

(2) CENTRAL AMERICA*

by

M. BÉHAR

(Institute of Nutrition of Central America and Panama (INCAP), Guatemala, C.A.)

The rather poor health situation of children in Central America, as in other regions of similar ecological conditions, is well known. I will analyze three parameters that can provide an idea of the magnitude of the problem. These are: mortality, and morbidity rates, and the patterns of growth. I will then analyze briefly the main responsible factors of this situation in order to come to the main objective of this presentation, which is to discuss the measures that in our opinion are necessary to correct the problem.

Mortality in Children. In Table I, the mortality rates of children under five years in Guatemala are compared with those for U.S.A. Children under five were selected because this is the age period in which the health problems are more serious and of greater significance. The first year of life is divided into two periods: 0 to 28 days (neonatal period) and 1 to 11 months. This is done because of the significant differences in the causes of death between these two periods. It is apparent that in U.S.A., as is the case in all developed countries, the mortality rates still relatively high during the neonatal period, decrease rapidly in subsequent periods, becoming negligible during the rest of

TABLE I. Deaths per 1,000 children per year by age (infants per 1,000 births) United States and Guatemala, 1958 to 1964†.

Age	United States	Guatemala	Ratio Guatemala to United States
Neonatal, first 28 days	18.6	35.9	2 : 1
Post neonatal, 29 days to 11 months inclusive	7.2	55.9	8 : 1
1 year	1.7	50	29 : 1
2 years	1	35.2	35 : 1
3 years	0.8	24.9	31 : 1
4 years	0.6	16.1	27 : 1

† Source for United States, Vital Statistics of the United States, 1958 to 1964, U.S. Department of Health, Education and Welfare, for Guatemala, INCAP-OIR Survey.

childhood after the first year of life. The situation is different in Central America and most of the developing countries as exemplified here by Guatemala, where the rates are not only higher at all age groups, but increase in the post-neonatal period, and remain high throughout the second year of life. The importance and public health significance of this second year death rate has been recently emphasized by GORDON et al. (1967). Only after the second year, a decrease of the mortality rates is observed in these developing countries.

*This work was partially presented at the Symposium "Health Problems in Pre-School Children", Eight International Congresses on Tropical Medicine and Malaria, Teheran, Iran, 7th-15th September, 1968.

Morbidity Rates. There is very little information available on morbidity during childhood in underdeveloped countries. The information obtained by INCAP in some rural villages of Guatemala can, however, illustrate the magnitude of this problem. Figure 1 shows the number of illnesses per child per year in one of these villages where a careful registration on morbidity for children under five years of age was established during a five-year period. We can appreciate here that as an average, the children during their first two years of life suffer 5 to 6 disease episodes. The higher rate of morbidity during the second year of life should be emphasized. When the duration of illness was taken into consideration, it was found that for the whole population studied, the average number of days that the children were sick by year, was 55. A significant number of children, particularly during the first two years of life were sick more than half of the time. The diseases more frequently observed were respiratory infections and diarrheal diseases during the first year, in the following years, diarrheal diseases were by far the most prevalent followed by respiratory infections and the common communicable diseases of childhood, particularly measles, chicken pox and whooping cough.

Pattern of Growth. The pattern of physical growth of children in underdeveloped areas has been very well documented and is strikingly similar in different areas independently

