. As will be shown, there is usually only one item on which the adjustment can be made, and that item is food.

Consideration of the budgets of the families who were rehoused on the Mount Pleasant Estate made this quite clear. Budgets from other families confirm this.

There exists a very strong desire on the part of working-class people to improve their housing conditions and, not infrequently, this desire overcomes discretion, and houses are taken at a rent which is beyond the capacity of the family to meet without reducing the spending power in other directions to a figure below the safety level. Table 30 (p. 204) shows that the weekly average sum spent on rent increases directly with the family income. Expressed in another way, it means that

families who can afford good housing conditions are not content to put up with bad.

As has been said previously the modern Council House does represent a reasonable standard of housing accommodation, but at present, and doubtless for a long time to come, only a portion of the working-classes can be housed in Council Houses. The remainder must be sheltered in privately owned houses. There are many excellent privately owned houses but, broadly speaking, the average privately owned house of a type suitable for the working-class does not offer the tenant the same standard of comfort and amenities as does the municipally designed, built and owned house. Those families who, from one cause or another, are unable to become tenants of Council Houses must depend upon their own efforts to find houses. The amount of rent is, in nearly all cases, the determining factor in the choice of a dwelling—not locality, size or convenience of the house itself.

As a broad generalisation it may be stated that privately owned houses (in industrial towns) which are within the rental capacity of the working-classes fall into two categories. The first category may be described as that of middle-aged houses, built in streets and rows. Such houses may be reasonably sound in structure but usually lack the space and amenities of post-war houses. The second category

consists, usually, of older houses which may not unfairly be designated as "near-slum" dwellings. There is, of course, every gradation between the types. The rents of these houses vary greatly, and there is the complication that some houses remain under the provisions of the Rent Restrictions Acts, whilst others have been decontrolled. From investigations made in Stockton-on-Tees it would appear that it is almost impossible to rent a house of even a very moderate standard of size and convenience at less than 7s. per week. This sum represents 25% of the income of an unemployed family with one child.

Owners of houses let at 10s. per week or less have little difficulty in finding tenants, and not a few families must perforce put up with a part of a house as they cannot find a whole one vacant at a rent they can afford to pay. For this reason subletting of privately owned houses by the owner or the tenant is not uncommon. In some cases, particularly in the case of large houses which have "come down in the world" and which cannot readily be let to one tenant, the practice of subletting is resorted to in order that the greatest possible income may be derived from the house. This practice is indefensible. In other cases subletting is an economic necessity. This occurs when two families are unable to find houses the rents of

which are within their capacity to pay. One or other of the families accordingly rents, say, a four-roomed house at a rent of from 10s. to 16s. per week and then sublets two of the rooms to the other family. Each family pays half the rent. In this way each family obtains accommodation in a house which in itself is reasonably satisfactory but only by a sacrifice of privacy and convenience. This form of multiple tenancy is much less reprehensible than is farming a house for profit. Though the sharing of a house by two families may be an economic necessity to the tenant and sub-tenant, the lack of privacy, the necessity of sharing one food-store, one kitchen range, one washing-boiler and one water-closet almost inevitably leads to friction and is a common cause of disputes and disagreements.

SUMMARY

In order to obtain a Council House the working-class family must be prepared to pay an all-in rent of about 12s. per week.

A privately owned house may be available at a somewhat lower rent, but the amenities and conveniences of it will not reach the standard of the Council House.

Among the families whose weekly budgets are the subject of study in this chapter, the amount

expended upon rent rises directly with income level, showing a desire for as good housing conditions as possible.

The 55s.-65s. income group spends approximately as much on rent as will suffice for a kitchen type of Council House. The 75s.-80s. group feels that it is justified in renting a parlour house.

Many of the families in the lower income groups desire better housing accommodation than they have but are unable to afford it.

FUEL AND LIGHT

Fuel is a necessity for warming the house, for cooking food and for heating water. It is impossible for a family in this country to exist without fuel, so that money spent on this item constitutes a necessary overhead charge and, like rent, must be budgeted for before food can be purchased. When considering family budgets it is not possible to separate fuel and lighting costs, so these two charges are considered together.

There are several factors influencing the amount spent weekly on these necessities. These include the size of the house, the type and efficiency of the kitchen range, the use of gas for supplementary cooking, and the nature of the illumination (gas or electricity) installed in the house.

A modern kitchen range uses less fuel than many old-fashioned fireplaces and, in addition, it heats water for baths and other domestic purposes. A large percentage of the older privately owned houses have inefficient kitchen ranges that use much fuel and are unprovided with a hot-water circulating system, so that water must be separately heated in kettles and pans. In most areas gas is cheaper than electricity for cooking and lighting.

The budgets of the 141 employed Stockton families shows that the amount spent on fuel and light increases with the income. The amounts are shown in Table 31.

The budgets were collected during summer months and the sums inserted under the heading of "Fuel and Light" would, of necessity, be higher during the winter. For a poor family who, ordinarily, have one fire only, the biggest increase in winter would be on account of lighting.

In Stockton-on-Tees coal can usually be purchased at 1s. 6d. per hundredweight bag. A moderately efficient kitchen range used for daily cooking and for heating water consumes rather more than one hundredweight of coal per week. Working-class families almost invariably do their own laundry work at home, and the wash-boiler used for this purpose can only be heated by the combustion of a considerable amount of coal or gas. From

TABLE 31

Group	Income	Weekly cost of Fuel and Light						Cost of Fuel and Light as percentage of Income	
		s. d.							
(1)	25s.-35s.	..	..	..	3	5½	..	..	11.02%
(2)	35s.-45s.	..	..	..	3	11½	..	..	9.89%
(3)	45s.-55s.	..	..	..	4	11½	..	..	9.99%
(4)	55s.-65s.	..	..	..	5	7½	..	..	9.48%
(5)	70s.-80s.	..	..	..	6	2	..	..	8.13%
				Means	4	9½	..	..	9.70%

numerous individual inquiries it appears that the minimum weekly consumption of coal by even the poorest of families is one hundredweight and a half. The cost of this amount of coal is at least 2s. 3d., and the greatest possible care has to be exercised to make this quantity suffice. Some families supplement the coal with coke, at a cost of 10d. per bushel. Group (1) of our budget families spends in summer 3s. 5½d. per week on fuel and light. If 2s. 3d. is spent on fuel the sum of 1s. 2¼d. is left for light. We know that these amounts are inadequate for ordinary purposes and comfort and they probably represent the irreducible minimum. Many north country housewives bake bread and baking-day involves heavy fuel consumption. The use of gas for supplementary cooking is expensive. The use of electricity for lighting purposes adds considerably to the weekly fuel and light account, even if normally only one room is in use as kitchen, sitting-room and parlour.

The existence of insufficient data makes impossible any exact statement as to the cost of winter fuel and lighting during the winter months, but it is within the bounds of fact to state that the increase lies between 50% and 100% on the summer costs. This is a very important matter, for the increased expenditure can only be met by taking the sums necessary from the amount spent on food. A

reduction of 2s. per week in the amount spent on food is a very serious matter and may, *inter alia*, have some causal effect upon the increased incidence of sickness prevalent during the first quarter of each year.

The sums included under the heading of "Fuel and Light" do not allow for money spent on firewood.

It is not possible to fix, having regard to necessity and a reasonable standard of comfort, a minimum weekly figure for fuel and light. Extravagance on these items among working-class families is rare, as the money is urgently needed for other purposes. The price of coal varies according to locality, rising with increased distance from the coal-mining districts. Expenditure during summer months on fuel and light in a Council House fitted with gas as a supplementary means of cooking and with electricity for lighting appears to be in the region of 5s. weekly. Approximately 10% of the net weekly income must be expended on these necessary adjuncts to family life.

