

Chapter 1

NUTRITION AND HEALTH IN PERSPECTIVE: AN INTRODUCTION

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The interactions of man with his environment are so complex that only an ecological approach to nutrition permits an understanding of the whole spectrum of factors determining the nutritional problems that exist in human societies. For this reason, the number of disciplines with interests extending into the field of nutrition is increasing. Formerly, human nutrition was the domain of the physiologist, the biochemist, and the physician, but the past 25 years have witnessed the awakening interest of the agronomist, the economist, the sociologist, the educator, the planner, and even the politician in this important field. These developments have tremendously widened the scope of nutritional science, and it is no longer conceivable that a single person or discipline should cover the whole area of nutrition. The health worker has therefore been obliged to widen his perspectives and his approach to nutritional problems. Clearly, to combat malnutrition requires cooperation between different disciplines and sectors. It is a challenge to the health worker to define his role in this field and to ensure that it is coordinated into the prevailing broad approach to nutrition.

During the first half of the present century, the attention of health workers was drawn to the dramatic clinical syndromes associated with a number of vitamin deficiencies. At that time, specific treatments for some of those diseases had been discovered and optimism about the chances of eradicating them was high, with good reason (*1*). In the years that followed, deficiency diseases such as beriberi, pellagra, and scurvy were largely controlled by relatively simple means. Today they are confined to a few areas of the world, although they may occur sporadically in individuals in many places and sometimes appear as a consequence of a local disaster or the disruption of normal life. Other deficiency diseases have proved to be more difficult to control.

However, while attention was focused upon those *diseases*, the underlying *condition* of the population—one of general undernutrition—was considered to be a *normal* characteristic of the communities under study and not worthy of much attention or concern. But as the diseases began to assume less significance the focus of attention began to shift, and gradually the importance

of the background condition was realized. This general condition of widespread undernutrition is the major predisposing factor in the dramatic deficiency diseases kwashiorkor and marasmus and a major determining factor in the sequelae of infectious diseases. It has also gradually been realized that malnutrition in the early phases of growth may influence the functional development of whole populations. It had formerly been accepted that growth standards developed for North American and European populations were not relevant to the populations of many of the developing countries, for whom statistical descriptors of "normal growth" were needed. There was much evidence that secular trends in growth had taken place with improvements in the general socioeconomic and health conditions in the developed countries, but still the condition of undernutrition was considered "normal" for the developing countries. Now attention is being directed to the question of whether the same secular trends are not to be expected in the developing countries and may indeed serve as indicators of an improving health status. What was once accepted as "normal" is now recognized as the true nutritional problem in all of its colossal magnitude. Formerly, health workers and nutritionists had been looking only at the tip of the iceberg of malnutrition. Now the definition of the problem has changed from the control of nutritional diseases to the control of malnutrition and undernutrition.

This newer perspective of nutrition has been given great prominence by the recognition of the precarious balance between food supplies and food needs (2), and of the role that a rapidly expanding world population has played in bringing this about. The need for careful planning and for a national and international approach to the management of resources has become alarmingly evident. From the time of Malthus the relationship between people and food has been apparent, but we have only recently come to realize that other variable factors also have important, and perhaps limiting, effects. For example, there are strong reasons for thinking that the availability of energy sources will have a considerable impact upon food production technology, including the "green revolution" (3). Energy is used in, for example, the mechanization of agriculture, the production of machinery, transportation, irrigation, and the production of fertilizers and pesticides. There is therefore a close association between an energy crisis and a food crisis. Other examples could be given of the limits to which man is pushing his available resources, of the inefficiency of his utilization of resources, and of the sequelae of his activities affecting his social, physical, and biological environment. Now, as never before in the history of man, events such as the failure of a crop in one part of the world can have serious repercussions in other, even quite remote, parts. To foresee such effects in our closely interwoven human society is extremely difficult.