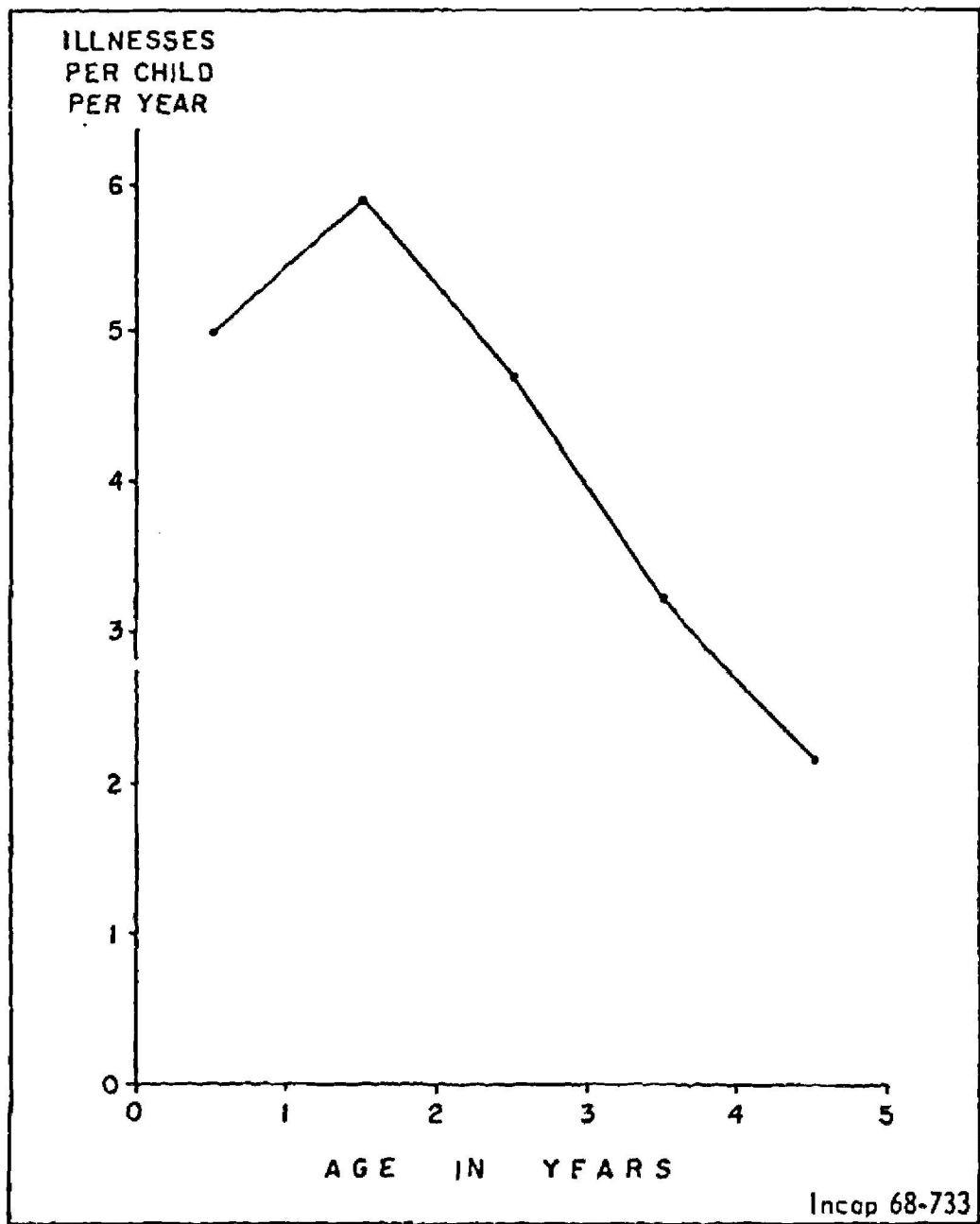


FIG. 1. Illnesses per person per year, by age in years, one Guatemalan village, May 1959 to April 1964.

of the ethnic differences of the populations. This pattern is illustrated in Figure 2 which shows the growth in weight for rural Guatemalan children of low socio-economic conditions. It can be seen that at the moment of birth the average weight of these children is only slightly below the corresponding value for U.S. children used here for comparison. They continue following exactly the U.S. standards up to the age of 3 to 4 months; from that age, they start to depart, growing much more slowly during the second half of the first year and particularly again during the second year of life, remaining below the standard for the rest of their lives. By contrast, Guatemalan children of high socio-economic classes who are well-nourished and with a much lower incidence of diseases do follow the U.S. standard without significant deviations, suggesting, among other observations, that the pattern of growth illustrated in this Figure is not genetically determined but the result of environmental factors.

