

III

NATIONAL HEALTH AND NUTRITION

To one whose work has lain in India, and who for more than twenty years has been engaged in a study of the relation of faulty food to disease, the belief that such food is of paramount importance in the causation of disease amounts to certainty. For there he meets with 'deficiency diseases' of every kind: xerophthalmia, night-blindness, beri-beri, malnutritional œdema, scurvy, rickets, osteomalacia, pellagra, angular stomatitis and certain skin diseases that are of this order. There, too, he encounters many maladies, not usually regarded as of malnutritional origin, which experience, both in the laboratory and the field, teaches him to regard as wholly or in part of this nature: gastro-intestinal diseases of various kinds, including non-specific colitis and peptic ulcer, certain respiratory diseases often found in association with xerophthalmia, urinary calculus, some ulcers and cardiac disorders, pyorrhœa and a number of others. Further, he soon becomes aware—if he had not available for his enlightenment the testimony of many shrewd observers who have gone before him—that malnutrition is a chief cause of the lowered resistance to infection exhibited by so many of the Indian people; the chief reason why they succumb by hundreds of thousands to the ravages of such scourges as malaria, kala-azar, cholera, dysentery, leprosy and tuberculosis. For him the soil assumes an importance even greater than the seed, and he becomes impressed by the urgent necessity to render it inhospitable to the growth of the seeds of disease by adequate nourishment of the body.

If we look upon 'infection' of whatever kind, be it due to microbe, protozoa, metazoa, or invisible virus, or to the intervention of vectors of pathogenic agents, as the evidence of personal or environmental uncleanness, then it may be said that the two chief causes of disease are faulty food and dirt. These two are the senior partners in the criminal business of disease-production—each the coadjutor of the other. It is along lines of improved cleanliness, both personal and environmental, that the triumphs of modern medicine have lain; it is along lines of improved nutrition that greater triumphs still remain to be achieved. Some years ago I made the statement that 'the newer know-

ledge of nutrition is the greatest advance in medical science since the days of Lister. When physicians, medical officers of health and the lay public learn to apply the principles which this newer knowledge has to impart . . . then will it do for medicine what asepsis has done for surgery.' I see no reason, in these later days, to detract from this view; on the contrary, there is every reason to emphasize it the more, particularly in regard to preventive medicine.

In this country the conviction that faulty food, and the faulty nutrition resulting from it, is a principal cause of ill health, does not appear to be acquired so readily as it is in the tropics. Perhaps it is that as an island race we have no others, at close range, with whom to compare ourselves. The tribes of the Indian Frontier are far removed from the slums of our great cities; and it would be as difficult for the slum-dweller to realize the perfection of physique to which these tribes attain, though nourished on the simplest and least varied kinds of foods, as it would be for the Frontier tribesman to understand that the physical imperfections of so many of the dwellers in the slums are largely due to the imperfections of the foods on which they are reared. Nevertheless, things nutritional are not, in essence, so different in India and in England as they may seem.

Diet and Incidence of Disease

Let me remind you of the experimental contrast to which I drew your attention in my first lecture (Fig. 3). You may remember that the great majority of the rats in that experiment enjoyed good health when fed on a well-constituted diet such as is used by Sikhs of the better class, while the great majority of those fed on an ill-constituted diet, such as is commonly used by the poorer classes in this country, developed two chief kinds of disease: respiratory and gastro-intestinal. You may remember also that the majority of rats fed on a diet in common use by the people of Madras also suffered from disease of these two systems of the body. The diet of the poorer class Britisher was, in fact, little or no better, so far as disease prevention was concerned, than that of the Madrassi. Here, now, is a diagram prepared from the material provided in the Annual Report of the Chief Medical Officer of the Ministry of Health for the year 1933 (Fig. 5). You will observe that amongst every 1,000 sick persons of the insured classes in England and Wales no less than 250 suffered from diseases of the respiratory system, and no less than 110 from diseases of the digestive system. Diseases of these two systems of the body accounted for more than one-third of all illness in these classes of the community. A similar diagram, prepared from the

Report (1933) of the Surgeon-General with the Government of Madras, reveals that amongst sick persons of the hospital class in Madras, no less than 183 out of every 1,000 suffered from diseases of the digestive system and 76 from diseases of the respiratory system; or more than one-quarter of the total sick. If from the calculation we remove the