The affluence that has accompanied industrialization in many countries has brought with it a particular problem of considerable magnitude. As

incomes continue to rise in North America, Europe, Japan, and elsewhere, and among the small privileged class in many developing countries, the demand for meat, and therefore for livestock production, increases. This leads in turn to an increased demand for feed and hence the total *per caput* utilization of grain rises. In Canada and the USA the *per caput* consumption of grain is approaching 1000 kg per year; of this, only about 75 kg are used directly as human food, much of the remainder being used as animal feed. By contrast, among the predominantly cereal-eating populations of developing countries the *per capita* consumption of grain (mostly for human food) is about 200 kg per year. Up to a point, livestock production is a useful and efficient way of using land that cannot be cropped for food production to provide a source of human food. However, beyond that point livestock production is a very inefficient way of utilizing the available resources. Affluence in industrialized societies has pushed livestock production in these countries far beyond the point of efficient utilization of food resources. If we are to avoid even more serious food shortages in the world as a whole this trend cannot be allowed to continue.

The recognition of this trend leads to the realization that the application of the intensive agricultural practices characterizing the "green revolution" pattern of food production may not be a real solution to the world's food shortage. We must continue to search for other sources of food and promote patterns of food production and utilization that are more efficient in their use of both food and energy resources. Perhaps it will be necessary to develop and use meat substitutes that will satisfy the demand in the affluent countries and populations for meat more efficiently than the current system of livestock production. The latter will remain an important method of converting otherwise inedible material into human food, but better management of the total resources is needed. It is within this framework that nutritional planning has become particularly important (4).

The problem of the protein-energy malnutrition that affects millions of children in the world is firmly rooted in the cultural pattern and general socioeconomic conditions of the people and in the nature and availability of food. The methods of control that worked so well in the control of the deficiency diseases have no close parallel in combating protein-energy malnutrition. The reasons for the existence of hunger and malnutrition are many and interrelated. The dietary habits and nutritional status of man have been conditioned by historical, geographical, and socioeconomic circumstances.

Historically, the exchanges of foods between the different continents have modified the traditional food patterns of populations. Although such interchange has, in general, produced more advantages than disadvantages, the results show many distinctive features.

Another factor is geography. Soil, climate, and rainfall influence the types of food crops that are grown. Many tropical and subtropical areas

are desert or semidesert, with prolonged droughts followed by catastrophic flood. The consumption of animal protein is 5 times as high in temperate as in tropical countries. Nearly three-quarters of the world's cattle are raised in the developing countries situated in tropical and subtropical regions, but these countries produce only one-fifth of the world's milk output and one-third of its meat (5). This cannot be explained by pure chance or ascribed simply to socioeconomic causes. The problem of the agriculturally depressed countries is aggravated further by the floods, cyclones, and other natural disasters that plague these areas.

In most of the developing countries 2, 3, or 4 staple foods supply 60–80% of the food energy. The nature of a country's staple foods usually determines the type and severity of malnutrition there. It cannot be overemphasized that, when a very limited number of foods provide a major proportion of the energy intake, the biological nature of those foods is of crucial importance.

Another even more important consideration is that man has created his own social and economic problems, and they are a more serious threat to human welfare than those posed by history and nature. The differences in economic growth and social development between the developed and developing countries are increasing while the efforts being made to close the gap are really very modest. It must be stressed, however, that this is no excuse for sitting back and waiting for the problem to be solved through a better understanding between countries and a better distribution of incomes within countries. The conquest of malnutrition is a formidable task that must be complemented by direct action through nutritional intervention programmes.

It is necessary to distinguish between factors that *condition* malnutrition and those that *precipitate* acute malnutrition and death. Thus, the historical, geographical, and social factors mentioned above undoubtedly condition both the form and extent of malnutrition, but in themselves do not explain the high mortality rates seen in many parts of the world (6). Diarrhoea and infectious diseases are common precipitating factors. It has been estimated by Mata et al. (7) and by Scrimshaw et al. (8) that a child may be affected by infections during one-fifth or one-fourth of his childhood years. Superimposed upon a background of undernutrition, the consequences of these episodes of illness are often disastrous, leading to major setbacks in growth and development or even to death.

Thus, the precipitating, rather than the conditioning, factors are undoubtedly responsible for much of the high mortality, and perhaps of the severe forms of malnutrition, among children under 5 years of age. It is evident from the rapid decline that can be achieved in childhood mortality rates that these factors are amenable to programmes of direct intervention and the improvements obtained by the health services through immunization, various forms of treatment including the use of new drugs, special feeding, and other approaches. In many parts of the world, the severe forms of

malnutrition also appear to be declining in prevalence. There are reasons for believing that the prevalence of these severe forms can be reduced to levels at which their public health significance is very small.