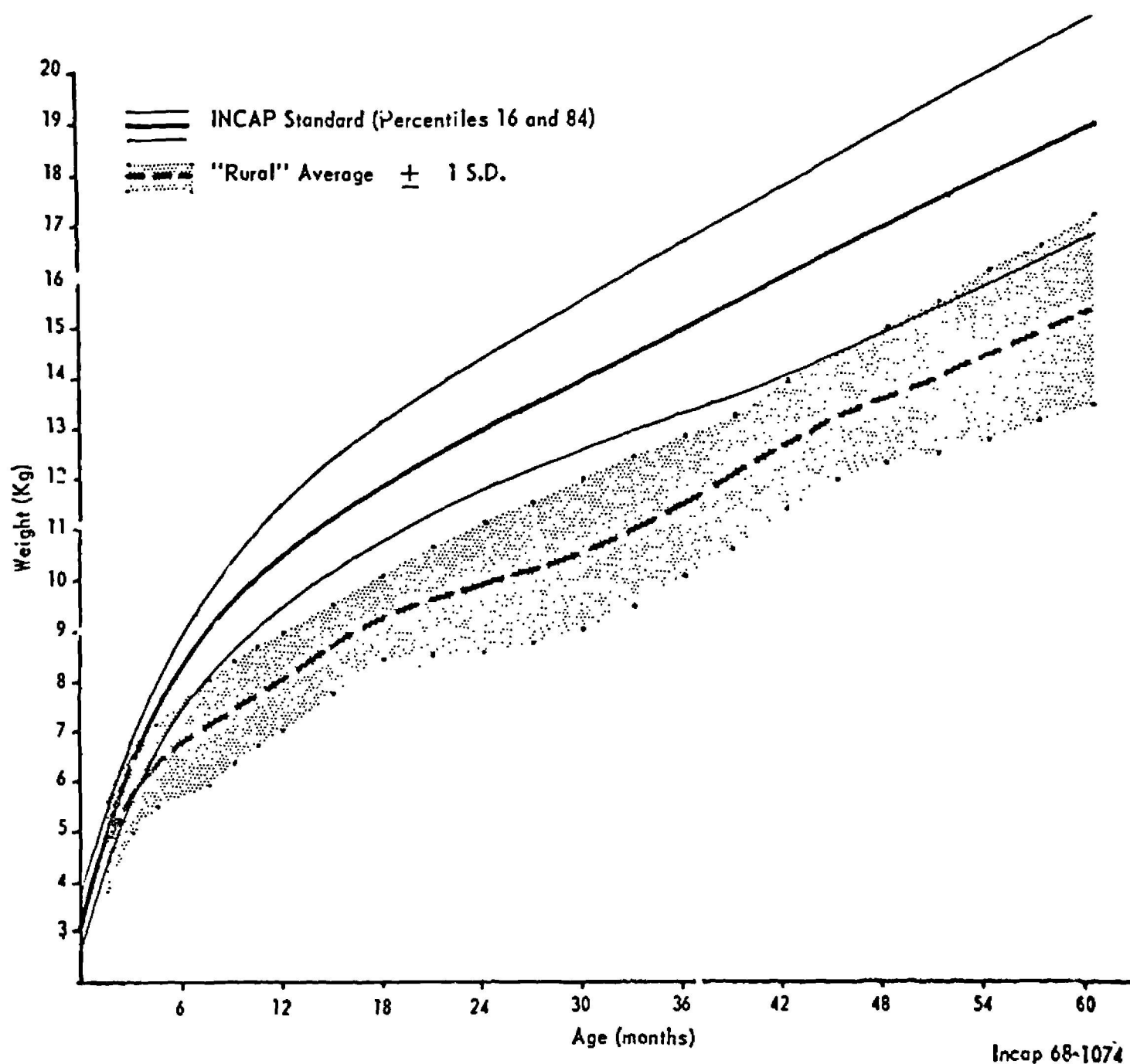


FIG. 2. Weight. Masculine sex (0 to 4 years). "Rural" Guatemala, 1965.