This 10%, added to the (approximately) 20% dedicated to rent, absorbs roughly 30% of the total net weekly income. With rents as at present prevailing, and with fuel and light at ruling costs, it is impossible for the working-class family to reduce this expenditure.

INSURANCES AND MEDICAL ATTENTION
INSURANCES

The working-class family, even at great personal sacrifices, adheres rigidly to the maintenance of insurances. The policies usually consist of small industrial insurances, the premiums of which are collected weekly or fortnightly by ambulatory agents. Many of these policies, in times of stress, lapse, but new policies are taken out as soon as possible. The amounts assured are not large; they range commonly from £15 to £25 at death and are regarded by the people as burial club payments. There exists a great horror of "Burial by the Parish," and the living will valiantly strive and sacrifice to keep the policies going, in order to avoid this slur upon their dead.

Much ignorant criticism is directed at what are called "the lavish and extravagant" funerals of the poor. Not all the money received on the insurance policy is actually spent on the funeral or on entertaining relatives and friends. The receipt of the insurance money so often represents the only chance of redeeming articles pawned during hard times and of obtaining such items as a new suit that the total sum received is soon expended.

It is usual for each member of the family to be insured and the weekly premiums total up to a

TABLE 32

Group	Income	Weekly Insurance Premiums			Per head			Percentage of Net Income			
		<i>s.</i>	<i>d.</i>		<i>d.</i>						
(1)	25 <i>s.</i> -35 <i>s.</i>	..	..	1	6½	..	..	4	..	..	4·88%
(2)	35 <i>s.</i> -45 <i>s.</i>	..	..	1	11¼	..	..	4½	..	..	4·84%
(3)	45 <i>s.</i> -55 <i>s.</i>	..	..	2	3¾	..	..	4¾	..	..	4·68%
(4)	55 <i>s.</i> -65 <i>s.</i>	..	..	2	9½	..	..	7	..	..	4·72%
(5)	70 <i>s.</i> -80 <i>s.</i>	..	..	2	9¼	..	..	6	..	..	3·65%
Means				2	3¼	..	..	6¾	..	..	4·55%

FAMILY OVERHEADS

considerable sum. Table 32 shows the sums paid weekly by each group of families on personal insurances.

Industrial insurance of this nature performs a very useful purpose, but there is reason to believe that the system and methods of its administration are not incapable of improvement. The percentage of lapsed policies appears to be very high. The policies are whole-life policies and have little or no surrender value. There is no medical examination on proposal, the head of the household usually signing a declaration that the person to be insured is in good health. This sometimes gives rise to difficulties, particularly if death occurs of an elderly relative shortly after the insurance is effected.

Insurance premiums represent nearly 5% of the total net income of the working-classes. The question arises, Are these insurances a necessary form of expenditure? The working-class families certainly think so, and there can be very little difference of opinion on the matter.

The items of necessary expenditure so far considered, viz. rent 20%, fuel and light 10%, and insurances 5%, bring up the unavoidable expenditure of a working family to 35%.

TABLE 33

Group	Income	Weekly Doctor's payments						Percentage of Net Income	
				<i>s. d.</i>					
(1)	25 <i>s.</i> -35 <i>s.</i>	..	..	..	7	$\frac{3}{4}$	..	..	2.07%
(2)	35 <i>s.</i> -45 <i>s.</i>	..	..	..	7	$\frac{1}{2}$	..	..	1.50%
(3)	45 <i>s.</i> -55 <i>s.</i>	..	..	..	10	$\frac{3}{4}$	..	..	1.80%
(4)	55 <i>s.</i> -65 <i>s.</i>	..	..	..	8	$\frac{1}{2}$	..	..	1.18%
(5)	70 <i>s.</i> -80 <i>s.</i>	..	..	..	1	7	..	..	2.08%
				Means	10				1.72%

MEDICAL ATTENTION

The assurance of medical attention and treatment when necessary has to receive the consideration of the working-class family.

The insured worker is, by reason of his National Health Insurance contributions, provided for, but medical benefit does not extend to his dependants. The working family nearly always provides for medical treatment, on the contract system, by joining a doctor's club. The contributions are usually collected fortnightly by an agent. Table 33 shows the expenditure incurred weekly for medical services by each income group. The figures given do not include the insured person's National Health contributions or the voluntary stoppages which a great many workers agree to, and which are paid to the local general hospital. Very few voluntary hospitals in industrial areas could continue without the aid of "workmen's contributions." The medical club contract rates are usually exclusive of conditions associated with pregnancy.

If any considerable bill for medical attendance is contracted, the usual method of payment is at the rate of so much per week paid to a collector.

Amounts paid on a contract basis for medical attention are a necessary expenditure, and the percentage of the net income so absorbed must be added to the previous total.

CHAPTER XIII

OTHER NECESSARY FAMILY EXPENDITURE

Household Utensils and Cleansing Materials

HOUSEHOLD UTENSILS wear out or are broken. However much care is exercised, expenditure of this nature is unavoidable. The kettle in time develops a leak, a pie-dish cracks or the spout is knocked off the teapot. Scrubbing and other brushes wear away and replacements become necessary.

Cleansing materials are consumable stores and a certain amount is used up each week. As the domestic laundry work is done at home, the amount of soap and soda used is considerable, and there is also the item of metal polish. Expenditure of money on these items is unavoidable. The sums spent under these headings vary with the size of the family and also with the income. The lowest-paid workers have obviously cut the cost of these articles below a reasonable limit, and they manage with a very meagre equipment of household utensils. Pots, pans, plates, cups, knives, forks

TABLE 35

Group	Net Income per week	Mean weekly cost of Household Utensils and Cleaning Materials						Percentage of Net Income	
		s.	d.						
(1)	25s.-35s. ..	..	..	..	10	..	..	..	2.67%
(2)	35s.-45s. ..	..	..	..	1 7½	..	..	..	4.11%
(3)	45s.-55s. ..	..	..	..	1 8½	..	..	..	3.5%
(4)	55s.-65s. ..	..	..	..	2 6	..	..	..	4.23%
(5)	70s.-80s. ..	..	..	..	2 10½	..	..	..	3.76%
					<u>1 11</u>				<u>3.65%</u>
					Means				

3.65% added to the previously expended percentages brings the total up to just over 40%.

and spoons are scanty and of the cheapest quality.

Table 34 shows the weekly cost of these items in each income group.

Of the headings under which expenditure is classified, none of those so far considered are avoidable, and it is difficult to see where economies could be made. Even in the highest income group the amounts cannot be considered extravagant.

CLOTHING AND HIRE PURCHASE

Climate, custom and the law in this country demand that human beings shall be clothed. Nudity, even in the height of summer, is illegal, if the individual appears in public in *puris naturalis*. There is no strict definition as to what constitutes adequate body-covering, and seaside resorts put different values on the permissible low limit of garments tolerated. The censorship exerted upon the amount of clothing worn is not directed or instigated by regard for the health of sartorial transgressors, but is dictated by a regard for "public decency and morality."

It will be realised that it is impossible to frame a definition of the minimum quantity, quality and cost of clothing required by an individual for any particular period. The individual's personal tastes, customary standard, occupation, the locality dwelt

in, and the degree of care taken of garments are all variable and all exercise some influence upon the cost of clothing. Most families of limited income possess and are capable of purchasing fewer garments than the individuals feel they require. It may be taken as an approximately true generalisation that families of moderate means spend as much as they can afford upon clothing but that they are unable to obtain as much, or of as good quality, as they desire.

Popular custom is a powerful influence that cannot be ignored, and there is a certain standard conformable to income and occupation which cannot be set aside. Changes in custom and in fashion have made a profound alteration in the clothing habits of all classes, but particularly of the working-classes during the past 25 years. These changes are not due merely to the whims and fancies of the people, but are largely due to the changing values of the older materials and to the introduction of new ones.

