

## Nutrition in the Caribbean

BY W. R. AYKROYD

*Department of Human Nutrition, London School of Hygiene  
and Tropical Medicine*

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During the winter of 1963–64 I made a visit of about three months to the Caribbean as a ‘Special Consultant on Nutrition’ to the Pan American Health Organization, which is the Regional Office of the World Health Organization for the Americas (PAHO/WHO), and to the Food and Agriculture Organization of the United Nations (FAO). In effect I was asked to study the nutritional problems of the area and assess their relative importance, to observe what is now being done to attack these problems, and to recommend future action. The following territories were visited, in the order indicated: Jamaica, Puerto Rico, St Thomas, Surinam, British Guiana, Grenada, Barbados, St Lucia, Martinique, Dominica, Antigua, St Kitts, Trinidad and Curaçao. Second visits were made to Puerto Rico and Jamaica.

A lengthy report was submitted to the sponsoring organizations. This paper consists mainly of parts of the report dealing with the public health aspects of nutrition in the area.

### SOME BACKGROUND

The state of nutrition of any population is determined by many agricultural, economic and social factors. A short account will be given of certain aspects of life in the Caribbean with a bearing on problems of nutrition. In this area the background is unusual and in some respects unique.

The demographical situation is the familiar one found today in most tropical areas, i.e. there is a persisting high birth-rate and a falling death-rate, resulting in rapid population growth. Children under 15 represent 41 % of the total population, as compared with 23 % in the United Kingdom. In the islands the density of population is high, averaging about 500 per square mile, with a peak figure of about 1400 in Barbados. Population pressure is reflected in extensive emigration, when and where opportunities for emigration are available.

Land under cultivation is devoted mainly to cash crops for export, notably sugar and bananas, so that all the islands are heavily dependent on imported food. Some, like Curaçao, and St Thomas in the U.S. Virgin Islands, produce almost no food for local consumption. Others, such as Jamaica, Puerto Rico and Trinidad, produce some of their own food, but only a fraction of requirements. Even the mainland country of Surinam imports much of its food. While in many territories there are possibilities of developing the production of valuable foods such as legumes, vegetables and fish for local use, dependence on imports for a large proportion of calorie supplies is an irremovable feature of the area as a whole.

Governments are naturally eager to promote the local cash crops, since the economy of most territories depends on them, and the efforts of agricultural and other departments are channelled in this direction. Marketing facilities which would encourage smallholders to increase the production of foods such as vegetables and milk are, in general, lacking. Moreover, locally produced foods everywhere face increasing competition from food imports, which are of good quality, and relatively cheap through modern developments in food processing, storage and transport. The result of all this is that the production of foods for local consumption is steadily declining rather than increasing in many territories.

The economic situation in the Caribbean has improved within recent years, as is shown by the rising per caput annual income. Tourists and bauxite are among the important sources of greater prosperity. There are, however, territories which have as yet shared little in the general advance. Equally, within the territories themselves, including the more prosperous of these, sections of the population remain extremely poor whatever the average rise in per caput income. There is also a growing population housed in shanties around towns, liable to unemployment and living in wretched conditions even when times are good. Children admitted to hospital for malnutrition often come from these areas.

Among social features, family structure is of great significance. The fecundity rate, i.e. the average number of children born per 100 women in the reproductive period, is remarkably high. Throughout the area, illegitimate births outnumber legitimate births: to give examples, in Grenada, in 1961, 2499 births out of 3691 were illegitimate, while in Barbados (1960) the corresponding numbers were 4187 and 6754; in St Lucia, about 97 % of first babies of women under 20 are born out of wedlock. Most women, in both urban and rural areas, are employed outside the home, and return to work soon after bearing a child. Financial support for the family is precarious because fathers tend to leave the vicinity of the home for employment elsewhere. Illegitimacy and the prevailing cultural pattern weaken the role of the father in child-rearing and family life, though they usually do not affect the mother's own sense of responsibility and love for her children. The number of absentee mothers, who leave their children to be looked after by others, is, however, increasing. Grandmothers play an important and sometimes disastrous role in child feeding.

The pattern of family life is thus often inimical to the careful rearing of children. The 1960 Report of the Health Department of St Kitts-Nevis-Anguilla says: 'Lack of love, care and understanding on the part of parents and guardians is destroying many of the infants of the colony'. This, in my view, is altogether too harsh a statement for general application, but its appearance in a health department report is worth noting. A good account of West Indian family and domestic patterns (which have, of course, an historical basis in slavery) was recently given by Sheila Patterson at a Royal Society of Medicine Symposium on 'The health of the coloured child in Great Britain' (1964).

There is a shortage of trained personnel to run technical services (health, education, agricultural, etc.) which is particularly serious in the lower ranks but also affects the senior grades.