(This research was supported by the Advanced Research Projects Agency (Project AGILE) and was monitored by the Nutrition Section, Office of International Research, National Institutes of Health, under ARPA Order No. 580, Program Plan No. 298.)

Responsible Factors. The poor health condition of Central American children, illustrated by the three previous parameters we have briefly analyzed are the result of the interaction of these children with their physical, biological and cultural environment. The immediate responsible factors deleterious to health resulting from this interaction, are primarily nutritional deficiencies and frequent infections by a variety of agents.

Among the nutritional deficiencies, protein-calorie malnutrition and vitamin A deficiency are the two most prevalent and of greatest significance. Among the infectious diseases, it has already been mentioned that respiratory infections, diarrheal diseases and the common communicable diseases of childhood (measles, chicken pox and whooping cough) are the most important and highly prevalent. These two conditions, infectious diseases and nutritional deficiencies, act synergistically, that is, each one enhances the deleterious effect of the other.

In order to decide on the appropriate and opportune preventive measures, it is important to know the age of the child at which the problems occur. Some information is available in Central America suggesting that the problem starts *in utero*. Studies carried out by BETETA (1953) at INCAP have shown, for instance, that the weight gain during pregnancy is significantly lower in a group of mothers from a poor rural village than in mothers from Guatemala City of high socio-economic condition 6.5 kg. as an average for the first group against 10.5 kg. for the second. More recently, preliminary information (CANOSA, 1968) has been obtained suggesting marked differences in the chemical composition of placentas from a group of mothers of low socio-economic condition in comparison with health mothers from the United States. Of particular interest is the difference found in DNA concentration which can be interpreted as indicating a much lower number of cells per unit of volume in the placentas from the poor Guatemalan mothers, as compared with those of the United States mothers. Further studies are in progress to validate these observations and to attempt to establish their possible significance in terms of function.

At birth, the average body weight of the Central American infants of the low socio-economic groups is only slightly lower than the one for the infants born from mothers of the better-off groups which is similar to the average weight of North American or European newborn infants. ARROYAVE (1968) at INCAP has found, however, that the ratio of non-essential to essential free amino acids in plasma which has been proposed by Whitehead, as a sensitive index of protein nutriture is different in the blood from the umbilical cord from babies born from mothers of low socio-economic condition and those born from well-nourished, healthy Guatemalan mothers of the higher social groups. The difference is small but becomes statistically significant for the ratios of either valine or cystine to glycine which seems to be more sensitive than the Whitehead index.

Further studies are needed to test this hypothesis of possible nutritional deficiencies already present at the moment of birth and to determine their significance. Observations in experimental animals suggest that this could be a very important factor influencing the future development of the infants. At any rate, there is no doubt that after birth, the large majority of children in Central America are exposed, since very early age, to a series of unfavourable environmental conditions resulting in malnutrition and frequent infectious diseases.

During the first 4 to 6 months of life the infants seem to be in relatively good condition, their growth is adequate, the rates of mortality and particularly those of morbidity are significantly lower than in subsequent periods. MATA, *et al.*, (1967) have found, for instance, that if these infants are infected—as frequently occurs—with *Entamoeba histolytica* or with pathogenic strains of *Shigella* during their first six months of life, the infectious are

usually asymptomatic, they do not produce disease and disappear spontaneously in a few days. In our opinion, this is mainly due to the fact that these infants are all breast fed and that breast milk satisfies their nutritional requirements during this period in addition to protecting them from infections and infectious diseases by other mechanisms. Their problem begins to be serious when the mother's milk becomes insufficient to satisfy their nutritional requirements or when breast feeding is interrupted for other causes. They are then submitted to diets which in general are inadequate and insufficient, particularly in regard to proteins, they become also more closely exposed to the unsanitary environment—the bottles and other feeding devices become another common source of infection. The weaning and post-weaning periods constitute then, the most critical age in the life of these children, and the earlier it occurs, the worse for the child.

