MALNUTRITION

Almost every child in the developing countries is handicapped by malnutrition. Nor, indeed, is this condition limited to the developing countries, for a recent report estimated that seven pupils out of ten in England are inadequately nourished to the point of being at risk (1). Minority groups in the richer countries are particularly prone to suffer in this way, shown, for example, by the widespread malnutrition among Australian Aborigines and part-Aborigines, beginning often in the immediate post-weaning period and in many cases imposing a permanent handicap on physical and mental development (2). Adequate nourishment requires the regular intake of foods appropriate in quantity, quality and variety for the maintenance of the individual's health. By this criterion few children escape being at risk, from excessive intakes and consequent obesity in the more privileged areas of the richer countries, from gross inadequacies, irregularities and resultant secondary infections in the poorer countries and the less privileged areas of the rich countries.

Until very recently the problem of suitable feeding has been linked generally with adequacy in terms of quantity; the value of balance of quality in diet, inadequate nutrition as the primary or secondary cause of disease and handicap are new concepts, the more so in the poorer countries. Improvement of the lot of the child depends on the success of two policies, those of convincing parents of the desirability of providing suitable diets for their children, and of making such diets available in adequate quantities through limiting family size and improving crop yields. The harm caused by malnutrition in childhood persists throughout life (3). Research in Mexico has demonstrated long-lasting behavioural changes in patients suffering from severe kwashiorkor and marasmus; investigations in Venezuela have shown that seven years after apparent recovery children who had suffered from kwashiorkor and marasmus still performed worse than children of the same genetic origin who had not suffered from malnutrition; and findings in Yugoslavia indicate permanent decrements in mental performance of children following clinical recovery from marasmus (4).

The importance of the early years

The importance of the child's early years is indicated clearly by these results. Each stage of the child's development conditions the next, so that the school-age child inherits all the consequences of nutritional crisis in early childhood (5). The school-age child in the developing country is the survivor from high infant mortality rates, but may also have been permanently handicapped well before he begins to attend school. The effects of malnutrition on mental development are all the more severe the earlier they occur and the more severe the degree of malnourishment (6). Malnutrition in Nigeria, a typical situation, affects mainly the pre-school child (7), and evidence from elsewhere shows that the intermediate pre-school age between 3 and 6 years tends to be neglected (8). If nothing is done before the child starts school valuable and irreplaceable time will have been lost (9). This is critical in view of the fact that the early development period of infancy and childhood from birth up to 4 years of age is the most efficient period in the total growth experience of the human being (10). If it is recalled that the child born in 1971 is a potential full member of his country's work-force from the year 1986 until the year 2036, the urgency and long-term implications of the problem of contemporary malnutrition become obvious. The burden of the results of malnutrition can hardly be eliminated, even in the most favourable circumstances, within the next century.

The extent of malnutrition in developing countries

It has been said of children in the tropics that "in the broadest sense they are all handicapped" (11), and such statistics as are available bear out this generalisation in terms of malnutrition among children in these countries. The disastrous consequences in Zambia of the three M's - measles, muti (local medicine) and malnutrition, have been noted (12). Malnutrition has been listed as the most common cause of death among 373 children upon whom autopsies were carried out in Accra in the period April 1965 to March 1966 (13). Malnutrition is recorded as responsible for the maximum number of deaths in one hospital in Dakar of patients between 18 and 24 months (14). In Zambia, investigations indicate that mortality of pre-school children is at least 300 per 1000 and possibly as high as 500 per 1000, of whom almost all are malnourished (15).

Addressing the Second World Food Congress on 16 June 1970 Lester Pearson said that 1,000 million children under the age of 14 were currently suffering from malnutrition in the world:

> "Among the children who survive, the results of malnutrition are devastating. Physical growth, health and strength is seriously affected." (16)

At least 300 million children suffer from the physical and mental effects of protein deficiency diseases, and up to one third of all children under the age of 5 years in some countries will die from these diseases (17). Some perspective may be given to the situation by pointing out that the average person in Britain eats over forty times as much meat and fish as the average Indian peasant (18), but this should be considered also in the light of the very wide regional variations within any given country.

Few detailed statistics have been compiled to break down the estimated totals; nutrition surveys are only now being undertaken in many areas. The general accuracy of the blanket totals, however, can hardly be questioned in view of the results of small-scale investigations and sampling. Among the African countries, for example, Botswana has suffered from recurrent drought and crop failure since 1961, which has left a legacy of widespread malnutrition, especially among expectant and nursing mothers and small children (19). Malnutrition has been cited as the main factor causing heavy mortality among children in the Cameroons (20). The Government of Ghana, in a paper prepared for the Second Commonwealth Medical Conference (21), qualifying its statement by noting that, as with most developing countries, statistical data is only gradually becoming available quotes the findings of surveys conducted by the National Food and Nutrition Board that there was an overt malnutrition rate of 1% among the child population. This remarkably low rate is probably explained by the limited areas in which the surveys were carried out, and possibly by the definition of "overt malnutrition".