## MALNUTRITION

Malnutrition in infants and young children is the most serious problem of nutrition in the area. In outlining this problem, the following quotation from a recent PAHO/WHO report (1963) dealing with the Leeward and Windward Islands (St Kitts, Antigua, Dominica, St Lucia, St Vincent, Grenada) makes a good starting point: 'In some of these islands, more than 50% of the total deaths occur by two years of age. It has been demonstrated that the greatest risk in childhood begins at about 6 months of age and ends at the end of the second year of life. When compared with a North American child the risk of dying for a West Indian child is 25 to 30 times greater during this period of life... The two main causes of death in this age group are gastro-enteritis and malnutrition.'

The figures shown in Table 1 for Grenada and St Kitts, supplied by PAHO, extend this statement.

Table 1. *Deaths in infancy and early childhood in Grenada, St Kitts and the U.S.A.*

Age	Age-specific death-rates			Ratio: Grenada/ U.S.A.	Ratio: St Kitts/ U.S.A.
	Grenada, 1961-62	St Kitts, 1960-62	U.S.A. 1959		
Under 1 month	15.4	29.7	19.0	0.8	1.5
1-2 months	4.7	4.9	3.0	1.5	1.6
3-5 months	10.3	19.4	2.4	4.4	8.1
6-8 months	15.4	18.8	1.2	10.4	15.9
9-11 months	19.2	18.3	0.7	26.2	25.1
12-23 months	33.0	35.9	1.7	18.8	23.3
24-35 months	7.0	7.9	1.0	6.6	7.4
36-47 months	3.0	2.2	0.8	3.9	2.8
48-59 months	1.0	2.4	0.7	1.5	3.5

Mortality statistics from other Leeward and Windward Islands show similar trends; the outstanding fact which they reveal is the peak in mortality between 6 months and 2 years. Its association with malnutrition is supported by morbidity data from St Lucia, where malnutrition was made a notifiable condition in 1962. Between December 1962 and October 1963, 189 cases were notified. The age distribution of these ran parallel with the mortality figures, i.e. the majority fell in the age group 6 months to 2 years. There were, however, twenty-four notifications for infants aged 4-6 months (Lees, 1964).

Deaths ascribed to gastro-enteritis, a major cause of mortality in the Caribbean, as in Central and South America, show a similar trend. The majority of deaths (85% or over) occur in children under 5, and within this age group there is a concentration of mortality between 6 months and 2 years. While deaths from gastro-enteritis have been considerably reduced in some territories, they remain exceptionally numerous in the Leeward and Windward Islands. In Grenada and Antigua in 1960 and 1962 respectively, gastro-enteritis was the leading cause of death, and much the same situation exists in other islands in this group.

When I was being shown round a ward in the General Hospital in one of the

islands, crowded with miserable children, I noted that the doctor called the ward 'the malnutrition ward' while the matron called it 'the gastro-enteritis ward'. It struck me that since gastro-enteritis and malnutrition in infants and young children are almost inseparable conditions, both clinically and statistically, it would be convenient to think of them as a single syndrome. This would be in line with a statement of Back (1960) based on experience in University College Hospital, Jamaica, that 'most of the babies with malnutrition had some degree of gastro-enteritis on admission and few of the babies with gastro-enteritis were well-nourished' but would carry the association a stage further. Later I discovered that the 'single syndrome' concept has found expression in the term 'weanling diarrhoea', coined by Gordon, Chitkara & Wyon (1963). The term itself is not appealing—though it is difficult to think of a better one—but the concept itself is likely to prove of significance in paediatrics. In the Caribbean it helps in fitting together various facts into a rational pattern.

In the human child, as in the young of some other species, the necessary transition from mother's milk to a mixed 'adult' diet can be a difficult and dangerous process, the gastro-intestinal tract being naturally the main danger point. Breast milk is easily digested and uncontaminated with infectious organisms, so that breast feeding 'protects' against gastro-enteritis; this is true in the Caribbean as elsewhere. The replacement of breast milk by other foods can have various effects. First, it usually means, in poor tropical and subtropical countries, a deterioration in the diet, particularly with respect to protein, because cows' milk and other supplementary foods rich in protein are largely unavailable, or not given. Secondly, the foods introduced may be mechanically unsuited to the infant's immature intestines and hence cause intestinal irritation and diarrhoea. Thirdly, these foods are likely to convey organisms which produce diarrhoea through inflammation of the intestinal walls. Diarrhoea leads in turn to deterioration in nutritional status through impaired utilization of foods which, even if fully utilized, would not meet nutritional needs. Chronic diarrhoea and insufficient nourishment induce marasmus caused by a combination of both. After a certain point is reached, the diarrhoea may reflect the inability of the intestines to absorb food because of atrophy resulting from malnutrition, and, in severe cases of protein-calorie deficiency, atrophy of glands secreting digestive enzymes is likely to impair digestion and absorption still further.

Gastro-enteritis occurs in all degrees, from mild gastro-intestinal disturbance to continuous and profuse diarrhoea with vomiting, leading to dangerous dehydration which calls urgently for fluid replacement if the child's life is to be saved. Research on pathogens has been done in a few places in the Caribbean, notably in Jamaica, where pathogens were isolated from the stools of 18.5% of children with diarrhoea, those most commonly found being *Escherichia coli* and *Salmonella* (Back & Brooks, 1962). The literature on this subject is reviewed by Gordon *et al.* (1963) who conclude that 'the infectious agents broadly encountered are much the same, suggesting that clinical variations relate mainly to host resistance and infecting dose'. With regard to 'host resistance', these authors go on to say: 'in the well-nourished child, acute diarrhoeal disease is a brief illness of a few days.