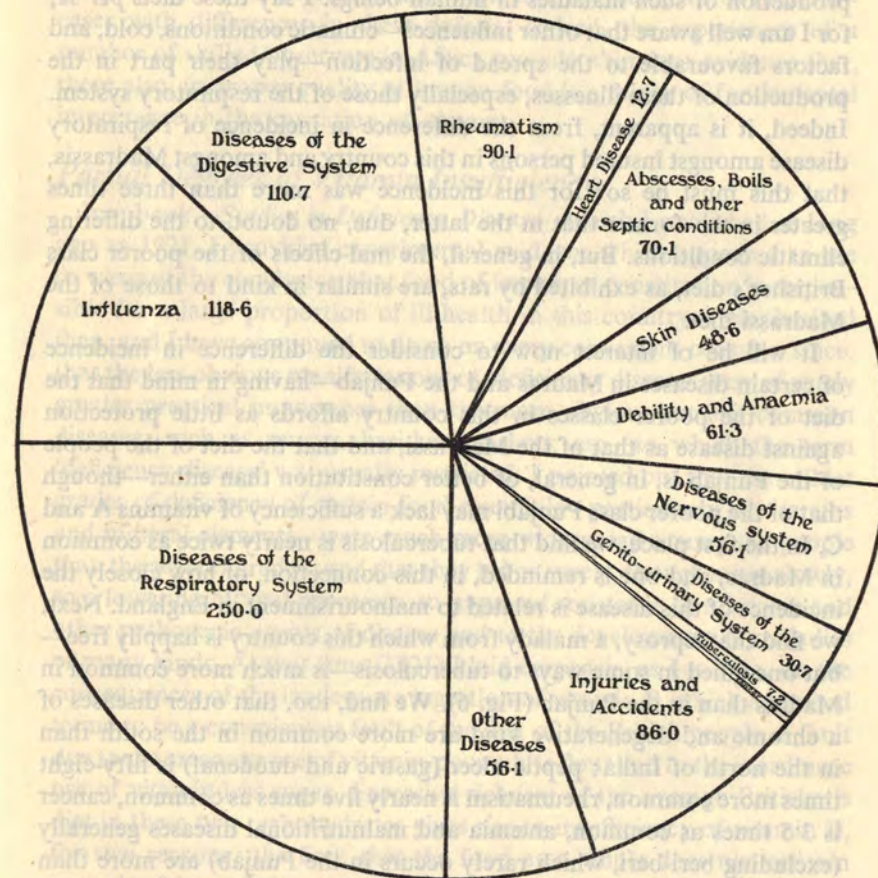


Figure 5. Insured persons in representative areas, urban and rural, in England and Wales—proportion per 1,000 cases of certain diseases to total cases treated by Insurance Practitioners, 1933. (Prepared from the Annual Report of the Chief Medical Officer of the Ministry of Health for the year 1933)

sufferers from purely tropical ailments, then in Madras also disease of these two systems of the body would account for approximately one-third of all sickness. I submit that if these diseases be, as they are, a chief

consequence of feeding rats—living in an equable climate and as far as possible protected against infection or influences favouring it—on a diet in common use by the poorer class Britisher and, also, a chief consequence of feeding them on a diet in common use by the poorer class Madrassi, then these diets *per se* are likely to be favourable to the production of such maladies in human beings. I say these diets *per se*, for I am well aware that other influences—climatic conditions, cold, and factors favourable to the spread of infection—play their part in the production of these illnesses, especially those of the respiratory system. Indeed, it is apparent, from the difference in incidence of respiratory disease amongst insured persons in this country and amongst Madrassis, that this must be so; for this incidence was more than three times greater in the former than in the latter, due, no doubt, to the differing climatic conditions. But, in general, the mal-effects of the poorer class Britisher's diet, as exhibited by rats, are similar in kind to those of the Madrassi diet.

It will be of interest now to consider the difference in incidence of certain diseases in Madras and the Punjab—having in mind that the diet of the poorer classes in this country affords as little protection against disease as that of the Madrassi, and that the diet of the people of the Punjab is, in general, of better constitution than either—though that of the poorer class Punjabi may lack a sufficiency of vitamins A and C. In the first place, we find that tuberculosis is nearly twice as common in Madras, and one is reminded, in this connection, of how closely the incidence of this disease is related to malnourishment in England. Next, we find that leprosy, a malady from which this country is happily free—but one allied in some ways to tuberculosis—is much more common in Madras than in the Punjab (Fig. 6). We find, too, that other diseases of a chronic and degenerative kind are more common in the south than in the north of India: peptic ulcer (gastric and duodenal) is fifty-eight times more common, rheumatism is nearly five times as common, cancer is 3.5 times as common, anæmia and malnutritional diseases generally (excluding beri-beri, which rarely occurs in the Punjab) are more than twice as common; rickets is four times as common. Diabetes and mental disease are three times as common, disorders of the heart four times, nephritis ten times, and infestation by round worms twenty times as common in Madras; while ulcers, skin diseases and various other local ailments are all more common in Madras. These differences in the incidence of disease can, I think, be accounted for in large part by the difference in the nutritive quality of the diets of the two peoples; and in view of the poor quality of the diet of many of our own people, they

are, to say the least of it, suggestive. They suggest that a similar relation of food of poor quality to the incidence of human ailments may be expected in other countries and in other peoples. That such a relation actually does exist elsewhere is exemplified by the studies made by Drs. Orr and Gilks of two African tribes whose diseases could be correlated with the defects of their diets and the incidence of these diseases with differences in these defects. Indeed, the experiences of a number of skilled observers in Africa provide abundant evidence that, there also, improper quality of human food is a factor of fundamental importance in the causation of disease.

Partial Degrees of Vitamin Insufficiency

In a book—*Studies in Deficiency Disease*—which I published as long ago as 1921, I provided experimental evidence which appeared to me to warrant the conclusion that food of improper constitution is responsible for a large proportion of ill health in this country. I emphasized then, and I have continued to do so on every convenient occasion since, that the less obvious manifestations of 'deficiency disease' were of vastly greater practical importance than the more obvious but less common diseases, such as scurvy, beri-beri, rickets, etc., to which the term 'deficiency disease' was usually restricted. I pointed out that the milder grades of deficiency of certain food-essentials—particularly of vitamins and mineral elements—were much more widespread among the people than the severer grades; and that they led as surely, though more slowly, to a lowering of vital processes, to impaired resistance to microbic and other pathogenic agents of disease and to the development of maladies of many kinds. At that time (1921) I laid emphasis, as I still do, on the consequences of the inadequate ingestion of vitamin B₁, which appeared to me to be a conspicuous fault of the diet of the British people, a fault due to the extensive use of vitamin-poor white flour and to the inordinate use of vitamin-less sugar. Excessive richness of the average Britisher's diet in these two carbohydrates gives rise to insufficiency of vitamin B₁, for two reasons: the first, that the food as a whole does not contain enough of it, and the second, that relative to the richness of the diet in carbohydrates this vitamin is rendered still more deficient; for we now know that the greater the consumption of carbohydrates the more vitamin B₁ is needed. Consider, in this connection, the chart which I now show you (Fig. 7). It is self-explanatory and I need not, therefore, amplify its description. It illustrates, however, two things to which I would draw your attention: first, the inadequacy of white flour as compared with freshly-ground whole wheat flour; and second, the striking