A report on the situation in Nigeria in 1958 considered that malnutrition "is not only common in some areas but almost universal, in a mild form, at certain ages" (22), while a survey of the situation in Senegal cites malnutrition "the base of all tragedies", and continues:

> "During the first years of life it is an exception to find a very healthy child, apart from the young infants under five months who are still entirely fed from their mother's breast ... The nutritional status of the child

in the bush varies from one season to the other in relation to the harvest of edible foods; but the nutritional status always remains inadequate."(23)

In East Africa, malnutrition, especially in young children, is an immense problem throughout the area, its indirect effects being enormous. A study in Kenya of children between the ages of 7 and 15 years showed that of the 383 school children examined, the majority envinced signs of one (and many of two or more) major symptons of malnutrition and vitamin deficiences (24). In Central Africa, the National Food and Nutrition Council assessment of the situation in Zambia cites the report of the Schools Medical Services that, of all primary school children examined, between 25 and 27 per cent have marked signs of malnutrition, and a further 50 to 60 per cent have signs of undernutrition or milder malnutrition (25). These results, it should be noted, are from the Schools Medical Service, which operates only on the Copperbelt and in the Lusaka area, the more affluent parts of the country, while "the worst nutritional conditions are found in isolated bush villages." It is reports such as this which call into question the very low incidence noted from Ghana, above. In Mauritius, too, the rapid population increase is given as the cause for widespread malnutrition and anaemia, particularly among expectant and nursing mothers and pre-school children (26).

Nothing in Africa, however, can compare with the scale and spread of severe malnutrition in Asia, as evidenced by the situation in India. In Bombay city, 42,472 children attending municipal schools were examined in 1956-57, when it was found that 35,326 of them, 83 per cent, suffered from some degree of malnutrition. A survey of children under the age of five years in Surat showed only 17 per cent healthy and, again, 83 per cent of children suffering ill-health because of nutritional deficiencies. A seven-year survey in Poona, from 1950 to 1957, revealed that two-thirds of the children examined were on the borderline or below accepted physical standards of health owing to malnutrition (27). More recently, a report in 1970 notes that at least 15 per cent of patients in children's hospitals in India are malnutrition cases (28). A comprehensive nutritional survey in Bangladesh undertaken between March 1962 and January 1964 demonstrated that malnutrition affects the health and well-being of at least half the population, while 60 per cent of households did not meet acceptable levels of protein consumption (29). The high mortality rate of Malay children between the ages of one and four years - ten times that of more developed countries - may be attributed to the fact that "knowledge and availability of nutritious food items is sadly lacking among the rural Malays who make up 75% of the total Malay population." (30).

In the Caribbean, there has been a welcome reduction in the rate of infant mortality following the introduction of public health programmes, but recent reports still reveal malnutrition as a significant contributory factor to infant mortality and child handicap (31).

As already mentioned, the degree of malnutrition varies seasonally and varies within countries. In some cases urban poverty and the high cost of food in towns leads to a high incidence of malnutrition in centres of population; elsewhere the low level of subsistence farming, ignorance or unwise concentration on cash crops results in high incidences of malnutrition in rural areas.

Overall, the picture in the developing countries is distressing, and, in many areas, deteriorating. As Lester Pearson pointed out (32), of the world's $3\frac{1}{2}$ billions, one billion are hungry, or dangerously undernourished,

or both. Half the world's population suffers from hunger or some form of nutritional deprivation, including almost one billion of children under the age of 14. It is not unreasonable to assume that of these billion children up to 250 millions live in Commonwealth countries.

Major causes of malnutrition

Malnutrition is usually the result of a combination of a number of factors, sociological, environmental, economic and demographic. A comprehensive list prepared following an investigation of the Zambian situation appears as Appendix A to this chapter. Summarised, the main causes originate in poverty, ignorance and disease. Overshadowing all is the population explosion.