An occasional death occurs, but the issue is decided without delay. The usual result is prompt recovery with little or no after-effects. . . . Among malnourished children of retarded development, the disease is not ordinarily an isolated episode of acute evolution. Clinical severity often seems less than in the well-nourished child, but the attack tends to persist. . . . episodes recur at relatively short intervals'.

Some further vital statistics and other records from the Caribbean will now be considered. In my view these can best be interpreted in the light of the association between malnutrition and gastro-enteritis.

#### INFANT MORTALITY

In some territories there has been a striking fall in infant mortality during recent decades. This is shown by the figures in Table 2.

The rates available from these territories for 1961 and 1962 show a substantial further fall. For example, the 1961 and 1962 rates for Trinidad and Tobago were 44.9 and 40.0 respectively.

In some territories, infant mortality rates (1959-60) were considerably higher than those given in Table 2. Examples are shown in Table 3.

Table 2. *Fall in infant mortality rates in certain territories between 1935 and 1960*

	1935	1959-60
Barbados	220	60
British Guiana	122	57
Jamaica	137	51
Puerto Rico	127	44
Trinidad and Tobago	99	62
Surinam	82	44

Table 3. *Some high infant mortality rates*

	1959-60
Dominica	112
Grenada	79
Montserrat	135
St Lucia	98
St Vincent	138

In 1961 and 1962 there was a fall in some of these rates; thus, in Dominica the reported figures for these years were 93 and 74 respectively. But current rates remain high for these and certain other islands.

It is often suggested that, in the developing countries generally, the infant mortality rate is less closely associated with nutritional factors than the death rate in the 1-4 age group. Reasons given in support include: breast feeding tends to be maintained throughout the first 9-12 months of life and often longer, and up to this age largely fulfils the infant's nutritional needs; the infant grows well for 6-9 months, after which the growth curve 'flattens out'; the maximum incidence of serious malnutrition is between 1 and 3 years of age. This is *not* the situation in

the Caribbean where breast-feeding, as will be shown, is of relatively short duration. Table 1 and other facts given earlier show that a high mortality, unquestionably associated with malnutrition, occurs in the second half of the first year. There seems little doubt that malnutrition and its companion gastro-enteritis underlie, through their effects in the second 6 months of life, current high infant mortality rates in some territories, that they were largely responsible for the high rates prevailing in other territories until a few years ago, and that the fall in the latter has been due mainly to the partial prevention of these conditions. There is however, another important fact to be considered, namely the occurrence of malnutrition and gastro-enteritis in infants *below* the age of 6 months.

In Trinidad, Jelliffe, Symonds & Jelliffe (1960) studied a group of seventy children admitted to the paediatric unit in San Fernando General Hospital, South Trinidad, in 1958, with a diagnosis of malnutrition. Of these, sixty were below 12 months of age including twenty-seven aged 1-5 months. Their condition was ascribed primarily to the early replacement of the breast by insufficient and 'bacteriologically dangerous' artificial feeding. When I visited this unit in January 1964, the paediatrician in charge, Dr Isahak Mohammed, kindly gave me parallel figures for 1963; in that year there were sixty-five admissions with fifty-six children below 12 months including thirty-eight aged 1-5 months. The 1963 figures thus show the same preponderance of cases under 1 year and an even greater proportion under 6 months. Another point worth recording is that in the 1958 group there were eighteen cases of classical kwashiorkor and in the 1963 group only seven.

It is possible that the early occurrence of malnutrition, i.e. infants under 6 months, is reflected in the mortality statistics of some territories. In Barbados, the infant mortality rate fell from 135 to sixty between 1955 and 1960, and the age-specific mortality in the age group 1-4 from 8.1 to 3.5 in the same period. But it appears that the fall between 3 and 5 months is 'lagging'. Table 4, based on figures provided by PAHO, illustrates this point.

Table 4. *Deaths in Barbados, St Kitts and U.S.A.—3 months to 2 years (1960-62)*

Age	(Age-specific death-rates.)			Barbados/	St Kitts/
	Barbados	St Kitts	U.S.A.	U.S.A.	U.S.A.
3-5 months	11.7	19.4	2.4	5.1	8.1
6-8 months	9.2	18.8	1.2	7.1	15.9
9-11 months	6.0	18.3	0.7	8.5	25.1
12-23 months	8.7	35.9	1.7	5.0	23.3

The significant point is that Barbados has less advantage over St Kitts in the age group 3-5 months than at ages over this period up to 2 years. This suggests that in Barbados there has been less success in preventing malnutrition in early infancy than in later infancy and the second year of life. Some support for this possibility is provided by data (unpublished) indicating a slackening in growth as early as the fourth month in babies brought to child health centres in Barbados.