It is interesting to consider the amounts spent weekly by the 141 Stockton families on clothing and boots as disclosed in their budgets. Table 35 shows the amount for each income group, the percentage of the total net income which this amount represents and the amount per week per head.

TABLE 35

Group	Net Income	Amount per week spent on Clothing and Boots per Family				Percentage of total Net Income				Expenditure per head	
				<i>s.</i>	<i>d.</i>					<i>s.</i>	<i>d.</i>
(1)	25 <i>s.</i> -35 <i>s.</i>	..	..	2	8½	..	..	8·62%	..	..	7
(2)	35 <i>s.</i> -45 <i>s.</i>	..	..	3	9½	..	..	9·47%	..	..	8½
(3)	45 <i>s.</i> -55 <i>s.</i>	..	..	5	3½	..	..	10·67%	..	..	10½
(4)	55 <i>s.</i> -65 <i>s.</i>	..	..	6	10	..	..	11·56%	..	..	1 5
(5)	70 <i>s.</i> -80 <i>s.</i>	..	..	9	8½	..	..	12·83%	..	..	1 9½
				<hr/>				<hr/>			<hr/>
				Means	5 8	..	..	10·63%	..	..	1 1

This Table reveals certain interesting points. It shows, as was expected, that the amount spent weekly both per family and per individual increases directly with income, but it also shows that the *percentage* of income allocated to clothing increases with income. For rent and fuel and light, though the amounts increase with income the percentage decreases. On insurance, doctors' accounts, and household utensils and cleaning materials the percentage of income spent remains fairly constant throughout the range of incomes for which budgets are available, but with clothing and footwear there is a steady increase in the percentage of income spent. This would appear to indicate that the lower-paid workers are compelled to put up with a lower standard of clothing than they consider necessary or desirable.

TABLE 36

Group	Amount per Head per week spent in Clothing				Annual amount		
	<i>s.</i>	<i>d.</i>			£	<i>s.</i>	<i>d.</i>
(1)	7	..	..	..	1	10	4
(2)	8½	..	..	..	1	16	10
(3)	10¾	..	..	..	2	6	7
(4)	1	5	..	..	3	13	8
(5)	1	9½	..	..	4	13	2

It is of interest to consider what these sums spent per head per week in clothing represent per year. Table 36 shows the yearly amounts.

Contemplation of these amounts absolves the families from any possible charge of extravagance under the heading of clothing and footwear. In 1933 the average weekly sum expended by Poor Law Authorities on clothing per child in Poor Law Institutions was 1s. 6½d. Poor Law Authorities clothe the children under their care adequately, but certainly not extravagantly, and have the advantage of purchasing in large quantities at competitive tender prices. If it is assumed that it costs no more to clothe an adult than a child we are faced with the fact that Groups (1) (2) (3) and (4) of our budget families are unable to attain Poor Law clothing standard. Group (5) can spend three-pence more per head than Poor Law Authorities but must purchase at retail as against contract prices. Group (5) has a mean net weekly income of £3 15s. 9½d. per family. It must not be overlooked that this expenditure includes footwear and that boots and shoes absorb a considerable proportion of the expenditure.

The amounts shown in Table 36 seem to be inadequate, but it is difficult to see how they can be increased. They amount to somewhat more than a mean 10% of the net income. When this 10%

is added to the 40% already absorbed by necessary expenditure one-half of the net income is accounted for. Careful consideration fails to discover any means by which this 50% can be reduced.

The sums disclosed as spent on clothing and footwear appear pitifully meagre, but further detailed inquiries into how these sums are spent reveals that somewhat less than the totals entered in this column is actually expended upon these particular items. The sums include money spent on blankets, sheets, towels and other domestic cloth goods.

How are the purchases actually made? Poorly paid families may make efforts to save up the actual cash required to purchase a dress or a pair of boots, but they rarely succeed in doing so. During the process of accumulating the necessary total so many urgent needs crop up that time after time the savings must be broken into or completely spent. Some more certain method than voluntary putting aside of small weekly sums is needed, and the demand has produced the solution. The difficulty is overcome by means of the "club." Clothing and other similar clubs are of infinite variety and complexity and vary from one part of the country to another. On the north-east coast they commonly take the following form: A woman who has a little ready money decides to form a "clothing club." She canvasses her friends and neighbours till she

finds twenty women who are willing to join her club and to pay a weekly sum of 1s. each. Having obtained the twenty names, she goes to one or other of the local drapery stores which specialises in this form of business. She agrees with the manager of the shop to buy twenty tickets of the value of £1 each. The price to her is 19s. per £1 ticket. She pays cash for the first ticket. Each week she collects 1s. from each woman who has joined her "club" and each week there is a draw. The club member who draws the lucky number immediately comes into possession of the £1 voucher which she can spend at the shop on whatever goods she chooses. Each club member goes on paying 1s. per week until she has paid 21s. A member may draw the first ticket or she may have to wait until the last drawing, which occurs twenty weeks after the first payment. The woman who has organised the club makes 2s. profit per member but against this she must take the risk of default. The whole sum represented by the £1 voucher must be spent at the one shop, and it does not necessarily follow that the purchaser is charged rock-bottom prices.

The above is the general principle of these "clubs," but variations occur in amounts of contributions and other details.

The system has many abuses and is expensive to the participants, but it is difficult to see how to

supersede it. It is very common in industrial areas.

A variation of the hire-purchase system is also used for the purchase of clothing, the weekly contribution being collected weekly by a "tallyman" who calls at the house.

HIRE PURCHASE

There are many variations of the hire-purchase system applied to goods other than those which come under the heading of "Clothing and Boots." The articles purchased by this means are furniture, beds, gramophones, radio sets, bicycles, perambulators. The contract may be direct with the shop supplying the goods, in which case the remedy for default is recovery of the goods by the shop, though the profits on a completed deal are not inconsiderable. The usual terms are as follows: For an initial payment of — the purchaser obtains delivery of — worth of, say, furniture. He pays in all — for the — worth of goods. Usually default in one payment involves forfeiture of the articles. This leads sometimes to difficulties, for the shopkeeper does not want the return of goods, possibly damaged. He wants his money and his profits. He has no remedy for default but recovery of the goods, so a system of finance corporations has grown up. These organisations pay the shopkeeper for the goods sold to the customer and recovers from

TABLE 37

Group	Amount spent weekly in Hire Purchase				Percentage of Net Income	
	<i>s.</i>	<i>d.</i>				
(1)		2½	..	..	0.66%
(2)	1	5½	..	..	3.58%
(3)	1	6½	..	..	3.06%
(4)	3	0	..	..	5.08%
(5)	3	5	..	..	4.50%
Means	1	11	..	..	3.37%

the purchaser in weekly sums. The advantage to the shopkeeper lies in the fact that he gets his money, though with a lower profit than on an ordinary hire-purchase agreement. The finance corporation is safeguarded, for its dealings with the purchaser are not on the basis of a hire-purchase agreement, in which only the article "hired" can be recovered. They are on the basis of "money lent" and the sum can be recovered in the ordinary way as a civil debt. This system appears to be spreading rapidly.

Table 37 shows the amounts spent on hire purchase per week by the 141 Stockton families, and the percentage of net income represented by these sums.

CHAPTER XIV

MONEY AVAILABLE FOR FOOD

APPROXIMATELY 55% of the available domestic income of our 141 families has been spent on items which cannot be classed as other than necessities, and the amounts spent under the various headings are not excessive. In the case of the lower-paid groups the amounts spent are insufficient to procure a reasonable or satisfactory standard of life.

The amount spent in each group is shown in Table 38.