The Report of the U.N. Population Commission, 1970, (33) emphasised that the changing reproductive balance between rich and poor countries is not an isolated event, but arises out of equally radical changes in the economic, social, environmental, cultural and socio-psychological spheres, all interacting with each other. The widening gap in birth rates between rich and poor countries can now serve as an effective indicator of the stage of a country's development; the more developed countries have an average yearly growth rate of about one per cent, the less developed more than twice that. The consequences are seen in pressures on food, inescapable poverty, and a high rate of dependency - in the developing world there are, on the average, two children under 15 years of age for every three adults in the productive ages, while in the industrialised countries the ratio is only one to three (34). One consequence, as the Pearson Commission stated:

> "It is a tragic fact that at the end of the 1960's there are more sick, more undernourished and more uneducated children in the world than there were 10 years ago. Every half-minute 100 children are born in developing countries. Twenty of them will die within the year. Of the 80 who survive ... 60 will suffer from malnutrition during the crucial weaning and toddler stage." (35).

It is, however, unbalanced population distribution, both chronologically and geographically, which creates the problem, rather than too great an overall number of people. Very low population density in countries such as Mali or Mauretania contribute to the problem of malnutrition because the transport and marketing of food is more difficult when vast distances separate small communities, while agricultural extension and medical services become much more expensive (36).

Poverty is self-perpetuating through malnutrition, for the ill-fed subsistence farmer has neither the will nor the ability to improve his lot. It is not only the poor, however, who are malnourished in the developing countries. Observations made in Senegal revealed that the population which evidences kwashiorkor is not necessarily only the poor population; kwashiorkor is not the exclusive prerogative of the poorest classes, being found in "farmers and fishermen as well as in employees." (37) More than a decade ago this had been recognised in Nigeria:

> "The number of children who die between the ages of two and five is known to be high everywhere in the country. In some areas the number is appalling. Many of the deaths

> arise primarily from malnutrition, yet poverty appears to have very little to do with the problem. Ignorance is the killer - and that among peoples whose affection for and value of children can never be questioned." (38)

Ignorance produces malnutrition in many ways, through social custom, religious and superstitious taboos, methods of food production and storage. The "granny syndrome" referred to already in the context of mental retardation, has its effects here, too. The children of literate and well-paid parents who have given over the care of their child to an aged relative will suffer from the conservative feeding habits of the older generation. Eggs are frequently forbidden to children: they turn children into thieves according to a Northern Nigerian belief, for example. (On the other hand, eggs are - or were until recently - forbidden to English children in parts of Lancashire because "they cause rickets".) Moslems may not eat of the pig, yet this one of the best sources of animal protein available; Hindus cannot eat meat from the cow; other religions eschew all food originating from an animal source. Taboos range from fish to fowl, from milk to palm kernal oil. Social status may have its effect, too. Beans, in parts of Nigeria, are despised as fit only for the poor, yet they are a valuable source of protein and minerals. Few wives conscious of their standing will eat beans during pregnancy or feed them to their children, when they could help to relieve the almost universal anaemia.

Family customs often militate against adequate nourishment for the child. In a typical "rich illiterate" household in Southern Nigeria:

> "(The man) is well fed since he takes a substantial amount of proteins and usually looks robust. But other members of his family are nothing like as well fed. If at any time, by an unusual circumstance, members of his family eat with him, the formula used is that a woman takes two pieces and a child one piece of meat, to every four the man eats." (39)

That this situation is not unusual may be judged from the following note from Zambia:

> "Maldistribution of food within the family is a potent cause of protein-calorie malnutrition. The men eat separately, receiving the master's share of both the staple and the relish, and many food customs seem designed to ensure that the available protein goes to the man. Traditional hospitality makes further demands on limited resources, and although the visitor is unlikely to be the guest of a child, it is the child who is most adversely affected." (40)

The situation reported from Rhodesia is not untypical:

> "It is a Shona custom that the father eats first, and that what he doesn't want his wife and family have. Added to this is the fact that the Shona are an unusually polite people and that it is a Shona custom not to encourage children to eat meat and protein-rich foods in case they become used to them and are greedy for them when guests come to the home. For

> these reasons Fungayi was probably fed on little more than maize porridge, tea, an occasional bottle of fizzy drink, and meat about once a month." (41)

The crisis at the time of weaning, too, accounts for many deaths from malnutrition among young children, and is certainly the major cause of kwashiorkor and marasmus. The rapid change from full dependence on the mother to independence in terms of both food and protection, as has already been described, can have traumatic mental and physical effects.