However, these improvements must be interpreted with caution. The changes that have taken place in the developing countries are more likely to be due to better public health programmes and treatment services than to a real improvement in the standard of living (9). The conditioning factors may have changed little. The decline in mortality that occurred 50–100 years ago in what are now the developed countries was largely attributable to the improvement in living conditions and nutritional status. That is why it took these countries a century to reduce their mortality rate by 50%, whereas many of the developing countries have achieved this reduction in 10 or 20 years.

The distinction is important; low mortality rates do not necessarily mean that the survivors are healthy. If the conditioning factors remain only slightly changed, many undernourished children or children showing signs of having been undernourished must be expected. They may be children aged 6 or 7 years who are beginning school and who, from their retarded physical development, appear to be no more than 4 years old. The tragedy is that such children are not comparable in their behaviour, psychology, or learning capacity, with other children aged 6 or 7 years; but they are not comparable with other 4-year-old children either. They belong to a separate group with their own biological and behavioural characteristics and an intersensorial organization that is difficult to classify strictly within a chronological age group. Recent scientific literature has been using terms that, if analysed with any social sensitivity, are depressing. It is stated, for example, that malnutrition, generally associated with repeated infections during the earliest years of life, *distorts* the symmetry of the body; leads to *perversion* of development; causes *unharmonious* development; produces an *ill-proportioned* child; leads to *unbalanced* growth; may be the cause of psychosocial *disharmony* and *maladjustment* in learning; etc. We are no longer talking about mere retardation, which in itself may be important, but of distortion, perversion, disproportion, imbalance, disharmony, and maladjustment, all of which are much more serious than mere retardation (10).

There are no clear reasons to explain why in the developing countries only 10% or 20% of the children enrolled in the first school grade finish primary school. There are of course educational and social factors, such as the shortage of schools and teachers and the pressures to use child labour on the farm, but the possible role of other factors connected with the functional development of the child should be considered as well. The majority of school “drop-outs” occur in the first and second grades, when the learning process is beginning. A report states that children in Pakistan do not return to school because “the child’s first year at school is an experience he does not wish to repeat” (11).

Nutrition workers and planners face a false dilemma. Activities that can be undertaken today aimed at the control of some of the factors that precipitate acute malnutrition and at the specific improvement of nutritional conditions of high risk or vulnerable groups, as through food supplementation programmes, can improve the picture of acute malnutrition. Such actions will undoubtedly reduce the numbers of severely handicapped survivors but we also recognize that a real and lasting improvement in the underlying conditioning factors requires major social and economic changes, and that these will take place slowly.

By many, these are seen as alternative approaches to nutritional problems and the choice between them is presented as a dilemma. But these are not alternatives. They are approaches that must be undertaken concurrently. The prevalence of acute malnutrition and its sequelae must be reduced through intervention programmes. The social and humanitarian costs of children whose development is hindered by protein-energy malnutrition in early life or who are rendered blind by the effects of vitamin A deficiency are too high to be ignored. These children cannot wait for the gradual improvement in living conditions that must come if a lasting solution is to be achieved. However, attention to immediate problems must not be a substitute for the development of realistic plans and programmes for ameliorating the conditioning factors.

Based on considerations of the prevalence and social significance of malnutrition, and the feasibility of prevention, there are obvious priorities for action in certain severe forms in many of the developing countries today (Fig. 1). These nutritional diseases are immediate targets for attack through approaches geared to the particular country and individual population groups. While some aspects of the epidemiology of these diseases are

Fig. 1. Priorities among nutritional deficiency conditions ^a

Conditions	Extent	Social Significance	Feasibility of Control
PEM	●	●	●
Xerophthalmia	●	●	●
Nutritional Anaemias	●	●	●
Endemic goitre	●	●	●

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^a The size of the circle gives an indication of magnitude. PEM, protein-energy malnutrition.

common to all developing countries, there are also marked differences. Nutritional status and the frequency of deficiency diseases follow very closely the patterns of food availability, social customs, and economic conditions in different areas of the world.