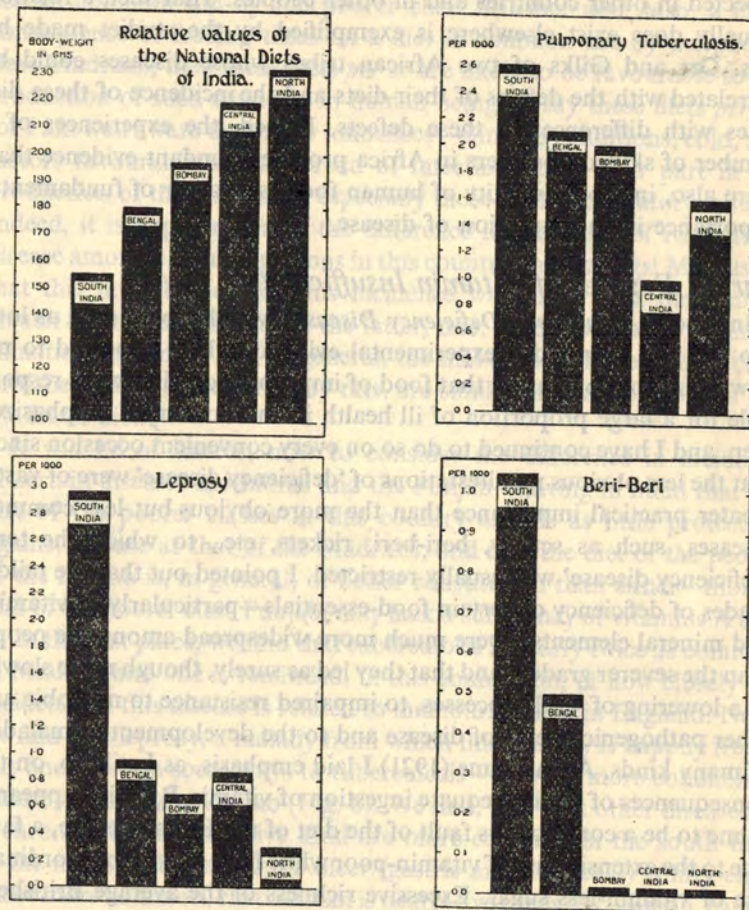


Figure 6. Nutritive values of diets in common use in the five main divisions of India (as determined by feeding experiments on rats) compared with the incidence of certain diseases per 1,000 of sick persons in these divisions.

difference in appearance of rats fed properly from infancy as compared with those who in earlier life have been improperly fed and have to make up for lost time when properly fed at a later age.

In this connection, also, let me draw your attention to the results of a large-scale experiment, carried out by Professor J. C. Drummond and his colleagues, to which he made reference in his Harben Lectures for 1933. This experiment was designed with the object of learning whether or not mild degrees of vitamin B₁-deficiency gave rise to disease, when animals (rats) were fed for long periods on food having this fault but otherwise satisfactory. Speaking of the results of this experiment, and of the kinds of disease from which the animals suffered, he said: 'He (McCarrison) is unquestionably right in insisting that vitamin-deficiency—and it must be remembered that he stresses at every turn the importance of recognizing the widespread occurrence of *mild* deficiency—is directly or indirectly responsible for a very large proportion of ill health to-day.' And in his Lane Medical Lectures, a year later, he repeats with even greater emphasis the same assertion. It is not only amongst the poorer classes in this country, but also amongst those who are better off, that the diet is commonly excessively rich in vitamin-poor, mineral-poor starchy foods and in protein-less, vitamin-less, mineral-less sugar. It is impossible for people subsisting on such diets to remain in good health. 'It is only being gradually realized,' says Dr. Friend, whose recently published book, *The Schoolboy*, is so valuable a contribution to the problems of food and nutrition, 'that the deficiency of white bread in vitamin B is one of the most serious dietary deficiencies to which our populations are being subjected at the present time.' To this I would add that the inordinate use of refined sugar is one of the most serious addictions of the day. That the insufficient ingestion of Vitamin B₁ is an important and widespread cause of ill health—especially of gastro-intestinal ill health—is now recognized in America, where 'the bread-meat-potato-sugar' diet of many American people has recently been shown to be dangerously low in this important factor, unless it is supplemented with a sufficiency of milk, eggs, fruits, nuts and vegetables (Sure, 1933). And if in America, why not in this country also, where the average diet is of the same 'bread-meat-potato-sugar' sort? According to American observers the mal-effects of such a diet are chiefly to be observed in children who exhibit poor appetites, poor growth, nervousness, constipation and other digestive disorders: effects which I observed, and recorded, in monkeys eighteen years ago. For many years past I have advised European mothers in India to supplement the feeds of their infants with a watery extract of yeast in order to

ensure an abundant supply of vitamin B₁, which cows' milk certainly does not provide in that country. A similar recommendation is now widely made in America, following the finding that not only cow's milk but the pooled breast milk of nursing women is relatively poor in vitamin B₁—poor because the women's own diets are poor in it. Many experiments have been made within the last few years on American children, the results of which show the good effect of the supplementary provision of vitamin B₁: better growth, better appetite, better assimilation of food and greater freedom from digestive disorders. Some clinicians in that country have come to the conclusion that a large proportion of the infantile mortality during the first year of life which is associated with gastro-intestinal disturbances may be due to vitamin B₁-deficiency consequent on the relative poverty of mother's milk and of cow's milk in this vitamin; a conclusion that has also been reached recently by certain observers in the Near East.

National Ill Health

What evidence is there of physical inefficiency in this country? and what that such as may exist is related in its origin to faulty nutrition? For answer to the first of these questions I must turn to certain authoritative publications. From the first of these—the Report of the Adjutant-General for the year 1934—I quote the following passage: 'What was disconcerting to any citizen with a care for the good of his country was that over 52 per cent of the men who went to the recruiting office did not come up to the physical standard laid down. In the big industrial areas of the north the percentage of rejections rose to sixty-eight.' The opinion of a high military medical authority was that the chief cause of the men's rejection was malnutrition during childhood. These figures are in themselves sufficiently disconcerting, but more so perhaps when it seems likely that the men who did present themselves for recruitment were not so physically impaired as many who did not. And if so high a percentage of men failed to come up to the by no means exacting physical standard laid down by the Army authorities, how many of their womenkind were likely to be physically inefficient?