Analysis of reported infant mortality by month in Trinidad might reveal similar trends. In Barbados and Trinidad the tendency towards early weaning seems to have proceeded further than in the Leeward and Windward Islands, which means very early cessation of breast-feeding and an extension of unsatisfactory and bacteriologically dangerous artificial feeding. Obviously, however, further studies are needed before conclusions can be reached. It would be necessary to reconcile the fall in total infant mortality in territories such as Barbados and Trinidad with an apparent tendency towards greater hazards to infants below the age of 6 months resulting from earlier weaning.

#### MORTALITY IN THE AGE GROUP 1-4

Mortality figures for this age group, which is a unit in vital statistics, are available for some Caribbean territories and for developing countries elsewhere. In the Caribbean generally fall in 'toddler' mortality has occurred in recent decades, coinciding with the fall in infant mortality. The figures shown in Table 5 for Puerto Rico, kindly supplied by the Health Department, are illustrative.

Table 5. *Mortality (1-4) in Puerto Rico, 1940-60*

	1940	1945	1950	1955	1960
Deaths in the 1-4 age group as percentage of total mortality	19.7	17.3	13.3	8.4	5.4
Deaths per 1000 children aged 1-4 (age-specific death-rate)	30.8	19.2	9.9	4.8	3.1

Between 1935 and 1959-60 the infant mortality rate in Puerto Rico fell from 127 to 44.

In Barbados and Trinidad (1959) the corresponding age-specific death-rates were about 3.5 and 3.1 respectively, which no doubt represents a large reduction on earlier figures. In Surinam, the reported rate dropped from about 5.2 in 1951-55 to 3.5 in 1961. The current U.S. rate is about 1.0.

It would no doubt be possible to break down the Puerto Rican figures given in Table 5 to show age-specific mortality for each year of life between 1 and 4, and the statistical records necessary for this purpose may be available in other territories, lying on the shelves of registrars' offices. I believe that such studies would show that in earlier years there was a high concentration of mortality in the age group 1-2, and that the fall which has occurred in mortality between 1 and 4 has been due primarily to fewer deaths between 1 and 2.

#### OTHER HEALTH STATISTICS

##### (a) *Deaths ascribed specifically to malnutrition*

In some territories, the mortality statistics include a number of deaths, nearly all in children below 2, under the following heads: 'malnutrition'; 'avitaminosis and other deficiency states'; 'deficiency states'; 'nutritional maladjustment'. All these seem to mean much the same thing. Such returns are useful in showing that serious problems of nutrition exist in the territory in question, but their

absence does not indicate the opposite. The criteria on which the diagnoses are made are inconsistent, varying in different territories and even in the same territory at different times. Hence such records are of limited value in assessing the nutritional situation and changes in it.

(b) *Broncho-pneumonia*

'Broncho-pneumonia' figures prominently in the vital statistics of the area as a cause of death in children, though it takes second place to gastro-enteritis. Uttley (1963), referring to Antigua, has written as follows about its association with malnutrition: 'Although the main killing diseases of early childhood are gastro-enteritis and broncho-pneumonia, these infectious conditions are normally terminal events, hiding from the physician the underlying state of malnutrition which greatly facilitates their lethal attack on the child and which is much harder to detect in their presence'. In the 1960 *Review of Health Services, British Guiana*, it is stated that many deaths in infants and young children are listed as gastro-enteritis and pneumonia, but are primarily due to malnutrition.

I found that medical and public health authorities in general shared these views on deaths from broncho-pneumonia. The significance of broncho-pneumonia is one of the many questions to which careful attention should be given in developing future public health and nutrition programmes in the Caribbean.

(c) *Measles*

According to a PAHO/WHO 'Summary of Four-Year Reports on Health Conditions in the Americas, 1957-60' (1962), measles is a serious and lethal disease of childhood in much of Central and South America. In Chile, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico and Peru it ranked as the fifth to seventh cause of death, with the majority of deaths occurring in children under 4. This report states that the measles death-rates for five countries of Central America, and for South America, were 100 and 40 times respectively higher than in the United States. It also comments that 'in middle America, the measles death rate for children 1-4 years of age was higher than for infants' and introduces the idea of a relationship between fatal measles and protein-calorie malnutrition, suggesting that measles is more likely to kill a malnourished than a well-nourished child. This relationship is still open to question but, on the other hand, there is abundant evidence that measles often *precipitates* severe malnutrition. Thus, in a group of fifty-one children with kwashiorkor in a hospital in Peru, kwashiorkor followed measles in thirteen (Graham & Morales, 1963).

In West Africa measles is a formidable disease of childhood with a case mortality of about 5%, and is often followed by severe malnutrition; here also a relation between the severity of the disease and the state of nutrition of the child population has been suspected (Morley, Woodland & Martin, 1963).