The percentages represent necessary expenditure. Theoretically the balance is available for the

TABLE 38

Group	Income	Percentage of net Income spent on Rent, Fuel and Light, Insurance, Doctor, Household Utensils and Cleaning, Clothing and Boots, and Hire Purchase	
(1)	25s.-35s.	..	55·19%
(2)	35s.-45s.	..	56·39%
(3)	45s.-55s.	..	53·94%
(4)	55s.-65s.	..	56·23%
(5)	70s.-80s.	..	55·15%

purchase of food. In actual daily life not all of the balance is available for this purpose. Nothing has, so far, been allowed for Trade Union subscriptions, Friendly Society subscriptions, newspapers, tobacco, matches, cinemas, family travelling (bus or tram fares), sweets, toys or amusements or small emergencies, and unexpected and unbudgeted expenditure.

Something must be allowed for these items. The difficulty is to determine what constitutes a reasonable amount. Though not, in the strictest sense, necessities, some expenditure on articles of the above nature is certain to occur and reduce the theoretically available balance. There exists no desire on the part of the authors to exaggerate the seriousness of the position of the working-classes. The figures of income and necessary expenditure are sufficiently serious to make the position plain. Exaggeration is unnecessary. After careful consideration it has been decided to include the following sums, which must be added to general expenditure before a figure theoretically available for the purchase of food can be arrived at:

In the case of Group (1)	add	6d.	per week.
”	”	”	(2) ” 9d. ”
”	”	”	(3) ” 1s. 0d. ”
”	”	”	(4) ” 1s. 3d. ”
”	”	”	(5) ” 1s. 6d. ”

TABLE 39

Group	Amount spent weekly on Items other than Food			Amount available weekly for Food Purchase		
	£	s.	d.	£	s.	d.
(1)	..	17	9	..	13	5
(2)	..	1	3 2	..	16	10
(3)	..	1	7 8	..	1	1 9
(4)	..	1	14 7	..	1	5 2
(5)	..	2	3 2	..	1	12 7

The sums added to the general expenditure bring up the percentages spent to those shown in Table 38. (To nearest whole figure.)

Group	Percentage of Income spent on other than Food		Percentage available for Purchase of Food	
(1)	..	57%	..	43%
(2)	..	58%	..	42%
(3)	..	56%	..	44%
(4)	..	58%	..	42%
(5)	..	57%	..	43%

The next step in the investigation of the domestic economy of our groups of families is to translate these percentages into money. Table 39 does this and shows the average sum that a family in each group can ordinarily have available for the purchase of food.

A crucial point has now been reached in the

investigation. The amount available for the purchase of food by a family in each income group has been ascertained. Is the sum sufficient, having regard to the size of the family, to fulfil the terms of reference of the British Medical Association Nutrition Committee, that is, to maintain health and working capacity?

SIZE AND MAN-VALUES OF THE 141 FAMILIES

When the details of the expenditure of the budget families was collected information was obtained of the age and sex of each member of each family. In all there were 745 individuals in the 141 families, an average of 5.28 persons per family. As has been pointed out in an earlier chapter (*see* p. 168) the quantity of food required varies with age. The cost of feeding an individual varies not only according to man-value, that is to the fraction of unity he represents, but also with the variety of food required. It is relatively more expensive to feed a child than an adult because the child requires certain expensive foods, such as milk, which an adult can do without. In order to determine the cost of purchasing the British Medical Association minimum ration for families in each of the five income level groups the following data were calculated for each group: the average number of

Q_H

TABLE 40

Group	Income	Average size of Family		Man-value per Family		Cost Man-value per Family				
(1)	25s.-35s.	..	..	4.63 persons	..	..	2.95	..	..	3.22
(2)	35s.-45s.	..	..	5.27	..	..	3.81	..	..	3.97
(3)	45s.-55s.	..	..	5.83	..	..	4.35	..	..	4.49
(4)	55s.-65s.	..	..	4.82	..	..	4.19	..	..	4.34
(5)	70s.-80s.	..	..	5.42	..	..	3.90	..	..	4.12
				5.28	..	..	3.84	..	..	4.02
				Means	..	..	3.84	..	..	4.02

individuals per family, the mean man-value and the mean "cost man-value."

These data are summarised in Table 40.

Reference to the British Medical Association Nutrition Committee's Report will show what the cost of a minimum diet for a family in each group amounted to *at the prices ruling in the summer of 1933* in the cheapest markets. It should not be forgotten that the prices on which the B.M.A. Nutrition Committee based its findings were the minimum prices available, and imported meat, for instance, was used instead of the more expensive home-killed product. Considerable price fluctuations have occurred in foodstuffs during the two years since the data for the B.M.A. Report were collected, and the prices of certain foods have, for some time, remained at a higher level than ruled in 1933.

Careful records are kept week by week of food prices in Stockton-on-Tees, and in June 1935 the cost of the various B.M.A. diets ranged approximately 20% above the 1933 figure. The articles in which the greatest increases have been noted are milk, bacon, butter, tea, eggs.

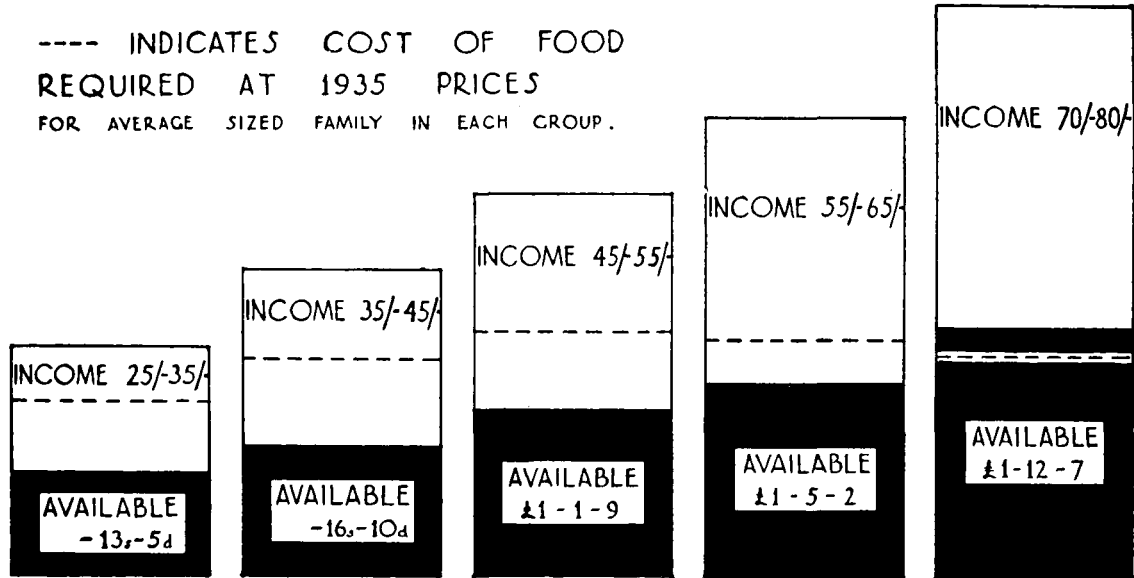
The stage has now been reached where it is possible to construct a table showing the cost of feeding families of the "mean cost man-value" of each of the five groups at the prices ruling in June 1933 and in Stockton-on-Tees in June 1935,

TABLE 41

Group	Income	Required for B.M.A. Scale 1932				Required for 1935 Stockton-on-Tees				Available						
		£	s.	d.		£	s.	d.		£	s.	d.				
(1)	25s.-35s.	..	..	19	0 $\frac{3}{4}$	..	..	1	2	10 $\frac{1}{4}$	..	..	13	5		
(2)	35s.-45s.	..	..	1	3	7 $\frac{1}{2}$	..	..	1	8	3 $\frac{3}{4}$	..	..	16	10	
(3)	45s.-55s.	..	..	1	6	7 $\frac{1}{2}$	..	..	1	11	11 $\frac{1}{2}$	..	..	1	1	9
(4)	55s.-65s.	..	..	1	5	9 $\frac{1}{2}$	..	..	1	10	11 $\frac{1}{2}$	..	..	1	5	2
(5)	70s.-80s.	..	..	1	4	1 $\frac{1}{4}$	..	..	1	8	11	..	..	1	12	7

DIAGRAM 5 TABLE 41 AMOUNT AVAILABLE FOR FOOD
 FOR AVERAGE SIZED FAMILIES IN DIFFERENT INCOME GROUPS

---- INDICATES COST OF FOOD
 REQUIRED AT 1935 PRICES
 FOR AVERAGE SIZED FAMILY IN EACH GROUP.



together with the sum of money available to a family in each group to meet that cost.