Another example, also of recent date, is still more disturbing: Not long ago the Pioneer Health Centre in Peckham carried out a survey of families of the artisan class, for whom the centre is intended. This survey revealed that 90 per cent of those over twenty-five years of age had some physical defect. From another source I glean the following statement: 'Among the insured population there were lost in 1933 a total of 29,000,000 weeks of work. To this staggering loss must be added the

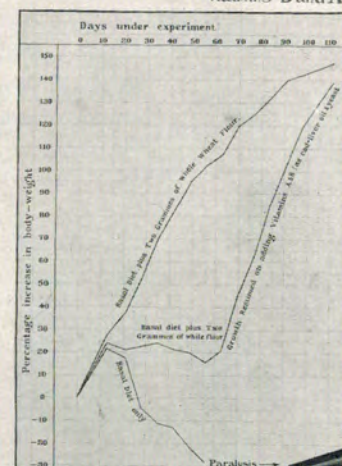
VITAMIN-VALUES OF WHOLE WHEAT FLOUR AND WHITE FLOUR.



Rat fed on basal diet plus whole wheat flour: appearance on 110th day of experiment.



Rat fed on basal diet plus white flour for 63 days and thereafter on the same diet to which vitamins B and A were added: appearance on 110th day.



Percentage increase in body-weight of three groups of rats fed as stated in the chart. The basal diet caused paralysis in the rats fed upon it. It consisted of starch 60 parts, meat-residue 20 parts, olive oil 10 parts and salt-mixture 5 parts. Cod liver oil 2 parts and yeast 3 parts were added on the 63rd day to the diet of the white flour group.



Rat fed on basal diet plus whole wheat flour: appearance on 47th day of experiment. The same rat is shown above on the 110th day.



Rat fed on basal diet plus white flour: appearance on the 47th day of experiment. The same rat is shown above on the 110th day.

Figure 7

cost of replacement of labour and the expense entailed in the care of the sick during the period of incapacity. These figures represent a heavy burden upon the community which is largely unnecessary.' It is a burden however, that the community must continue to bear until it has learned that to be physically efficient the individuals comprising it must not only be taught to practice the principles of nutrition, but be provided with the means to practise them. It is to be noted in connection with this enormous amount of certified sickness that it was not of the killing kind—the people were sick but not mortally sick'.¹

There is, too, the very high incidence of anæmia, due to deficiency of iron, in working-class women, to which attention has recently been drawn by Professor Davidson of Aberdeen. 'If', he says, 'the percentage of anæmic women found in Aberdeen is present in the industrial areas of the South (and we believe that anæmia may be even more serious there, since economic conditions are worse and the cost of living higher) then the loss of economic efficiency of the working-class mothers in this country must be enormous.'

The still very high incidence of tuberculosis, especially in adolescence, is another outstanding evidence of national ill health: 'During the last completed decade, 1921–30, there were, roughly speaking, forty-five thousand deaths of males and an equal number of females at ages 15–30. Amongst the males very nearly one-third of this mortality was due to tuberculosis while amongst the females the proportion was as high as one-half.'² It seems probable that a principal, if not a paramount, cause of this high incidence of, and mortality from, tuberculosis at this particular period of life is faulty food deficient in vitamin A, involving a low content of this vitamin in lung tissue and consequent susceptibility of the lung to infection.

As a final example of the prevalence of physical inefficiency, malnutrition in childhood may be cited. 'In his Annual Report for the year 1934, the Chief Medical Officer of the Board of Education repeats the emphasis of former reports on the necessity for satisfactory nutrition. During the routine medical examination 12 children per 1,000 were found to be malnourished and 14 per 1,000 undernourished' (I quote from the *British Medical Journal*). It may be taken as certain that a major proportion of this faulty nutrition was due to food of improper quality or to insufficient food or to both. Believing, as I do, that sickness is more often the result of malnutrition than malnutrition the result of

¹ *Spectator*, Oct. 19, 1934, p. 586.

² Report of the Chief Medical Officer of Health, 1933.

sickness, I venture to think that the evidences of malnutrition in school-children are likely to be more widespread than these figures indicate. For it is not only that children suffering from malnutrition are under-weight or under-grown; that there is a disproportion between their weight and height; that their posture is poor; that they are often round-shouldered and have protruding bellies, winged scapulæ and lordosis; that they are of poor muscular development and easily fatigued; that they are irritable, haggard, anxious and, perhaps, mentally slow if not precocious; that they are wakeful, restless, and often troubled with unpleasant dreams; that they have headache and fleeting pains, sometimes in one part of the body, sometimes in another; although all these are signs of malnutrition. But there are others, indicating disturbances in structure or in function of organs or parts of the body: the circulation is poor; the skin is mottled or dry and hot, or moist, cold and clammy; there is usually anæmia; the digestive system is quite commonly unstable or disordered, constipation is frequent or may alternate with diarrhoea, the appetite is capricious—the desire for 'sweets' is often inordinate—dental caries is the rule—and susceptibility to infection is very marked, especially infection of the upper respiratory passages. It is well enough to say that malnutrition may be brought about by faulty health habits or by physical defects, such as dental decay or gastro-intestinal disorder; it may. But these physical defects, this bad or capricious appetite, this constipation or digestive disturbance, this anæmia, this poor circulation, this faulty function of the skin—these are themselves consequences of faulty nutrition and, as a rule, it is this that gives rise to them, not they that give rise to the faulty nutrition. If we take this view of 'mal-nutrition' in schoolchildren—and for my own part I believe it to be the correct one—then it will be found that there are in this country not 12 per 1,000 who are suffering from it, but several times that number; nor will it be found to be confined exclusively to the poorer classes. Indeed, the widespread incidence of dental caries and of minor rickets is, in itself, sufficient evidence that this is so. There is one certain means of detecting dietetic malnutrition and that is by the assessment of the nutritive value of the diet that is actually being consumed; and in making this assessment attention must be paid as much to such essentials as calcium, phosphorus, iron and iodine as to vitamins, proteins and energy-bearing foods. If the diet does not contain in adequate amounts all elements and complexes needed for normal nutrition, then the user of it is suffering from, or will suffer from, malnutrition. It seems probable that a cause of malnutrition which may be overlooked is the non-provision of sufficient energy-bearing foods to meet the enormous

expenditure of energy by growing children consequent of their bodily activities in sports and games.