Given these facts and speculations, it is interesting to note that measles scarcely figures at all as a cause of death in the vital statistics of Caribbean territories. In St Lucia, there was an epidemic of measles in 1957; 931 cases were reported, with six deaths, a low case mortality as compared with West Africa. Since then no

deaths from measles have been registered in this island. I asked medical and public health authorities in all the territories visited about measles and was told everywhere that the disease was common but not dangerous. This applies not only to the islands but also to Surinam and British Guiana on the South American mainland. It therefore appears that measles is not an important element in the malnutrition-disease complex in the Caribbean.

Study of the reasons underlying the apparently fortunate position of the area might throw light on the remarkable differences in the severity of measles in space and time.

#### MALNOURISHED CHILDREN IN HOSPITALS

In many territories the charts of a large proportion of infants and young children under treatment in hospital are labelled 'malnutrition'. These patients usually represent a concentration of cases from the whole or a considerable part of the territory concerned. I noted a general correspondence between the hospital picture in any given territory and the infant mortality rate and the state of development of maternal and child health services. The majority of the children admitted with a diagnosis of malnutrition were between the ages of 4 months and 2 years and were suffering from malnutrition of the marasmic type, associated with diarrhoea. I saw only a few cases of classical kwashiorkor, with oedema, dermatosis, enlarged liver and the characteristic appearance of misery. In the Caribbean kwashiorkor is less common than marasmus and the general impression of doctors is that it is seen less often to-day than 5-10 years ago. The children with kwashiorkor are somewhat older than those with marasmus, i.e. they are usually 15 months or over.

#### CHILD-FEEDING PRACTICES

The high incidence of malnutrition and gastro-enteritis in infants and young children is the result of child-feeding practices characteristic of the area. I tried to obtain as much information about these as possible in the different territories, mainly by questioning experienced doctors, health visitors and nurses. Visits to markets and shops provided useful information; for example, large displays of tinned milk products of many kinds, including expensive proprietary infant milk preparations, threw light on trends in child feeding, as did statements by shopkeepers such as 'we don't sell much arrowroot nowadays'. There is not much in the literature on the subject. Jelliffe (1955) described practices in Jamaica, but some changes have occurred since his account was written. The sketch which follows is based on these and other sources. While practices naturally differ to some extent from place to place, some generalizations can be made.

The duration of breast-feeding in the Caribbean is shorter than in Africa and Asia. Three to 6 months is usual and 9 months seems to be the limit except in a few communities, e.g. East Indians in British Guiana. This relates to the period during which the breast is offered to the child. A distinction must be made between breast-feeding as the sole or main source of the infant's nourishment, and partial breast-feeding which makes a smaller contribution to its needs. After 3 months or so, and often earlier, breast-feeding, if it does not cease altogether, becomes partial. The

mother may give the baby some breast milk before she leaves for work in the morning and again in the evening, and perhaps also during the night. The morning feed is often omitted. The mother usually seeks to continue partial breast-feeding *as long as possible in the hope of avoiding pregnancy*.

Throughout the area, this pattern of limited breast-feeding is changing in the direction of *less* breast milk. In some sophisticated urban circles the position now prevailing in countries such as England and the U.S.A. has been reached, i.e. artificial feeding is regarded as the norm and the breast as an out-dated organ for feeding purposes. This is an important fact, since such circles set the fashion. But more important is the general tendency towards a reduction of the infant's consumption of breast milk in the population as a whole, in response to economic and social pressures.

The foods given to supplement or replace breast milk include processed cow's milk, starchy roots and fruits and cereals. Among the processed milks, sweetened condensed milk, containing about 45% of sucrose, is popular because of its apparent cheapness; it was the first kind of tinned milk to be used in infant feeding in the Caribbean. Recently, however, its sale seems to have diminished, while the use in child feeding of the more expensive dried and evaporated whole milk products, and the still more expensive proprietary infant milk foods, has greatly increased. Simultaneously, there has been an extended use of dried skim milk which in terms of milk solids contains more protein than whole milk, but is much cheaper.

The main foods other than processed cow's milk are preparations of starchy roots and fruits such as sweet potatoes, yams, bananas, pumpkin and arrowroot (*Maranta arundinacea*), and various cereals. Arrowroot, which has a negligible protein content, took first place until a few years ago in some of the Leeward and Windward Islands, but is now less frequently used in that part of the Caribbean. In Trinidad, however, it remains a popular infant food, one of its uses being to 'strengthen' dilute milk solutions. It is also thought to be a good food for infants with diarrhoea. In the area generally, there seems to be a tendency to replace starchy roots and fruits by cereal preparations such as corn flour gruel and wheat flour porridge or gruel. Some of the familiar breakfast cereals, on sale everywhere, are being given to infants and young children; Quaker oats seems to be specially popular in several islands. Since cereal preparations are richer in protein than starchy roots and fruits, their growing use is a change in the right direction. In Jamaica some nutrition workers consider that the increased use of wheat flour gruel in infant feeding has helped to prevent malnutrition.

Fish and meat are rarely given to children under 18 months to 2 years; they are thought to produce worms. The same applies to beans, which are thought to be indigestible. Eggs are too scarce and expensive to be given to children in poor families. Where the influence of child health centres is making itself felt, fruit juice may be introduced into the infant's diet from about the third month.