Food production and methods of storage also contribute directly to malnutrition. The level of agricultural production is low in most developing countries and many areas experience a "hungry season" in the period between finishing eating the old crop and gathering the new harvest, a season which will lengthen for many in future unless crop increases keep pace with population growth. The Green Revolution in this context is a palliative, not a cure. Food losses, both in course of production and in storage, are calamitously high. It is estimated that over 25 per cent of the food in many developing countries is lost to insects, birds, rodents, monkeys, moulds and the combined effects of heat and humidity:

> "Nine million tons of protein per annum could be saved by preventing cereal grain being destroyed by insects and rodents. This is greater than the current annual production of oil seed protein ... Losses of one third of stored grain are common." (42)

In East Africa:

> "Several million pounds of maize grown in Kenya go to feed weevils every year ... Five out of every 30 lb. of maize in a housewife's debe are eaten by these insects within six months of the harvest in any one season." (43)

In their report on the World Food Problem, the United States President's Science Advisory Committee states:

> "If only half of the estimated world loss of food grains in storage was prevented, it would represent 55 million tons per year, or enough to make the diet of 500 million people in developing countries adequate in total calories." (44)

Men have it in their power to remove the major causes of malnutrition - poverty, ignorance, superstition, unjust custom, disease. Until such time as the dimension of the problem is more adequately appreciated children the world over will be at risk nutritionally, from malnourishment, undernourishment, badly balanced diets, or, as in England, from obesity.

Characteristics of malnutrition

It has been said that few school children are affected by specific disorders of malnutrition to the extent of requiring special educational provision (45). By the age of six, of course, many children are already dead; but, of those who remain, most of those who do go to school have their health affected adversely by a diet deficient in quantity or quality. The school-age child, for example, may inherit somatic retardation, irreversible

lesions, enzyme and functional disturbance appearing and often accumulating after the nutritional crisis in early childhood (46). Generally, too, it is unusual to find a deficiency of just one factor in a diet, deficiencies usually being multiple (47). Malnutrition characteristics are frequently overlaid by the results of diseases suffered as a consequence of lowered resistance. Worm infestations, too, aggravate the direct results of malnutrition; perhaps 80% of the Malaysian rural population, or about 4 million people, are infected with heavy hook-worm, and 35% with whip-worm (48). Weakness due to malnutrition may at times even mimic paralysis (49).

Malnutrition certainly affects the life-expectancy rates in the poorer countries. Life-expectancy in East Africa is only 35-40 years (compared with over 70 in Britain), with an infant mortality rate approaching 20% of live births. In many areas, half a generation disappears between birth and 5 years (50). While it may be true that the more survivors among the young, the greater the human capital available 15 or 20 years hence (51), precautions need to be taken to ensure that the capital is in the best possible physical and mental condition. It is perhaps starting to realise that 25% of India's revenues is spent to maintain children who die before reaching the age of 16 years, before they can contribute effectively to production, so that a reduction in infant and child mortality would increase the Indian revenue more than any envisageable effort of industrialization (52).

The effects of malnutrition can be seen in the rate of physical development. Undernourished children are to some degree underweight and undersized, although in many cases it is difficult to establish norms, so widespread are deficiencies. In North Africa, for example, it is usually in the youngest classes in school (5 to 7 years) where weight deficiency is most marked, following the deficiency seen after the weaning period. A recovery around 9 to 10 years tends to be followed by another retardation, particularly in girls, at 12 to 15 years (53).

The primary and secondary effects of malnutrition on the physical and mental health of young children are widespread and grave. It is now clear that the lack of proper diet can contribute to the onset of blindness. In India more than ten thousand children go blind every year because of an inadequate intake of Vitamin A and consequent keratomalacia. Vitamin B2 deficiencies may also play a not insignificant part in ocular pathology, in conjunction with other nutritional factors (54). As a secondary factor, measles in the malnourished child accounts for a high incidence of blindness (55). Deafness, too, is frequently the direct or indirect result of malnutrition (56). Among the manifestations there may be cited dental caries (57), anaemia (58), errors of metabolism related to enzyme deficiencies (59), and psychological disorders:

> "It is unquestionable that psychological disorders rank foremost in the clinical picture of malnutrition. Studies with psychological tests have been made by various authors on malnourished children and showed that recovery from malnutrition is usually accompanied by a definite improvement of the I.Q. Studies in severely malnourished children showed the severity of the impairment of intellectual development. It seems that children who suffered prior to six months of age from severe malnutrition are likely to have a probable loss of their intellectual potential, whereas children affected at a later age may completely recover from the intellectual deficit if other factors, especially social, do not interfere." (60)

Considerable variation exists in opinion concerning the effect which malnutrition may have on mental retardation. Some authorities believe that only now are data and observations being collected "in the hope of establishing whether there is a connection" between mental retardation or school failure and a former pathological condition caused by malnutrition and various diseases (61). At the workshop on the Delivery of Mental Health Care held in Uganda in 1969 one speaker "suggested that malnutrition might be exerting a malevolent background effect" on brain-damaged children (62). The Pan-African Psychiatric Workshop on the Mental Health of Children in Developing Countries, held in June 1970, recognised the existance of evidence "which suggests that Protein-Calorie-Malnutrition may lead to some intellectual deficit if it occurs in the earliest years." (63). Another survey mentions "a growing belief" that a relationship exists between early malnutrition and mental retardation, "and some nutritionists believe that the damage may be permanent." (64). The picture may become clearer following the results of a retrospective study being undertaken on the effects of early protein-calorie malnutrition on Zambian primary school children (65).