Among the families which form the subject of this investigation only those in No. 5 group, with an income of between 70s. and 80s. per week, have a weekly balance sufficient at current prices to purchase a diet just adequate to maintain health and working capacity.

Before making any generalisations from these figures, it is advisable to point out that the average size of the 141 families is larger than the average family in the town as revealed by the 1931 census. The average there given is 4.06 persons per family, as against 5.28 in the group under investigation. The census figure is, of course, a mean of all the families resident in the town at the date of the 1931 census and includes many families not of the working-classes and also families of one or two persons, lodgers, etc. It cannot be argued from the census figures that the average working-class family in the town consisted of 4.06 persons.

Table 41 (p. 244) shows the sums available per family for the purchase of food. The mean size of the family in each income group is not identical, so that comparison between groups cannot be made until unit value per group is determined. Table 42 shows the sum per man-value in each group available for food purchase.

TABLE 42

Group	Income	Sums available for Food Purchase			
		Per Head		Per Man-value	
		<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>
(1)	25 <i>s.</i> -35 <i>s.</i>	2	11½	4	3
(2)	35 <i>s.</i> -45 <i>s.</i>	3	3	4	4
(3)	45 <i>s.</i> -55 <i>s.</i>	3	9½	4	11
(4)	55 <i>s.</i> -65 <i>s.</i>	5	2½	5	9½
(5)	70 <i>s.</i> -80 <i>s.</i>	6	2	8	1½

Cost Man-value of B.M.A. scale for June 1932 was 5*s.* 11*d.*
 Stockton, June 1935 = (+ 20%) = 7*s.* 1*d.*
 Say 7*s.*

In the cases of Groups (1) to (3) the sum is insufficient. The degree of insufficiency decreases as the income level rises.

Table 43 shows the sum per man-value required and the percentage of that sum available for each of the five groups :

TABLE 43

Group	Income	Man-value cost of B.M.A. diet (Stockton, 1935)		Available		Percentage available
		<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	
(1)	25 <i>s.</i> -35 <i>s.</i>	7	0	4	3	61%
(2)	35 <i>s.</i> -45 <i>s.</i>	7	0	4	4	62%
(3)	45 <i>s.</i> -55 <i>s.</i>	7	0	4	11	70%
(4)	55 <i>s.</i> -65 <i>s.</i>	7	0	5	9½	83%
(5)	70 <i>s.</i> -80 <i>s.</i>	7	0	8	1½	116%

Some doubt occurred whether the sums shown in the above calculations to be available for food purchase were in actual practice available or, if available, were spent on food. Now it happened that details of the expenditure on foodstuffs of 126 families were available. These families were all resident in Stockton-on-Tees and only 21 of them were included in the previous 141 families whose budgets have been considered. Information was also available as to the quantities of each kind of food purchased by these 126 families. It was therefore possible to calculate the quantities of protein, fat, etc., purchased by each family and to see in what respects the groups fell short of the British Medical Association minimum diets.

The 126 families were distributed over the same income levels as in the previous analysis and means were calculated in a similar manner.

The mean rents paid in each income group of the 126 families were somewhat lower than among the 141 families except in Group (1), in which it was higher.

The differences are shown in Table 44.

The differences give a theoretically increased food-purchasing capacity to the 126 families except those in Group (1), who are at a disadvantage of $4\frac{1}{2}d$.

TABLE 44

Group	Income	Mean Rent			
		(1) 141 General Budget Families		(2) 126 Food Budget Families	
		<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>
(1) ..	25 <i>s.</i> -35 <i>s.</i>	..	7 10½	..	8 3
(2) ..	35 <i>s.</i> -45 <i>s.</i>	..	9 2½	..	8 1½
(3) ..	45 <i>s.</i> -55 <i>s.</i>	..	10 0	..	9 4
(4) ..	55 <i>s.</i> -65 <i>s.</i>	..	11 9½	..	9 4½
(5) ..	70 <i>s.</i> -80 <i>s.</i>	..	15 3¾	..	11 1½

Table 45 shows sums of money available for food purchase per man-value per week in each income group of the 141 general budget families and the actual amount spent in food purchase per man-value in each income group of the 126 food budget families.

The sums actually spent on food are in Groups (1) (2) and (3) less than the amounts which, theoretically, should be available for the purpose, but, as was explained in a previous chapter, miscellaneous items of expenditure, such as sums spent on newspapers, cigarettes, amusements and other things, were calculated at a very low figure. There is bound to be some weekly expenditure which cannot be entered under any heading except that

TABLE 45

Group	Income	Amount available for food 141 General Budget Families		Amount spent on food 126 Food Budget Families		%			
		<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>				
(1)	25 <i>s.</i> -35 <i>s.</i>	..	4	3	..	3	3	..	46%
(2)	35 <i>s.</i> -45 <i>s.</i>	..	4	4	..	3	5	..	49%
(3)	45 <i>s.</i> -55 <i>s.</i>	..	4	11	..	4	6	..	64%
(4)	55 <i>s.</i> -65 <i>s.</i>	..	5	9½	..	7	4	..	104%
(5)	70 <i>s.</i> -80 <i>s.</i>	..	8	1½	..	8	4	..	119%

of "Miscellaneous Expenses," and which will probably vary from day to day and from week to week. Some of this expenditure is unavoidable. Sometimes sums are absorbed in the repayment of debts, the rent may be in arrears, or some other domestic trouble may have arisen. There is, too, the personal factor of the care exercised in the spending of odd sums on pleasures or small luxuries. It was obvious that not all the money theoretically available for the purchase of food would or could in practice be so used.

In the foregoing Table it will be noticed that in Group (4) the amount spent on food is greater than that calculated from a study of the 141 general budget families. This is largely accounted for by the fact that the mean rent paid by

this group in the 126 food budget families is considerably lower than the mean rent paid by the corresponding income level group in the general budget series.

Owing to the varying sizes of families in the income level groups and also to their varying age and sex composition, the only way of comparing the food expenditure of the different groups is to reduce it to unit man-value expenditure. This has been shown in Table 45. It may be of interest to show the expenditure per head in each group, but it must be remembered that the figures so given cannot be used for calculation or comparison as food needs vary with age. The amount of money spent per head in each income level group of the 126 food budget families amounted to:

In Group:

(1)	(25s.-35s. income)	2s. 3d.	per head per week.
(2)	(35s.-45s. ")	2s. 5½d.	" "
(3)	(45s.-55s. ")	3s. 5d.	" "
(4)	(55s.-65s. ")	5s. 7d.	" "
(5)	(70s.-80s. ")	6s. 7d.	" "

Table 45 also shows the sums actually spent per unit man-value per week on food for each income level group. As has been explained, the June 1935 cost of obtaining the British Medical

Association minimum diet per unit man-value amounts to 7s. per week.