The quantity of the diet received by infants and toddlers is as important as its quality. In the Caribbean as elsewhere supplementary foods are usually given in insufficient amounts during the weaning period and deficiency of calories and

deficiency of protein go together. Their inter-relationship is reflected in the terms 'protein-calorie deficiency' and 'protein-calorie malnutrition' now generally applied to the manifestations of malnutrition, in their various forms, in infants and toddlers in the developing countries.

The growing reliance on processed milk in infant and child feeding in the Caribbean is a trend which merits careful consideration. The same thing is happening in many tropical countries, though in few to the same extent as in the Caribbean. Processed milk provides protein of good quality otherwise lacking in the child's diet, based on pappy preparations of starch roots and fruits and cereals. If an infant is given less arrowroot and more tinned milk—even sweetened condensed milk—this represents an improvement. There is no possibility, in the area as a whole, of producing fresh milk in sufficient amounts to meet child feeding requirements. Objections to the increasing use of processed milk are made on two main grounds: first, its availability discourages breast-feeding and artificial feeding promotes gastro-enteritis and malnutrition; secondly, in its more expensive forms it is out of line with the purchasing power of poor families.

Breast-feeding unquestionably counters malnutrition and intestinal infection, so that its prolongation is most desirable. In child health centres in the Caribbean mothers are urged to avoid early weaning, and such exhortations should no doubt continue. But much experience shows the difficulty of extending the period of breast-feeding, and the strength of economic and social pressures in the opposite direction. As far as infant and child health is concerned, the encouragement of safe and satisfactory artificial feeding, in which processed milk largely replaces breast milk, seems of greater practical significance.

In cost, the proprietary infant milk foods head the list. These are skilfully advertised and enjoy social prestige because they are used by the well-to-do. They are extolled as 'the best food for infants', a claim often enhanced by the picture of the bonny baby on the tin. Even illiterate mothers, without access to the radio and newspapers, learn of their remarkable properties by hearsay. The result is that mothers insist on buying them, however deep a hole this makes in the family's resources, feeling that if they do not buy them they are failing in their duty to the child. But often they cannot buy them regularly, so that the expensive tin is made to last longer than it should by excessive dilution, and in effect the baby receives water coloured by the milk product. Further, the mother feels that she need not bother much about the rest of the infant's diet, so long as it is getting so valuable a food. Artificial feeding of this nature is not only deleterious in the nutritional sense; the necessary handling of the feeding bottle in insanitary homes is likely to cause infection. These infant foods are, of course, excellent in themselves. They are based on much nutrition research and when properly and fully used produce thriving infants. But undoubtedly they can be a menace to child health at a certain stage of economic and social development.

I noted that the giving of expensive infant milk foods evoked an emotional response on the part of nurses and doctors. Almost everywhere, it was the first thing I heard about on inquiring about infant feeding. Sometimes I was told that their sale should be prohibited. Among the reasons for these reactions is that

infants fed on highly diluted milk products will probably develop malnutrition and hence come to the attention of child health services and hospital doctors. In *the population as a whole, however, their misuse may be less common than dramatic stories about it suggests, and may well be counterbalanced, to a growing extent, by their successful use in accordance with the instructions on the tin, by mothers who because of better wages can afford them easily.* The actual situation is that the use of imported processed milk in infant and child feeding in the Caribbean is increasing every year, and is likely to go on increasing. In my view the child health services should accept this situation and adjust their activities accordingly. This means placing strong emphasis on the form of imported milk which is much the cheapest in terms of protein content, namely, dried skim milk.

#### COMMENT

Most of the facts I was able to gather about child malnutrition in the Caribbean during a tour which, though brief, offered an exceptional opportunity of visiting many territories, seemed to make sense when put together. Or perhaps it would be better to say that a rational pattern, needing completion by further studies, was discernible. In a general way, mortality statistics, morbidity records and the clinical picture of malnutrition can be related to child-feeding practices. For example, the age incidence of malnutrition and gastro-enteritis is explained by early weaning, partial or complete, and here the concept of 'weanling diarrhoea' adds clarification. The importance of malnutrition and gastro-enteritis in infants under 6 months needs, however, further investigation. Again, the reasons for the infrequency of classical kwashiorkor, and its regression during recent years, are not immediately obvious; possibly education in child feeding through maternal and child health centres and skim-milk distribution have reduced its occurrence in children at the most susceptible age, which is between 1 and 2 to 3 years.

The feeding practices themselves reflect economic and social factors, the availability of various foods, locally grown and imported, and the state of development of maternal and child health services. With regard to food supplies, the quantities of skim milk distributed are of special significance. The unusual structure of family life is an important factor.

This paper is confined to malnutrition in one age group, and of course attention must also be given to other sections of the population. In the longer report to the sponsoring organizations, malnutrition in age groups other than infants and toddlers was considered and the conclusion reached that this is, relatively speaking, of minor importance. Other sections of the report dealt with food supplies and the vital question whether reliance on imports can or should be reduced. The main purpose of the assignment was to recommend further studies which will give a more complete picture of the problem, and action to combat malnutrition. A brief account of the main recommendations relating to the most vulnerable groups will now be given.