The Death-rate and National Health

It is commonly stated that because the death-rate in this country is falling the national health is improving. Recently a writer in *The Listener*¹ voiced his dissent with this statement so pertinently that I am prompted to quote the major part of his letter, though recognizing that the falling death-rate is an achievement of which the public health services have every reason to be proud. This writer says, 'Again and again this fallacy appears in the Press. Why is it assumed that a falling death-rate connotes a higher standard of health? To save a man's life by drugs or surgery does not necessarily make a healthy man of him. The national health is the sum total of the healths of individuals; it can be nothing else. If the reasoning "low death-rate, therefore good health" is sound, then if in an institution filled with incurables there is no death during the year, the death-rate becomes nil, and consequently the institution the healthiest place in England, though there is not a single healthy person in it.' The same writer goes on to say: 'What we should like to know is the number of semi-invalids carried by the nation; why all hospitals and nursing homes, etc., are full. . . . Why, under National Health Insurance, the increase between 1920 and 1930 of short-term (not exceeding six months) sickness was 109 per cent, of long-term (exceeding six months) 230 per cent; why the enormous decline in quality of eyes and teeth.' I am convinced that faulty nutrition due to the long-continued use of food of improper quality provides a no inconsiderable part of the answer to these questions.

Effects of Improved Diet

What evidence is there that by the provision of properly-constituted food, and of the hygienic amenities that should go with it, the physical condition of the people can be improved and disease prevented? There is, to begin with, the evidence provided by Dr. Cory Mann, at the instance of the Ministry of Health and the Medical Research Council, which demonstrated the unique value of milk as a food and the great improvement brought about in the physical condition of children by its adequate provision. Similar results have within recent years been obtained by investigators in Scotland. There is abundant evidence of the value of the free meals now issued, in increasing numbers, to poorer class schoolchildren, and of the value of the cheap milk made available

¹ 20th November, 1935.

by the Ministry of Agriculture. In a private communication which Miss Joan Fry made to me some time ago she spoke of the improvement in the health of the children of the unemployed allotment holders, under the beneficent scheme of the Society of Friends, consequent on their greater use of fresh vegetable foods. But perhaps the most valuable, because the most extensive and complete amongst investigations of the kind, is that recorded by Dr. G. E. Friend, Medical Officer of Christ's Hospital, Horsham. In his book, to which I have previously referred, he recounts the dietetic history of the school and the results of his physical and clinical surveys. These show that during the period for which reliable data have been collected there is a continuous upward trend both of weight and height of the boys consequent on improvements effected in the school dietary. Further, there is a definite decline in certain classes of illness, particularly of septic conditions, a diminution in the amount of dental caries, and a remarkable drop in the incidence of fractures and bone injuries. It cannot be doubted but that these results are in great part due to dietetic improvements, though improvement in hygienic conditions generally no doubt contributed its share to them. Nor have I any doubt in my own mind that had the dietetic improvements approached nearer to the provision of a perfectly-constituted diet, their beneficial effects would, with respect to the health of the boys, have been still more striking.

Chief Faults of British Diets

If now we turn to the Report of the Chief Medical Officer of Health for the year 1933, we find therein a certain uneasiness that all is not so well with the nutrition of the British people as it might be. It is affirmed that the evidences of malnutrition are not widespread. This is no doubt true of its grosser evidences. But is it true of the less obvious manifestations of faulty nutrition? If, as I maintain, the latter include many forms of subnormal health, not all of which are scheduled in the Nomenclature of Disease, and of chronic ill health—many, in short, of the commoner degenerative ailments from which the people suffer: digestive, respiratory, osseous, arthritic, cardiac, hæmic, glandular, inflammatory, etc.—then are the evidences of malnutrition, indeed, widespread.

We may read in this Report that the food-essentials most likely to be deficient in the diets of the people of this country are proteins of high biological value, calcium, iron and vitamins A and D; and we may, perhaps, conclude from the use of the words 'most likely' that the diets of our people are not uncommonly deficient in one or more or all of these essentials. If you are inclined to accept my own opinion, after what

I have told you, there may be added to these likely deficiencies that of Vitamin B₁. I was assured recently by one who labours in the East End of London that such 'fresh' vegetable foods as ultimately penetrate into that locality are usually many days old; and I am reminded, in this connection, of certain interesting observations made some time ago by one of my Indian assistants. He found that within seventy-two hours of gathering green vegetables from my well-tended kitchen garden in Coonoor, they lost the major part of their vitamin C content. I do not know whether the rapidity of this loss would be as great in England, where climatic conditions are so different; but it seems safe to assume that by the time their sparse supply of leafy vegetables reaches the dwellers in the East End of London the vitamin C content is considerably reduced. From which assumption I would be inclined to expect an inadequate intake of vitamin C by relatively large numbers of people in the slums of our great cities. But it is no longer necessary to make such assumptions, for in the 'Report on the Physiological Bases of Nutrition', recently submitted by a committee of experts to the Assembly of the League of Nations, it is stated that 'deficiencies in important nutrients are a common feature in modern diets; and these deficiencies usually occur in the protective foods (foods rich in minerals and vitamins) rather than in the energy-giving foods.' [The comment may, however, be made that the deficiencies do not occur in the protective foods themselves, but in modern diets because of the scanty use of the protective foods.]

We have, too, the authority of the Committee on Nutrition set up by the British Medical Association (1933) that 'a shortage of calcium, phosphorus and iron is not uncommon' in the diets of the people of this country. Let us, for a moment, refer back to my second lecture and see again what this not uncommon shortage means. It means, or may mean according to the degree of shortage, impairment of every vital function, stunting of growth, poor physique, poor bone formation, softening of bone, rickets (not necessarily of the florid type), tooth decay, crooked spines, impairment of muscular efficiency, including that of the gastrointestinal tract and heart, abnormal response of the nerves to stimuli, tetany, disturbance of menstruation and lactation, disturbance of the neutrality of the body and of the interchange of body fluids, anæmia and all its attendant consequences. This is what a shortage of calcium, phosphorus and iron means. And if with these we are to include a shortage of vitamins A and D, as the Report of the Chief Medical Officer of Health suggests we may, and of vitamins B and C—as there is good reason to believe we should—then to these consequences of

mineral shortage there are to be added those of vitamin shortage, in themselves a formidable array and not the least important of which is lowered resistance to local infections. To those who do not know what the shortage of these essentials means, the mere statement that it commonly exists is not impressive. But to those who do—and you are now amongst that number, if you were not so before—it must be obvious that faulty food is directly or indirectly responsible for a very large proportion of ill health to-day. If it be not, what then is its cause? You may search in vain for a more satisfying explanation of it.