Based on considerations of the effect of malnutrition and undernutrition on work output and productivity (12), the nutritional status of the total population, not just those groups susceptible to acute malnutrition, is a matter of concern. Populations faced with inadequate supplies of food may "adapt" to this situation by decreases in the typical adult body size and weight or by reductions in voluntary physical activity, or by both. While "adaptations" of this type may not be a major health concern they have implications for the total productivity of areas where manual labour is commonly employed. In children, such "adaptations" may have lasting effects on psychosocial, as well as on physical, development.

It can be predicted that even if far-reaching changes in nutritional standards do not occur in the present decade the general and child mortality rates will probably continue to decline in many developing countries over the next few years, but perhaps more slowly than in past decades. In some areas the sharp declines in mortality rates are just beginning. Health activities are very effective in reducing high mortality rates but to lower mortality below a certain level requires a much broader improvement in the standard of living. It can also be predicted that a reduction in very severe cases of malnutrition and specific deficiency syndromes will occur, except in the event of natural or social disasters. However, the problem of malnutrition will probably persist, with its inexorable repercussions on the physical and functional development of children, school performance, productivity of labour, and social adjustment.

The need for urgent action is therefore obvious, not only for humanitarian reasons but also to achieve faster socioeconomic development (13). The President of the World Bank has stated, "In one sense, of course, the ultimate cause of malnutrition is poverty. But this does not mean that we either must, or can ever afford to, wait for full economic development to take place before we begin to attack the problem. On the contrary, reducing the ravages of serious malnutrition will itself accelerate economic development and thus contribute to the amelioration of poverty" (14).

It is in this context that we must see the responsibility of the health sector, working in close collaboration with other sectors at national and community levels. The major responsibility for the design and implementation of programmes intended to minimize the prevalence of severe forms of malnutrition and ameliorate their effects in populations will fall upon the health services. However, although public health personnel are aware of their limited capacity to deal with the complex of factors conditioning nutrition problems, particularly in the social and economic spheres, the

health sector must recognize and accept its responsibility to work with other services in planning approaches for tackling these fundamental aspects of health improvement.

In the field of nutrition, as in politics, the task is to do what is possible without forgetting to make possible what is necessary.

REFERENCES

1. AYKROYD, W.R. *Conquest of deficiency diseases: achievements and prospects*. Geneva, World Health Organization, 1970 (Freedom from Hunger Campaign Basic Study, No. 24)
2. *Assessment of the world food situation, present and future*. Rome, United Nations World Food Conference, 1974 (Provisional Agenda Item 8)
3. PIMENTEL, D. ET AL. *Science*, **182**: 443-449 (1974)
4. BERG, A. *The nutrition factor, its role in national development*. Washington, DC, The Brookings Institution, 1973
5. JASIOROWSKI, H.A. FAO's activities in livestock development. *World Animal Review*, **1**: 2-9 (1972)
6. WHO Technical Report Series, No. 477, 1971 (Eighth report of the Joint FAO/WHO Expert Committee on Nutrition)
7. MATA, L.J. ET AL. Diarrhoeal disease in a cohort of Guatemalan village children observed from birth to age of 2 years. *Trop. geogr. Med.*, **19**: 247 (1967)
8. SCRIMSHAW, N.S. ET AL. *Interactions of nutrition and infection*. Geneva, World Health Organization, 1968 (Monograph Series, No. 57)
9. BENGGA, J.M. Nutritional significance of mortality statistics. In: *Proceedings of the Third Western Hemisphere Nutrition Congress, Miami Beach, 1971*. Mount Kisco, NY, Futura, 1972, p. 270
10. BENGGA, J.M. *Biotech. Bioeng. Symp.*, **1**: 253 (1969)
11. *UNICEF News*, **59**: 12 (1969)
12. FOOD AND AGRICULTURE ORGANIZATION. *Nutrition and working efficiency*. Rome, 1962 (Freedom from Hunger Campaign Basic Study No. 5)
13. BERG, A. ET AL., ed. *Nutrition, national development, and planning. Proceedings of an International Conference held at the Massachusetts Institute of Technology, Cambridge, MA, October 1971*. Cambridge, MA, MIT Press, 1973
14. MCNAMARA, R.S. *Address to the Board of Governors of the World Bank Group*. Washington, DC, International Bank for Reconstruction and Development, 1971