## INVESTIGATION AND ACTION

(a) There should be continuing study and analysis of the mortality statistics (current and past) of the different territories, with special reference to mortality in infants and young children and its relation to malnutrition. Attention should be given to the possible influence of malnutrition on mortality in children under 6 months of age, and to trends in mortality from certain causes, e.g. gastroenteritis and broncho-pneumonia. An associated question is the ascribing of deaths to 'malnutrition', 'deficiency states', 'avitaminosis', etc.; here clarification and the 'standardization' of diagnoses are needed. The same applies to morbidity data on malnutrition. Studies of vital statistics should not ignore hospital admission figures.

Good opportunities exist for such investigations in the Caribbean. In general, small 'manageable' island populations are involved and vital statistics are more accurate than in most developing countries. Further, medical and public health services have been in operation for a considerable period of time, which makes possible illuminating retrospective studies. Facts with a bearing on the causes of infant and child mortality elsewhere in the tropics would probably be elicited. In the Caribbean itself trends in vital statistics are an important indication on the effectiveness of measures for preventing malnutrition.

(b) Further studies should be made of child-feeding practices in the different territories.

The outline given in this paper needs filling in. Differences in feeding practices in different territories could be correlated with the prevalence of malnutrition. A watch should be kept on changing trends.

(c) More information is required about the social and economic background of individual children suffering from malnutrition and of the feeding errors responsible for their condition.

When visiting wards in which malnourished children were under treatment, I often asked the questions: 'Who are these children? Why are they here?' Various answers were given. There were impressions that many of them came late in a closely spaced sequence of births in a large family, and quite contrary impressions that they were usually the children of very young mothers. Sometimes poverty was emphasized, sometimes the lack of maternal care, and sometimes the connexion between malnutrition and 'shanty towns'. With regard to maternal care, diversion of attention from the child because another was on the way, and its being taken over by the grandmother, were sometimes mentioned. On the dietary side, abrupt weaning and the misuse of expensive milk products were among the reasons given for the children's condition.

Systematic investigation of this aspect of the problem is recommended. It would not be difficult. I visited child health centres with well-kept records where a few days' analysis of record cards would provide some of the answers. The Infant Jesus Malnutrition Hospital in Roseau in Dominica kindly produced for me overnight some data on the last twenty-five admissions, showing the marital and working status of the parents of these children and whether the father was providing support or not.

(d) The treatment of children with malnutrition, excellent in a few hospitals, is unsatisfactory in the majority. The children do not receive enough protein and calories, and nursing care is inadequate. Stay in hospital is prolonged and relapse often occurs after discharge. Steps to improve, and even to standardize to some extent, methods of treatment throughout the area are therefore recommended. PAHO has already made a beginning in this direction. The satisfactory rehabilitation of children after severe malnutrition is an associated question. It can be promoted by good hospital treatment, the careful instruction of mothers on feeding methods, and the following up of convalescent children by maternal and child health and other services. The establishment of 'rehabilitation centres', to which the child could be sent after reaching a certain stage of recovery, has been proposed. This idea merits examination, but it is likely that improved treatment and subsequent supervision would make such centres unnecessary.

(e) Maternal and child health services and centres have primary responsibility for combating malnutrition, through education and the distribution of supplementary foods. In some territories they are well organized and reach a large percentage of the population; in others their coverage is limited and trained staff inadequate. A realistic study of the state of development of maternal and child health services in the area is therefore recommended. A close relation would unquestionably be found between this and the prevalence of malnutrition. It is well known, for example, that the remarkable fall in infant and toddler mortality in Barbados in recent years has been associated with the creation of efficient maternal and child health services by an outstanding Director of Medical Services.

As part of this study, the content of teaching on child feeding through maternal and child health and other services should be examined, with the object of revision if necessary. Present teaching sometimes reflects too closely the text-books of the developed countries and needs more adaptation to local conditions.

(f) During recent years skim milk has been distributed in large quantities, mainly through maternal and child health services. The amount distributed per head of population has probably been larger in the Caribbean than anywhere else in the world. Most doctors and nurses are convinced that skim milk has done much to prevent malnutrition, and that its use should be continued and extended. I believe their views are fully justified. Certain studies on skim milk are recommended in the report. An attempt should be made to compare the quantities distributed with trends in the prevalence of malnutrition. Methods of distribution, less efficient in some territories than others, could be improved by elementary studies to discover the best procedures. It is desirable that the commercial sale of skim milk powder should be encouraged, to supplement or replace free distribution. Among the ways of doing this is to pack the skim milk in attractive containers. Here again some simple investigations and trials are needed.

Studies and activities of these kinds, and others concerned with food supply and consumption, agriculture, growth records, the prevalence of anaemia, etc., would be facilitated, and more rapid progress would be made in preventing malnutrition, by establishing a Caribbean Nutrition Centre. A final recommendation to PAHO/WHO and FAO deals with the functions and structure of such a centre.