These weaning and other child-rearing practices, as well as other cultural economic and social factors, all influencing the health condition of the children, are frequently the result of an insufficient adaptation of large population groups to the rapidly changing ecology imposed by western civilization, urbanization and industrialization.

PREVENTIVE MEASURES

Coming now to the main objective of this presentation, that is, to analyze what should be done to correct the present situation, I will limit the discussion to the programs aiming to control and prevent malnutrition. This is done because malnutrition constitutes a basic health problem, closely interrelated with and aggravating all the others; and because it is the area in which I have more direct personal experience.

We must first recognize that malnutrition is the result of a combination of interrelated social, economic, cultural and public health factors affecting food production, distribution, consumption and utilization. For a definitive and permanent solution to the problem of malnutrition, all the indicated responsible factors must be corrected. This requires long-term multidisciplinary coordinated programs. Because of the interrelation and interaction of the different factors involved, the improvement of any single aspect however, will pay dividends by alleviating the effect of the others, this emphasizes the importance of defining priorities in action programs for a more efficient utilization of available resources. This can only be done as a combined effort of the different sectors at the policy-making and planning bodies at the national level.

While the long-term programs are designed and implemented, immediate action is required to the solution of problems that cannot wait for the effect of the long-term measures. This is, the case for instance, of children already suffering from malnutrition. The program can then be divided into those from which immediate results can be expected and those of long-term action; it is important, however, to emphasize that they are not mutually exclusive or should be implemented consecutively. Both types of action should be implemented as soon as possible; they are indeed complementary in their effects.

A. *Measures of long-term action*

1) Multisectorial national level. Food and Nutrition Policy.

The need to satisfy the basic food requirements of the population and to promote and maintain adequate nutrition of all the inhabitants must be recognized as a fundamental purpose of society. For this reason, at the national level, the highest policy making and planning governmental authorities should clearly define and implement the national food and nutrition policy as an integral and important component of the national development plans.

This policy stating the present situation and the desired goals should serve as one of the fundamental bases for the development of economical, agricultural, educational, public health and other related programs. As example of the sectorial programs which will derive from the national food and nutrition policy the following can be mentioned:

a) In Agriculture: The need of producing the right type and amount of foods according to the nutritional requirements of the population should be considered in the agricultural plans in addition to the direct economic interest of agricultural production. This may require measures to stimulate and protect the desired food production. Among them: (1) support of research programs in this field; (2) increment of agricultural extension and of credit facilities in food production oriented toward more efficient food production by means of improved agricultural techniques (fertilization, pest control, seed selection, etc.) and (3) increment of adequate storage facilities, price stabilization programs and other measures that facilitate the marketing of basic food crops.

b) In Industry: The food industry may contribute toward the improvement or toward the deterioration of the nutritional status of the population, it is, therefore, necessary that the responsible governmental agencies take the proper protective measures. These should include: (1) adequate control of sanitary and nutritional characteristics of processed foods, their labelling and propaganda; (2) protection and support by all possible means of industrial foods which are nutritionally desirable and, (3) establishment of restrictive measures to prevent the production of industrialized products which are nutritionally undesirable or even deleterious.

c) In Education: The lack of adequate knowledge in regard to food and nutrition by the general population is one of the main factors responsible for malnutrition. All the educational activities, particularly the programs of systematic education, should therefore consider the importance of giving the required knowledge in relation to food and nutrition and of developing adequate food habits as one of their objectives. At all levels of formal education, from the elementary school to the university, the basic concepts and practices for good nutrition should be incorporated in the regular curriculum at the appropriate level.

d) In Public Health: Activities oriented toward the prevention of malnutrition should be an important component of the national public health plan. They include measures such as: (1) the fortification or supplementation of appropriate food vehicles with nutrients which are likely to be deficient in the regular diet of the population; (2) the inclusion of nutrition education as a regular component of health education; (3) the assignment of the needed priorities to the attention of the nutritionally more vulnerable groups; pregnant women, lactating mothers, infants and pre-school children, and (4) the continuous surveillance of the nutritional condition of the population.