Prevention of Disease by Diet

Concerning the matter of disease prevention and of the part which properly constituted food may play therein, I need give only three examples: the first provided by Miss Margaret McMillan in her book *The Nursery School*—which should be an obligatory text-book for every student of medicine; the second by the Papworth Village Settlement for sufferers from tuberculosis; and the third by the ante-natal work now being done in Dublin. Many others could, of course, be given. Hear what Miss McMillan had to say of the weakly and ill-conditioned children who came from the slums of Deptford to her nursery school; children, rickety and bronchitic; children with adenoids and dental caries; children with inflammatory states of eyes, nose, ear and throat. After they have been nurtured and properly fed for three or four years they are, she tells us, almost all cured of any ailments they may have had, 'they are all straight and well grown, the average child is a well-made child, with clean skin, alert, sociable, eager for life and new experiences'. He does not need, she says, to see the doctor or the dentist, and he has none of the minor ailments that affect the children of the slums. Surely this is an achievement of the highest order, an answer to the question how best to deal with 'the minor ailments that affect the children of the slums', and a cogent reason for the establishment throughout the length and breadth of the land of nursery schools of the McMillan type. It is a heartening sign of the times that the present Government intends actively to encourage their establishment.

And at the Papworth Village Settlement for the subjects of tuberculosis, what do we find? That in this village of 400 persons no child born there during the twenty years of its existence has, while a member of the community, contracted tuberculosis of the lungs, bones, joints, cerebral membranes, nor indeed any clinical form of the disease. Yet these children are the offspring of parents who suffer from tuberculosis and are in constant contact with them. How has this remarkable

achievement been brought about? Sir Pendrill Varrier-Jones, to whose endeavours it is due, explains it as follows:

'1. Adequate food supply. Ignorance as to dietetic values is dispelled by advice at the clinic, by lectures and by the village nurse. Also by actual demonstration by food supplied from the Central Institution at small cost.

'2. Adequate food supply is possible because there is an adequate and prolonged parental income, maintained by means of assured employment.

'3. Freedom from anxiety as to loss of employment; therefore expenditure can be budgeted in advance.

'4. No risk of unemployment after breakdown; the income being maintained meanwhile (a) in the case of pensioners, by a pension, and (b) in the case of non-pensioners, by the Friendly Societies' contributions supplemented by the Welfare Fund.

'5. Proper housing, which allows medical advice to be put into immediate practice; such as through and thorough ventilation in living rooms; isolation of infected persons in bedrooms or verandas. That is to say, avoidance of mass dose.

'6. Public opinion, which makes it possible to live with windows open without being jeered at; to use sputum pots in the house, and pocket flasks out of doors, without being shunned or made conspicuous.

'To sum up—economic conditions determine the spread or otherwise of disease. To prevent disease it is necessary to create an environment rather than to give a dole where there is no opportunity for money to modify the condition of its recipient. The child's resistance to disease is maintained by (a) adequate nutrition, and (b) the absence of mass dose of infection.'

The ante-natal work which I was privileged to see when in Dublin a few years ago is another activity that is yielding remarkable results, because it is based on the sound foundation of improving the nutrition of expectant and nursing mothers. Three months before the expected birth of their babies the poorer class women come daily to certain centres, where they receive an excellent midday meal. They are cared for during their confinement and a fortnight thereafter they continue their visits to these dinner-centres for another three months. I am told that the infantile mortality amongst the children of these women is approximately one-third of that in women of the same class who cannot or do not avail themselves of these facilities or for whom there are, for lack of funds, not sufficient centres.

Maternal Mortality

There is much talk at the present time of the high rate of maternal mortality in this country, and much argument in regard to factors that may or may not be concerned in its causation. Amongst these faulty nutrition has come in for its share of blame. How far it is to blame we do not yet know, since the matter has never been thoroughly investigated. But it is a false argument which would maintain that because in some places maternal mortality is higher in well-to-do women than in women of the poorer classes, faulty nutrition can have nothing to do with it. For some women amongst the better classes have no idea how to feed themselves properly during or after pregnancy. There is abundant evidence, derived from experiments on animals, that the activity proper to the function of reproduction and to the health of the reproductive tract is influenced unfavourably by faulty nutrition. Of particular importance in this connection is insufficiency of vitamin A. It has recently been found (Mason) that levels of vitamin A-deficiency which are insufficient to produce xerophthalmia result in marked disturbances of the reproductive function in female rats. These include difficult labour, often associated with uterine bleeding and infection. Observations such as these may have an important bearing on maternal mortality in human beings; for of this we may be certain, that unless the diet of the expectant mother conforms in every detail to the physiological requirements of pregnancy her chance of surviving the ordeal of childbirth will be lessened. In my second lecture I mentioned, under the various food-essentials there discussed, the amounts of some of them that are needed during pregnancy. These may be enumerated again: a well-balanced diet containing 70 grammes of protein, of which one-third must be derived from animal sources; an abundance of all vitamins, including vitamin D, which, however, should be provided in the form of cod liver oil so as to avoid the risk of overdosage and as an additional source of iodine; 2 grammes of calcium; 1.6 grammes of phosphorus; 0.3 gramme of magnesium; and 20 milligrammes of iron. Personally, I believe that the best diet for expectant mothers is one made up of whole cereal grains, milk, milk products and eggs, with fresh green vegetable foods and fruit in abundance.

Mention has already been made of the part which antecedent rickets and osteomalacia may play in increasing the risks of childbirth by causing alterations in shape of the female pelvis.