Groups 1, 2 and 3 fall short of this sum. The percentage of 7s. spent by each group amounts to 46% in Group 1; 49% in Group 2; 66% in Group 3; 104% in Group 4 and 119% in Group 5.

The deficiencies in Groups 1, 2 and 3 are serious. Group 4 exceeds the minimum expenditure by fourpence per week per unit man-value. This group is on the border line, and minor errors or fluctuating prices may depress the group below the standard. Group 5 is the only one which shows a working margin.

It must be obvious, if a family is unable to allocate a weekly sum of money sufficient to purchase the minimum diet considered necessary by the British Medical Association Nutrition Committee to maintain health and working capacity, that there must be deficiencies in the diet consumed.

The nature and extent of these deficiencies is clearly shown by analysis of the food budgets of the 126 Stockton-on-Tees families. The relevant figures are set out in Table 46.

As shown in this Table the diets of Groups 1, 2 and 3 are woefully deficient in first-class (animal) protein. First-class protein is the most important constituent of human dietaries, for it is by its

TABLE 46

Food purchased by 126 Stockton-on-Tees families per unit Man-values per day

	B.M.A. Minimum Income only	First class Protein 50 grams	Total Protein 100 grams	Fat 100 grams	Carbohy- drate 500 grams	Calories 3,400
Group 1 ..	25s.-35s.	23·6	68·8	81·2	444·0	2,831
„ 2 ..	35s.-45s.	25·9	72·2	80·9	436·1	2,845
„ 3 ..	45s.-55s.	26·6	72·0	91·7	427·0	2,872
„ 4 ..	55s.-65s.	48·9	99·1	111·6	485·2	3,489
„ 5 ..	70s.-80s.	50·4	112·4	125·0	561·7	3,950

assimilation that the growth of the body tissues is made possible. The amino-acids contained in first-class protein constitute the building materials of the tissues, and repair of tissue is also largely dependent upon the ingestion of first-class protein. First-class protein is present in animal products only. Milk, cheese, meat, fish and eggs are the usual sources of first-class protein in the human dietary. Unfortunately these substances cost more than carbohydrate foods (flour, bread, sugar, etc.), which yield considerable energy value but little or no tissue-building material.

The total protein obtained by Groups 1, 2 and 3 is also deficient in quantity. The difference between the amount of first-class protein and total protein is made up of second-class or vegetable protein. Vegetable protein is of less value to the human body than is first-class protein and though much of it can be used by the tissues of the body it cannot be substituted for animal protein.

Groups 1 and 2 show a deficiency of approximately 20% in the amount of fat purchased and Group 3 has a deficit of nearly 10%.

Carbohydrate foods are cheap and the deficiency in this dietary constituent is smaller than is that of protein, but it is not until Group 4 is reached that adequate quantities of even this, the cheapest form of food, are obtained.

Calories (the measure of the energy value of food) are deficient in the first three groups.

Group 4 obtains a diet which approximates closely to the British Medical Association Nutrition Committee's recommendation, and Group 5 has some margin over and above the minimum requirements. The diet of Group 5 may be classified as a safe diet; that of Group 4 as being on the border line, while those of Groups 1, 2 and 3 are seriously deficient. According to the findings of the British Medical Association Nutrition Committee, Groups 1, 2 and 3 cannot maintain health and working capacity.

When the food-purchasing power of a family is below its requirements economies are effected by reducing the quantities purchased of the more expensive foods. The housewife must endeavour to avoid complaints of actual hunger and she must purchase cheap bulky foods for this reason.

The diets purchased by Groups 1, 2 and 3 are similar in quantity and kind. Group 3 has a very slight advantage over Group 1 in first-class protein and total protein and a rather greater advantage in fat. The carbohydrate and total calories are almost identical in the first three groups. The amounts spent per unit man-value by each of these three groups of families is 3s. 3d., 3s. 5d. and 4s. 6d. respectively. It will be asked why the diet of Group 3

at a cost of 4s. 6d. per man-value per week is so little better than those of Groups 1 and 2. It might be assumed that less efficient marketing could be blamed, but such an assumption would be wide of the mark. Study of the detailed dietary sheets of the families in each group shows that Group 3 purchases better commodities than Groups 1 and 2. The amounts of milk, butter, and eggs bought by Group 3 are higher than in the two lower income groups. Groups 1 and 2 purchase margarine only.

The vitamin and mineral contents of the dietaries purchased by Groups 1, 2 and 3 are also deficient.

As income rises, not only do the actual quantities of food purchased increase but the proportions of the more important constituents of a diet are raised towards the minimum requirements. There is also an increase in the amounts of dairy produce, fruit and vegetables bought. Dairy produce, fruit and vegetables are good sources of the mineral salts required by the body and of the vitamins.

Graphs have been prepared showing the quantities of various foodstuffs purchased by families at each income level. These show clearly this tendency and they are indicative of the sound knowledge of the elements of satisfactory dietetics possessed by women of the working-classes. The rule-of-thumb methods used by these women work well, and it is doubtful if education in the principles of nutrition

would enable them materially to improve the nutritional condition of their families. There are, of course, in all classes of the population individuals who are careless and extravagant. There are also stupid and mentally dull people who are inefficient in all their activities, the purchase of food included, but the generalisation that on the whole the working-class woman buys, according to her means, wisely and well, may be accepted as true.

The quantities of various items of food purchased each week per unit man-value are shown in Table 47.

The figures contained in this Table are of considerable interest.

Meatstuffs. Under this heading are included beef, mutton, pork, sausages, etc. Families in Income Groups 1, 2, 3 and 4 purchase approximately the same weight of meat per unit man-value. Group 5 buys a considerably greater quantity. There is in connection with this an interesting point not shown in the figures contained in the following Table. The weight of meat purchased by Group 1 is almost the same as that purchased by Group 4, but the cost of the 1.30 lbs. bought by Group 4 exceeds considerably (almost double) that of the 1.22 lbs. bought by Group 1. Those families with very small purchasing power buy frozen meat; those with a somewhat higher sum of money available buy chilled

TABLE 47

		Group		(1)	(2)	(3)	(4)	(5)
		Income		25s. - 35s.	35s. - 45s.	45s. - 55s.	55s. - 65s.	70s. - 80s.
Meatstuffs	lbs.	..	..	1·22	.. 1·39	.. 1·27	.. 1·30	.. 1·93
Butter	.. „	..	..	0·08	.. 0·07	.. 0·13	.. 0·15	.. 0·23
Margarine	„	..	..	0·34	.. 0·41	.. 0·29	.. 0·17	.. 0·53
Fresh Milk	pints	..	..	0·55	.. 0·63	.. 1·00	.. 1·66	.. 1·96
Tinned Milk	tins	..	..	0·78	.. 0·61	.. 0·61	.. 0·09	.. 0·30
Eggs	..	..	..	1·01	.. 1·45	.. 1·41	.. 1·45	.. 1·38
Fish	.. lbs.	..	..	0·18	.. 0·18	.. 0·29	.. 0·25	.. 0·34
Cheese	.. „	..	..	0·09	.. 0·11	.. 0·21	.. 0·42	.. 0·11
Flour	.. „	..	..	5·39	.. 5·87	.. 6·00	.. 3·66	.. 4·30
Bread	.. „	..	..	0·35	.. 0·27	.. 1·41	.. 1·64	.. 1·23
Potatoes	.. „	..	..	2·89	.. 3·85	.. 3·16	.. 2·41	.. 1·61
Sugar	.. „	..	..	0·99	.. 0·83	.. 0·79	.. 0·79	.. 0·42

meat, and those with adequate means can afford home-grown meat. The poorest families would have almost entirely to do without meat if only home-killed meat were available at current prices.