## DISCUSSION

The conventional practice of grouping deaths in the periods 0-1 and 1-4 has, in the Caribbean and other developing areas, largely obscured the peak in mortality associated with weaning, and retarded recognition of one of the major causes of death in man, namely the combination of malnutrition and gastro-enteritis in infants and toddlers wholly or partially removed from the breast. It is only when the mortality records are broken down into shorter intervals, as in Table 1, that the peak becomes evident. In the developing countries its timing turns on local breast-feeding practices; when, as in much of the Caribbean, weaning takes place between 3 and 6 months, it is found between 6 months and 2 years. If weaning is even earlier, as seems to happen in Trinidad, a high mortality associated with 'weanling diarrhoea' occurs below 6 months, mainly from the third month onward. When breast feeding is prolonged for 9 months or more, the major incidence of sickness and mortality due to malnutrition and associated conditions is between 1 and 3 (but probably diminishing between 2 and 3). Mortality statistics, past, present and future, could advantageously be viewed in the light of these facts. A change in, or rather the extension of, methods of presenting mortality statistics in public health reports from the developing countries would bring out the importance of the malnutrition-disease complex as a cause of death. For this purpose, mortality from 6 to 12 months, and from 1 to 2 or 3 years of age, would be more informative than the conventional infant mortality rate and mortality between 1 and 4. When weaning is exceptionally early, mortality from 3 to 5 months should receive special attention.

The WHO 'Expert Committee on Medical Assessment of Nutritional Status' (1963), in discussing vital statistics and malnutrition, comments that: 'there is much to be said for analysing mortality statistics according to age intervals smaller than those usually employed. In much of the world grouping deaths of children 1 to 2 years old would probably be found most useful in assessing mortality from protein-calorie malnutrition. Further inquiries may reveal other age-specific mortality rates significant in relation to malnutrition.' These comments are relevant to the Caribbean.

Malnutrition in infants and young children in the Caribbean could be greatly reduced or even eliminated in a few years by suitable measures, in spite of any difficulties created by the unusual pattern of family life. Real progress in this direction is already being made, evidenced, for example, by infant mortality statistics (Table 2). But such an achievement would increase food requirements through acceleration of population growth. The whole problem of food supplies in the area, particularly its growing dependence on imports, has not been considered in this paper, though discussed in my report to PAHO/WHO and FAO. The Caribbean Nutrition Centre, if established, will be concerned with these basic questions as well as with the prevention of malnutrition.

## SUMMARY

1. In many parts of the Caribbean there is a high mortality between 6 months and 2 years due to malnutrition and gastro-enteritis. These two conditions are so closely inter-connected that they can conveniently be regarded as a single syndrome, for which the term 'weanling diarrhoea' has recently been suggested. The clinical picture revealed by visits to children's wards was in line with the vital statistics.

2. The prevalence of malnutrition and gastro-enteritis in infants and young children is the result of child-feeding practices characteristic of the area. The duration of breast-feeding is shorter than in Africa and Asia. After 3 months or so breast-feeding, if it does not cease altogether, becomes partial, and in general there is a steady change in the direction of *less* breast milk. In some territories weaning at an even earlier stage in infancy seems to result in the common occurrence of malnutrition in infants under 6 months of age.

3. The foods given to supplement or replace breast milk include processed cow's milk, starch roots and fruits and cereals. Imported processed milk supplies good quality protein otherwise lacking in the child's diet, but the use of expensive proprietary infant milk foods, out of line with family purchasing power and given in over-diluted form, is among the causes of malnutrition. The use in infant and child feeding of dried skim milk—much the cheapest kind of milk in terms of nutritive value—is increasing and this trend should be encouraged.

4. Most of the malnutrition is of the 'marasmic' type. Classical kwashiorkor, now comparatively rare, was seen more often 5–10 years ago.

5. It is suggested that the conventional practice of grouping deaths in the periods 0 to 1 and 1 to 4 has, in the Caribbean and other developing areas, retarded recognition of the importance of malnutrition and gastro-enteritis as the principal cause of death during and after the weaning period. The analysis of mortality statistics according to shorter age intervals is desirable.

6. Further studies and action are recommended concerned with the following: the continuing analysis of mortality and morbidity statistics to elicit relationships with malnutrition; child feeding practices in the different territories; the social and economic background of individual victims of malnutrition and of the feeding errors responsible for their condition; improvement in the treatment of malnourished children; the scope and efficiency of maternal and child health services; the distribution of dried skim milk and its extension.

7. The establishment of a Caribbean Nutrition Centre will contribute to the prevention of malnutrition and help in solving long-term problems of food supply and nutrition in the area.

I must gratefully acknowledge the help I received during the assignment from United Nations staff members and from government departments and individuals in the various territories, where suitable programmes of visits were arranged and relevant information provided. Thanks are also due for kind personal hospitality which helped to make a tour in one of the most beautiful and interesting parts of the world an unforgettable experience.

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