'Building of an A1 Nation'

If I have convinced you of the fundamental importance of food in relation to public health, it will have become obvious that one of the most urgent problems of our time is how to ensure that each member of the community shall receive a diet that will satisfy his or her physiological needs. It is clear that to achieve this much-to-be-desired end many barriers—poverty, unemployment, apathy, ignorance, prejudice, habit—must be surmounted, and many interests—agricultural, industrial and economic—readjusted. To do so is, in the main, a primary function of Government. For, as Carlyle expresses it: 'Wherever the health of the citizens is concerned . . . all governments that are not chimerical make haste to interfere.' During the recent election campaign one read of plans for 'the building of an A1 nation'; ante-natal, child-welfare and maternity services were to be improved and extended; nursery schools for children under school age were to be actively encouraged; increased facilities for treatment, particularly dental treatment, were to be provided; orthopaedic centres and open-air schools were to be formed; the medical insurance scheme was to be extended to include persons of younger age; physical education was to be undertaken. All these are well enough—and laudable; they are, indeed, essential parts of a properly organized policy of health. But without measures that will ensure the better feeding of the people they cannot, like a diet inadequate in vitamins though complete in other regards, achieve the end in view—'the building of an A1 nation'. But while the main burden of achieving this end must rest on Government—and a heavy burden it is—there is much that individuals can do for themselves, much that the medical profession and the professions allied to it can do, much that the teaching profession can do, much that all people of education can do. For they can make it their business thoroughly to acquaint themselves with the principles of nutrition, to practise these principles and to inculcate them in others. These principles are not difficult of comprehension, their practice is simple, and the benefits to be derived from their practice are sure. Fifteen years ago, in a book from which I have ventured to quote already, I wrote as follows: 'With increasing knowledge of nutritional problems, it has become apparent that our dietetic habits need remodeling, and that education of the people as to what to eat and why they eat it is urgently necessary. It is clear that green vegetables, milk and eggs should form a far higher proportion of the food of the nation than is now customary. So far from curtailing the beneficent scheme whereby portions of land were made available during the war for cultivation by

allotment holders, this scheme should be extended and facilities given to allotment holders for the keeping of fowls. Municipalities and other public bodies should concentrate on the provision of an abundance of milk, eggs and vegetables, for there is no measure that could be devised for improving the health and well-being of the people at the present time that surpasses this either in excellence or in urgency.' To-day, fifteen years later, there is little I can add to this exhortation. Its truth is now generally admitted. It is, indeed, the essence of the 'Report on the Physiological Bases of Nutrition' submitted by a special committee two months ago to the Assembly of the League of Nations. It emphasizes two needs, as urgent to-day as when these words were written: the need for education in the principles of nutrition and the need for the employment of many of our 'unemployed' in the production of more milk, more eggs and more vegetable foods. Concerning this matter of the employment of the unemployed, I need only point to the splendid efforts of the Society of Friends; efforts which provided assistance for 120,000 unemployed men in 1934, and enabled them to produce fresh foods to the value of £600,000. I understand that the sole barrier to its further extension is want of funds. In a letter to *The Times*, about ten months ago, I appealed, in this connection, for the more prudent expenditure of public funds. I repeat the appeal here: 'Year by year we import vast quantities of vegetables all or most of which could be produced in our own country and by our own people. Long before these vegetables reach consumers of the poorer classes they have lost, especially those of the green leafy kinds, much of their health-promoting properties. . . . Surely it is prudent to provide our people with these important foodstuffs in a state as fresh as possible. Their production should therefore be greatly extended and their speedy distribution ensured.'

'It is schemes such as that of the Society of Friends for the provision of allotments for the unemployed and for settlement on the land that deserve generous financial support rather than the expenditure of vast sums on the production of a food-material (sugar) whose consumption by the nation as a whole is vastly in excess of the nation's need for it. The need of our people for fresh vegetable foods, procurable at a cheap rate, is great—as great as their need for clean, cheap milk. Thousands of our people stand idle in the market place who would be well employed in the production and distribution of these health-giving foods. It should not be beyond the organizing capacity of a nation that produced a vast citizen army to meet the curse of war to organize a citizen army to meet, by the adequate production and distribution of fresh vegetable foods, dairy produce and eggs, the curse of preventable

disease'. To this last phrase I can add nothing except to say that it envisages what England needs, and needs most urgently; for in this way there lies a solution of some of the problems of agriculture, unemployment, and improvement of national health.

It may, perhaps, be objected that, as it is, we produce more milk than our people can, under present conditions, buy. But the greater consumption of milk is now a national necessity and means must be found to ensure it. Coming from a country where, perforce, all milk must be sterilized by heating, the objections to its sterilization do not appear to me to be so great as some appear to think. It is true that this treatment does deprive it of some of its nutritive quality, but of little that cannot be made good by the adequate use of fresh vegetable foods; while even in its sterilized state, it remains one of the best and cheapest of all food-stuffs. Would it not be possible to sterilize milk in large centres of its production and distribute it in suitably sized sealed tins? Means have been found for the safe distribution of inflammable petrol—a cheaper fluid than milk—can none be found more efficient than the bottle for the house-to-house distribution of contaminable milk? At present the housewife in the slums of our great cities has often no place suitable in which to keep a reasonable supply of milk; the sealed tin might help to solve her difficulty, and a little knowledge help her to keep her supply untainted. However this may be, sterilized milk is vastly better than no milk, or than too little milk however pure it be. This also must be said: the provision of fresh vegetables is complementary to the provision of milk—the one is as much a national necessity as the other.