Butter and Margarine. The amounts of butter purchased are small, but the popular desire for butter is well illustrated by the steady increase in quantity obtained as income level rises. Group 1, the poorest group, buys only $1\frac{1}{4}$ ozs. (approximately) per man-value and Group 5, the richest, buys nearly $\frac{1}{2}$ lb.

The amount of margarine bought by the members of Group 5 suggests that it is used for cooking, cake making, etc., and not as a substitute for butter on bread, but Group 1 uses it as a substitute for butter.

Milk. The amount of milk purchased is shown—for fresh milk as pints and for tinned milk as standard tins. Each standard tin contains the equivalent of $1\frac{1}{2}$ pints of fresh milk. The quantities of fresh milk purchased, even by the higher income level families, are low, but it would appear that there is a desire to consume fresh milk and that the amount obtained increases regularly with income. It is not the desire for milk that is lacking but purchasing power. The actual consumption of milk by the families in the lower income groups is somewhat increased by free or half-price issues to

infants and young children in child welfare centres and elementary schools.

The amount of tinned milk bought by the families decreases as the income level rises. This appears to lend weight to the belief that fresh milk is preferred. The amounts of fresh milk shown in Table 47 are pints per week; if the quantities shown are divided by seven the daily amounts consumed will be arrived at. It cannot be denied that these quantities are a very long way below optimum. Milk is of such great value in its protein, fat, mineral and vitamin content that a serious shortage, such as that shown in Table 47, is disquieting.

Eggs. Group 1 obtains one egg per unit man-value per week. The other family groups purchase nearly three per fortnight. Eggs vary greatly in price. The lower income groups buy imported eggs and never pay more than 1*d.* each for them. The upper income level groups may buy new-laid eggs. Among those members of the working-classes who can afford to buy new-laid eggs the numbers purchased decreases as, seasonally, the price rises. The price level of imported eggs varies in "sympathy" with the prices of new-laid English eggs.

Fish. There is a steady increase in the consumption of fish with increasing income. Fish prices vary according to season, variety and quality.

Fish is a valuable source of first-class protein, and the amounts purchased are lower than might be expected.

Cheese. Cheese contains protein of excellent value and is, in many respects, a valuable substitute for meat. The price varies very greatly according to the amount of surplus milk available and also according to the variety, state of maturity, and so on. When an adequate quantity of meat can be obtained, the amount of cheese eaten is small. When the meat forms a low proportion of the diet, cheese consumption increases if the family can afford it.

Flour and Bread. Families with low-purchasing power rely to a very large extent upon flour and bread to provide the bulk and energy foods in sufficient amount to prevent an actual feeling of hunger.

The practice of home-baking of bread is still common in the North of England, and it is interesting to observe that the amount of baker's bread eaten increases with income.

Potatoes. Fluctuations in the price of potatoes are considerable. To some extent potatoes are used (when cheap) as a substitute for bread. When cheap, potatoes yield considerable energy value for a small outlay of money. It is interesting to note that from Group 2 onwards there is a steady decline in the amount consumed.

Sugar. The sugar shown in the budgets is purchased as sugar, and among the upper income groups this may be supplemented by sweets and chocolate.

The quantity purchased, as shown in the budget summary in Table 47, declines with increasing income. The badly fed woman with a very low income has found that a cup of tea with a considerable amount of sugar in it greatly refreshes her and quickly removes the feeling of faintness and fatigue of which many of them complain.

Consideration of the food budgets of these 126 Stockton-on-Tees families yields ample material for serious consideration by economists and all who are interested in the conditions of our people. The serious shortage of essential foods disclosed is a matter of great moment and one which ought not to be dismissed lightly.

How far the conditions of the 141 general budget families and the 126 food budget families are typical of families living elsewhere than in Stockton is not known to the authors. The data presented have been collected with care and special steps were taken to avoid error. No attempt is made to draw general deductions from the material included in this survey. That is left to others. What has been done is merely to lay before those interested certain facts and figures, which have been carefully

collected. That these data possess wide economic and social implications appears certain. Further surveys of a similar nature carried out elsewhere are needed in order to check the Stockton-on-Tees findings.

There seems to be no adequate reason to assume that the conditions found in Stockton-on-Tees are peculiar to that town. Further surveys in other areas will show how much or how little other districts differ from Stockton-on-Tees. On the evidence so far available it appears not improbable that nearly one half of the population of England and Wales subsists, to a greater or lesser extent, below the safety line of nutrition.

A remedy for this state of affairs cannot easily be applied, but the seriousness of the position is such as to warrant careful study by all who desire to improve the health and physical condition of our people.

CHAPTER XV

DEATH-RATES OF EMPLOYED AND UNEMPLOYED POPULATIONS

DURING the course of a recent survey of the housing conditions of one district in Stockton-on-Tees information was recorded as to the names, size of families and other details of the occupants of the houses. The opportunity afforded by this special housing survey was used to obtain additional information about the families, and records were made and maintained as to the age and sex of each individual, state of employment and so on of the families dwelling in the area. This information, used in conjunction with the routine records filed in the Health Department office, enabled an interesting study to be made.

The area was selected merely because the houses in it required special consideration. When the area was first defined upon a map, no thought was given to the economic circumstances of the inhabitants; it was the houses and not their occupants that brought this particular area under special notice. This area is triangular in shape, one side

being bounded by a railway, another by an arterial road and the base by a main road. The whole of the houses in this triangle were inspected and, particulars of the whole of the occupants were recorded.

The total number of houses in the area is 745, the number of families 803. During the course of the collection of data incidental to a survey of the area it appeared that the inhabitants could be divided into employed and unemployed families. The housing conditions in the area were more or less uniform, nearly all the houses being of similar type, and there was no great variation in their rents.

After the data had been collected and recorded, an analysis was made of the details relevant to a social study of the population.

It was found that 369 families were unemployed and had been so for six months or more. In the majority of the families the period of unemployment greatly exceeded six months, and in quite a considerable number of the families it fell between three and six years.

The number of families who were and had been more or less continuously employed totalled 408. •

These 777 employed and unemployed families fall short of the total number of families in the area by 26. These 26 (103 persons) families and their records were discarded because they could not,

with justice, be assigned to either employed or unemployed group. They had either been employed and had recently fallen out of work, had been unemployed and had recently obtained employment, or had been so intermittently employed that they could not be assigned to either group.

The records of the 777 families extended over a period of four years.

There existed therefore two groups of families. One group consisted of 369 unemployed families containing 1,572 persons; the other group consisted of 408 employed families, containing 1,564 persons. Numerically the personnel of the two groups was almost identical, but that is entirely fortuitous.

Of the unemployed group 8 had been out of work for from 6 to 8 months. The period of unemployment of the remainder varied from 1 to 14 years.

There was some difference between the average size of family in the two groups. For the employed it was 3.83 persons per family; for the unemployed, 4.26. The difference may appear considerable, but it is interesting to note that the mean size of family of the total area population was 4.036 persons, which is almost identical to the mean size of family in the Borough of Stockton-on-Tees as shown by the 1931 census, viz. 4.06.

The total population under review amounted

TABLE 48

Population, deaths and crude death-rate per 1000
of unemployed :

Year	Number of Deaths	Population	Crude Death- rate per 1,000
1931	51	1,604	31·79
1932	36	1,588	22·67
1933	39	1,572	24·80
1934	35	1,556	22·49
Totals	161	6,320	25·47

The corresponding figures for the employed
population were :

1931	30	1,595	18·80
1932	32	1,579	20·26
1933	22	1,564	14·06
1934	28	1,549	18·07
Totals	112	6,287	17·81

to 1,564 employed and 1,572 unemployed. These two figures added together amount to 3,136. This total is between 4 and 5 per cent of the total population of the Borough and appears to be of sufficient size to yield results of value.

The weekly income of each of the 777 families was known. Calculations showed that (1) the mean

income of the 369 unemployed families was 29s. 2½*d.* per week.