Other health problems not directly related to nutrition but which will contribute to the control of malnutrition are, the programs of environmental sanitation, water supply (at the house level), and health education for the control of intestinal infections and parasitism; and the maternal and child programs which should consider the need of family planning and birth spacing to protect the health of mothers and children and which can contribute to decrease the gap between population growth and food availability.

2) Development of human resources

The development and implementation of the measures indicated in the previous sections require specialized professional and technical personnel, now practically nonexistent in the developing countries. The most urgent need is for nutritionist-dietitians;

food scientists and food technologists; professors of nutrition at the university level (medicine, dentistry, agronomy, veterinary medicine, etc.); specialized teachers of nutrition for secondary and normal schools; agricultural economists with adequate orientation in nutrition and veterinarians specialized in animal nutrition. At the same time that the formation of this needed personnel is stimulated, supportive measures should be taken to ensure their proper utilization creating the necessary positions at an adequate level.

B. *Measures of Short Term Action*

1) The care of malnourished or potentially malnourished children.

Children who are already suffering from malnutrition and who constitute a significant proportion of the pre-school age population, cannot wait for the measures orientated to correct the fundamental causes of the problem as summarized in the previous section. The following actions are recommended for the immediate attention of these children.

a) For severe cases:

Children with advanced forms of protein calorie malnutrition or with complications, must be considered as emergencies and immediately hospitalized. The treatment to which these cases are subject in the hospitals needs to be improved. Hospital fatality rates for malnutrition are still too high. This is due to the fact that although some expensive and frequently unnecessary measures are used such as blood or plasma transfusions, use of multi-vitamin preparations and other expensive drugs, not enough attention is given to the fundamental dietary treatment which is well-known, more effective and less expensive. The hospitals should also try to educate the children's parents in their proper feeding upon discharge, to prevent recurrences which are still very frequent. After discharge from the hospitals, follow-ups should be made until complete recovery, which usually requires from 3 to 4 months. The personnel, particularly the auxiliary personnel in charge of these children in the hospitals, should receive training and orientation in all these aspects related to the care of severely malnourished children. The hospital dietitian should have adequate training in public health nutrition as a basic requirement.

b) For moderate or uncomplicated cases:

Children with moderate to severe, uncomplicated cases of malnutrition can be recovered more efficiently and economically on a semi-ambulatory basis. For this purpose, Nutrition Education and Rehabilitation Services have been proposed (BENGOA, 1964). These are services functioning as part of the health centres where the children stay only during the day. They are properly fed and even more important, their mothers are educated in a practical and objective way by participating in the selection, preparation and administration of the foods given to their malnourished children and are able to observe the effect of an adequate diet and how such a diet can be obtained within their own resources and facilities. Other services, with the same basic philosophy but better adapted to local conditions can be developed.

c) For mild cases:

The number of children in the initial stages or with mild forms of malnutrition is very large. In the population groups of low socio-economic condition in Central America, practically all the pre-school children suffer from this condition. No mechanism exists at the present time to reach all these children individually, but efforts should be made to take proper care of those who are attending the health services. In most cases these children are taken to the local health services, not for their nutritional condition which is not recognized by the parents, but for some other concomitant condition, a respiratory

or diarrheal disease, for instance, or for vaccination, or even only accompanying their mothers or other members of the family for a consultation. In most cases, the nutritional condition of these children is not recognized at the health services either, or no attention is given to it. At this stage, the rehabilitation of these children is however, easier, more efficient and economical. The parents of these children should receive, independently of the reasons why the child was taken to the service, proper nutrition education and when indicated, adequate nutritional supplements.