A notable attempt has recently been made in Bombay to improve the diet of the common people, and, after much trial in schoolchildren, a balanced and very inexpensive diet has been evolved that appears to satisfy physiological needs. This has been achieved by the inclusion in it of whole cereal grains, dried skim milk, soya bean, ground-nut, pulses and green-leaf vegetables. So long as we in England insist on including in our diets the more expensive, though not necessarily the most nutritious foodstuffs, so long will a balanced diet be beyond the reach of many whose means are limited. In a recent authoritative report it is stated that meat is among the 'protective foods'. It is probably so included because it is a rich source of 'good protein' and of vitamin B₁₂. But it is poor in certain other essentials, and is, indeed, one of the food-stuffs whose defects are made good by milk and green-leaf vegetables, to which McCollum originally applied the term 'protective'. As recently as 1934 he writes: 'There are available only two types of protective foods, or foods which are so constituted as to make good the defects

of a white bread, meat, sugar and potato type of diet. These are milk and leafy vegetables.' It is, to my mind, inadvisable to include in the category of 'protective foods' a wide range of expensive foodstuffs, some of which may be beyond the reach of many of our people. By naming meat 'protective', the impression is created that health depends on its inclusion in the diet, which it does not. Far better is it to encourage the use of inexpensive but none the less nutritious foodstuffs (milk, cheese, herrings, wholemeal bread, vegetables, etc.), from which satisfying and well-balanced meals can readily be made at a relatively low cost. It is here that education is called for: education not only in food-values but in the correct and inexpensive selection and combination of foodstuffs.

Education

In this matter of education in the principles of nutrition two of the great professions—the medical and the scholastic—are in a position greatly to aid the endeavours of Government in 'the building of an A1 nation'. In regard to my own profession I may repeat what I wrote fifteen years ago: 'It is for us so to instruct ourselves that we may . . . use our newer knowledge to the end that customs and prejudices may be broken and a more adequate dietary secured for those under our care.' 'There can be no doubt', said the *British Medical Journal*, in a leading article last year, 'but that this newer knowledge of nutrition has placed in the hands of our profession a potent weapon against disease—a potent instrument in the promotion of physical efficiency and well-being. It behoves us, therefore, to become proficient in this knowledge, to apply it in the daily course of our work, and to spread it by every means in our power.' A special responsibility attaches to our medical schools in this respect. 'At present medical students during the early years of their course are given a few lectures and demonstrations dealing with the physiology of nutrition, and perhaps carry out a little laboratory work in this field; the subject is presented as a chapter of physiology, and not as an integral part of preventive medicine.' The authors of the League of Nations Report,¹ from which we here quote, are 'far from suggesting that yet another speciality should be added to the already congested medical curriculum'. But surely a subject that is 'an integral part of preventive medicine' must in the future be given a place in the medical curriculum commensurate with its importance. In its teaching we must be content with no half-measures. The student must have the opportunity to see with his own eyes the havoc that is wrought in the

¹ *Nutrition and Public Health*, 1935.

various organs and tissues of animals subjected to faulty nutrition of various kinds and degrees. Only when the medical profession is itself so instructed, can it play its proper part in the instruction of the public.

The next most important direction in which educational effort is required is in the teaching of the elements of nutrition to schoolchildren: 'We spend millions', said Lord Bledisloe in a letter to *The Times*,¹ 'on feeding the minds of the youth of the nation. Is it not time that we spent a little (as an essential part of all school curricula) on showing those young people how rationally and sensibly to feed their bodies and those of their prospective progeny?' Here he goes to the root of the matter, for it is only by the instruction of youth that the faulty food habits of the people can ultimately be altered and the desire created for those things that be good from the nutritional point of view. This desire will lead to the demand for them, may be translated into the greater production of them and, perhaps, lead also to the return of many more people to the land—a thing greatly to be desired. But to teach the children the teachers must themselves be taught, and this requires the adequate provision in all training colleges for prospective entrants into the scholastic profession of facilities for the acquisition of a thorough knowledge of the subject. These facilities do not, so far as I can learn, now exist, or if existing they are not adequate. Their provision is an urgent matter. It 'should set the Board of Education thinking more deeply on a question which vitally affects our national physique'.²

We have the assurance of Dr. Mary Swartz Rose, Professor of Nutrition, Teachers' College, Columbia University, than whom there is no greater authority on the teaching of nutrition to boys and girls, that it is a subject to which they take readily when it is properly taught. Her own book is a model of how such instruction should be given. An essential part of this instruction, as advocated by Professor Rose, is to give children the actual experience of feeding animals (rats, guinea-pigs) on different diets and to let them see for themselves the influence of food on health and growth.

There are many other directions in which organized effort is needed in regard to education in nutrition: the employment of public health nutrition workers and of 'nutritionists' and 'dieticians', as is now so largely done in America; the teaching of nutrition in schools of domestic science; education work among rural populations; publications and propaganda. These matters are all dealt with at length in a recent publication by the health organization of the League of Nations.³ But behind

¹ 6th November, 1935.

² *Observer*, 17th November, 1935.

³ *Nutrition and Public Health*, IV, February, 1935.

all such effort there is the dark cloud of economic conditions that make it difficult, if not impossible, for large numbers of our people to procure diets that will satisfy their physiological needs. Happily there are signs that this cloud is lifting, and there is no lack of evidence both of desire and of effort to ensure a better way of life for the less fortunate amongst us. Until this cloud is dispelled the distribution of relief in kind might well be resorted to. Collective feeding has much to recommend it, both for workers and for unemployed.

In dealing with a subject so vast as nutrition, the lecturer, perforce, confines himself to certain aspects of it—usually those that have come within his own experience. For my own part, my interests have lain in the direction of learning what I could of the relation of faulty food to nutrition and of both to health and disease; and out of this desire to learn there has come the desire to spread such knowledge of the subject as we already possess. It has been my endeavour, during these lectures, to convey this knowledge to you, in the hope that with understanding there may come belief. Belief that the continued use of properly-constituted food, from the earliest period of development onwards throughout life, is the surest means we have of acquiring and maintaining that condition of body—good health—which is ‘the vital principle of bliss’:

*This Life-joy, like the breath-kiss of the all-ambient air
unnoticed til the lack of it bring pain and death,
is coefficient with the untrammel'd energy
of nativ faculty, and the autometric scale
of all functions and motions, . . .
it is the lordly heraldry of the banner'd flower,
in brutes the vaunt of vigour and the pose of pride,
their wild impersonation of majesty; and in man
the grace and ease of health alike in body and mind,
thatt right congruity of his parts, for lack whereof
his sanity is disabled, main'd and compromised.¹*

ROBERT BRIDGES

¹ From *The Testament of Beauty*, by Robert Bridges (Clarendon Press, Oxford).

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