(2) That of the 408 employed families was 51s. 6*d.* per week.

As the name and address of each of the 777 families was known it was a simple matter to search the Health Department records for the deaths which, over a period of four years, occurred in each family.

The results of this search are interesting, and are summarised in Tables 48 and 49.

These crude death-rates appeared to show a higher death-rate among the unemployed than among the employed, but as crude rates are not necessarily comparable the age and sex distribution of the individuals in each group of the population

TABLE 49

Standardised death-rates per 1000 population:

Year		Unemployed		Employed
1931	..	36·56	..	22·18
1932	..	26·07	..	23·90
1933	..	28·05	..	16·59
1934	..	25·86	..	21·32
		29·29		21·01
	Means	29·29	..	21·01

were compared and the rates were standardised.

The standardised death-rates for the two populations are shown in Table 49.

Statistically the mean rate is 3.7 times greater than the probable error and is definitely significant.

The authors have an intimate personal knowledge of the area in which these families reside, and there appears to be no material variation in the environmental conditions of the employed and unemployed families dwelling in the area, yet the difference shown above in the standardised death-rates occurs. The difference in the two rates is startling.

As the age and sex distribution of the individuals comprising each group is accurately known, the "expected death-rate," i.e. the death-rate in proportion to the death-rate for the whole country, can easily be calculated. A comparison of these rates is given in Table 49. These rates are given as the means of the four years.

	Unemployed	Employed
Expected deaths	54	53
Actual deaths	161	112

The annual expected rate was, for the unemployed, according to sex and age distribution, 8.75 per 1,000 as against an actual death-rate of 29.29 per 1,000. For the employed the expected rate was 8.53

per 1,000 as against an actual rate of 21.01 per 1,000.

These rates are certainly high, but they should be compared with the rates for the Mount Pleasant and the Riverside Areas which have been previously discussed.

These statistics may be summarised as follows:

107 more unemployed persons died during four years than, by the normal expected rate, should have died.

59 more employed persons died during the four years than, by the expected rate, should have died.

Epidemic incidence and death-rate were during the four-year period insignificant and cannot be assigned as a relevant factor in the death-rate of either group. External environmental factors in each group appeared to be identical. By a process of exclusion it would appear that income, as expressed by purchasing power, is the only variant which correlates with the variant death-rates.

The primary object of this volume is to set out facts, not to make deductions, but it would, from the evidence so far available, appear that the incidence of physical defects and death-rates is associated with nutritional factors and that the nutritional state is closely connected with purchasing power. This conclusion is a matter of considerable

importance to the State and is not merely a matter of local consideration.

In the past various investigators have correlated death-rates with environmental factors, such as overcrowding, and with other factors, e.g. nature of employment; but, so far as we are able to ascertain, no figures have been published showing correlation between death-rates and income level. In order that comparison between death-rate and income level may be made, a detailed social survey of the population under review must first be made. So far as the Stockton-on-Tees investigations go, and it is admitted that they are limited in extent, it would appear that there is a relationship between death-rates and income level. This is shown in Table 50.

The 777 families were arranged in groups according to income level and the deaths occurring in each group were calculated as a rate per 1,000 persons of each group.

It would be unwise to dogmatise on the significance of these rates until the results of further comparable investigations become available, but it does seem suggestive that there should be, even among this limited number of people, such a regular decline in death-rate with regular increase in income level.

If the apparent significance of the rates in this

TABLE 50

Death-rates in groups arranged according to income level

1		2		3		4		5
Income per week in shillings	..	Population	..	Crude Death-rate per 1,000	..	Expected Death-rate per 1,000	..	Standardised Death-rate per 1,000
25s.-35s.	..	1,187	..	30.96	..	12.03	..	25.96
35s.-45s.	..	712	..	18.60	..	9.65	..	19.34
45s.-55s.	..	690	..	17.02	..	8.90	..	19.23
55s.-65s.	..	275	..	12.72	..	8.47	..	15.13
65s.-75s.	..	132	..	13.25	..	9.87	..	13.51
75s.- +	..	140	..	9.00	..	7.89	..	11.52
		9,136						

The rates in columns 3, 4, and 5 are means of a four-year period.

DIAGRAM 6 TABLE 50 RELATION
 BETWEEN INCOMES & DEATH-RATES

INCOMES PER WEEK DEATH-RATES PER THOUSAND

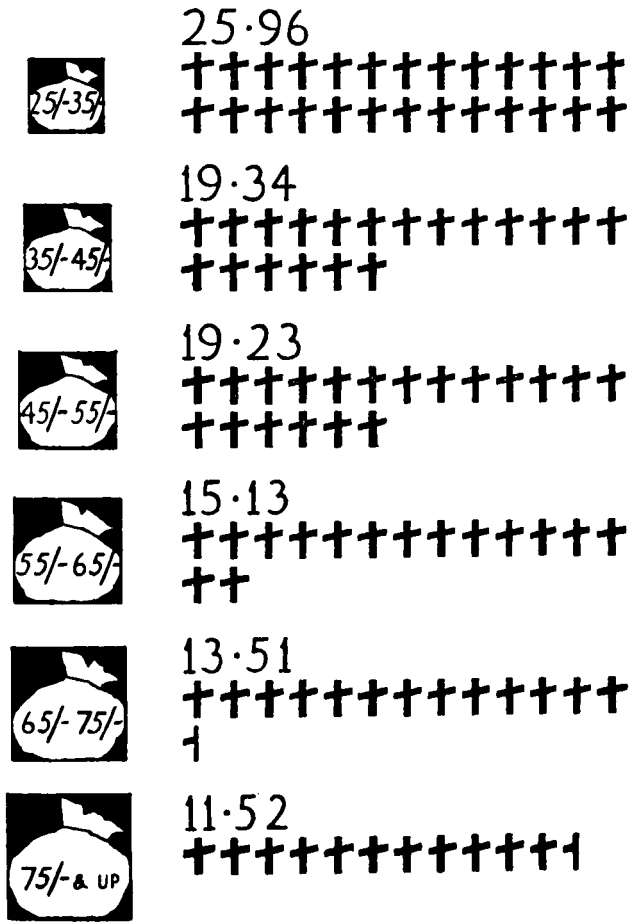


table is subsequently shown to be even approximately valid, the social and economic implications will demand profound consideration. It is because of the magnitude of the issues involved that caution is necessary; but the striking nature of the findings in the present social study precludes the possibility of their being entirely ignored.

The data contained in this volume have been collected with care, and we believe that they represent facts. It would be advantageous if other workers had made similar investigations and if their results were available for comparison; the more information that becomes available the less the likelihood of error. Social surveys have, it is true, been made elsewhere, but they have not been planned on identical lines. The results of such surveys do, however, show that large numbers of families are forced to exist below the economic level of sufficiency.

It does appear that the nutritional and physical condition of families is closely associated with financial status. Incompetent marketing may, in some instances, be a factor predisposing to malnutrition, but it would be easy to exaggerate its effect. The generality of housewives expend the available income wisely and well. It is difficult to see how the average housewife can improve on her present methods of food purchase and household management.

It is no part of our task to suggest remedies or to indicate how they should be applied. This task must devolve upon others.

The phenomena described and discussed in this book appear to be of sufficient importance to form a basis for further investigations, and it is earnestly hoped that other workers will carry on the work and expand it.

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capacity and the costs thereof, together with consideration of the necessary domestic overhead charges, indicate that a considerable proportion of the population is, of necessity, subsisting below the safety line of adequate nutrition. Detailed consideration of family budgets at different income levels indicates a positive ratio between income and diet and, further, that the death-rate of a community is not unassociated with its income level. The social and economic implications of the data contained in this volume are far-reaching.

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