The health service personnel should also be properly trained for this purpose and standard procedures of diagnosis should be established. At the present time, body weight by age is the most practical, but other criteria is being investigated. These efforts can result in significant savings by reducing the number of more advanced cases that need care which is much more expensive.

d) Food distribution programs:

When products are available for food supplementation programs; care should be taken to ensure their most efficient use. To be beneficial, these should be properly selected, giving priority to pre-school children, pregnant women and lactating mothers. Its distribution should always be accompanied by nutrition education activities. The foods used should be not only those nutritionally indicated, but ideally, they should also fit within the dietary practices of the population and be of the type they can acquire in the local market. Only in this form will the food supplementation programs be really effective in terms of educating the families so that eventually they could feed themselves properly at their own initiative and with their own resources.

In the case of supplementary feeding programs in schools, it is even more important that their main purpose be education. They should be primarily oriented toward the formation of good feeding habits. It is therefore, of greater importance in this case, to select the type of foods to be used, keeping in mind their local availability, price and other characteristics which will ensure the achievement of the educational objectives of the program.

e) Control of infectious diseases:

As was indicated, the common infectious diseases of childhood are not only a frequent cause of death in malnourished children, but they are also an important cause of malnutrition in children living on marginal diets. Of particular importance are diseases such as measles and whooping cough for which vaccines are now available. The additional need of these preventive measures in populations in which malnutrition is prevalent, should therefore, be taken into consideration in the planning of vaccination programs. The early age at which in rural Central America these diseases are prevalent, coinciding with the age of more serious nutritional deficiencies, should be kept in mind. It is recommended that all possible efforts be made to organize adequate vaccination programs to protect the pre-school age population from these diseases.

f) New protein-rich foods:

New foods of high nutritive value, particularly in regard to proteins and other essential nutrients which are deficient in the usual diet of the populations, can now be developed utilizing locally available raw materials (BÉHAR, 1963). If these foods are prepared in a way that will fit in with the dietary habits of the populations, particularly as a weaning

food, and sold at a price that will be within the economic capacities of the needy population, they can be of greater value as another contribution to control malnutrition. An example of such a food is Incaparina, a vegetable mixture developed by INCAP, based on a cereal flour enriched with cottonseed flour as a source of protein and with other sources of essential nutrients. This product, now commercially produced and widely used in Central America, is contributing to improve the diet of the population, particularly of small children.

The present knowledge in nutrition and food sciences opens many new possibilities of this type that should be utilized; the enrichment of basic staple foods with synthetic amino acids or with protein concentrates is another example of this type of action.

In conclusion, I want only to emphasize that practically all the measures we have indicated have one common and basic component, this is: education. Only through the conscientious and active participation of the population can most of the nutrition problems be effectively solved. There is no way of imposing preventive measures in this field.

As the other health problems of children in underdeveloped areas, particularly infectious diseases are controlled with the dramatic advances achieved in this field, the nutritional deficiencies will be acquiring an even greater importance. The demographic problems we are now facing, both in terms of population increase, and in urbanization, are also contributing to this situation. We do have the scientific knowledge and technical capabilities to face it. Let us hope that we will have the wisdom to be able to correct the basic social, cultural and financial factors now limiting the application of this knowledge.

REFERENCES

- Arroyave, G. (1968). *Personal Communication*.
 Béhar, M. (1963). *J. Am. Med. Women's Ass.*, 18, 384.
 Bengoa, J. M. (1964). *J. trop. Pediat.*, 10, 63.
 Beteta, C. (1963). *Embarazo y nutrición (estudio longitudinal en mujeres embarazadas pertenecientes al grupo rural de bajo nivel socio-económico de Guatemala)*. M.D. thesis. Universidad de San Carlos de Guatemala, Facultad de Ciencias Médicas.
 Canosa, C. A. (1968). Proc. PAHO Advisory Committee on Medical Research, Washington. (In press).
 Gordon, J. E., Wyon, J. B. & Ascoli, W. (1967). *Am. J. Med. Sci.*, 254, 357.
 Mata, L. J., Urrutia, J. J. & Garcia, B. (1967). *Nutrition and Infection*. Ed. G. E. W. Wolstenholme and Maevu O'Connor, p. 112-126. (Ciba Foundation Study Group No. 31). London, Great Britain: J. & A. Churchill, Ltd.