Some authorities are already convinced that the link between malnutrition and brain damage, mental retardation and epilepsy has been proved, since cerebral symptoms, often with profound mental changes, are to be found in severe deficiency (66). Others believe that there is "enough evidence in the literature" to prove that severe PCM during the early developmental phases of the central nervous system causes mental retardation of various degrees, suggesting that "we may be witnessing a situation in which approximately two thirds of the pre-school children in the world are becoming mentally handicapped due to PCM" (67). Research in Chile, for example, has shown that the brains of children who died from marasmus before the age of one year had appreciably less DNA and therefore less brain cells (and brain cells are not renewed in number) (68). In the circumstances it may be wise to accept the conclusion of the Pan-African Psychiatric Workshop:

> "Despite the lack of definite findings, it was strongly emphasised by everyone present that since there are no known benefits from this disease (PCM), efforts should be made to ensure its eradication!!!"(69)

Some main forms of malnutrition

As opinion varies on the relation of malnutrition to mental retardation so it varies about the exact effect of maternal malnutrition on the health of the child. Positive assertions; "it is well known that the state of maternal health during pregnancy directly influences foetal growth and development" (70), are countered by more caution:"some observations show that a poor maternal diet affects the developing foetus," (71) or

> "it is believed that the period of greatest vulnerability is the prenatal period and the first few months of life, because the phase of maximum growth takes place at this particular moment," (72)

In Ghana, for example, pregnant women have been found to be less well nourished than the rest of the adult population (73), so that the unborn child must be considered at risk. In the rural areas of developing countries the hard work which the mother is subjected to has a harmful effect on her child's development, particularly in the last three months of pregnancy when the child's weight should be tripled (74). The needs at this stage are not

always recognised. In the Cameroons, for example, pregnant women do not benefit from rest or extra food (75), although the crucial period for maternal malnutrition to have a direct effect on brain function is during these critical last three months of pregnancy (76). Particularly damaging is protein deficiency during this period, and evidence from countries such as Nigeria indicates that the majority of women in the poorer countries do not receive sufficient protein at this time. An investigation in the Western Nigerian town of Imesi-Ile some years ago concluded:

> "It is usual for European or American mothers to gain from 25 to 30 pounds in weight during the months of pregnancy, and the average weight of their babies when born is at least two pounds heavier than the Yoruba newly-born baby. We were not at the time looking for this but we were so struck by the unusual fact that our Imesi mothers either did not gain weight, or only very little, that we have kept accurate figures and find that the average gain in weight in the Yoruba expectant mother is only one or two pounds. We believe that the reason for this is the lack of protein in the Yoruba diet." (77)

Malnutrition in the mother puts the unborn child at risk. Deficiencies at the weaning stage evoke the main manifestations of malnutrition in the young child.

Kwashiorkor was first described by Dr. Cicely D. Williams, a Medical Officer in the (then) Gold Coast, who observed a disease among infants in the Accra area, and in her report called the disease by the name given to it by the Ga people (78). Dr. Williams' discovery was not immediately accepted; recently one doctor in Kenya claimed to have worked there for twenty years without seeing the disease:

> "It's an invention of the nutritionists or a result of the modernisation of conjugal habits." (79)

It is now generally accepted that kwashiorkor develops mainly at the weaning stage, a particularly critical one (80). Rapid weaning - usually because of another pregnancy, a point emphasised by the International Planned Parenthood Federation (81) - causes the abrupt separation of the child from his mother and an unsuitable protein-deficient diet usually follows breast-feeding, resulting in kwashiorkor. Once again there is some disagreement about the distribution of the disease. The Pan African Psychiatric Workshop, basing its findings upon Senegal (82), observed that kwashiorkor appears mainly in towns and affects first born children more frequently than later born children. On the other hand, another account of the situation in Senegal, says that the number of kwashiorkor cases is 3 to 5 times lower in the very urbanised areas and in the stable and traditional areas (83). Birth rank, too, may be a significant factor in the incidence of kwashiorkor "since the earlier a child comes in the family the better off he is likely to be." (84) Girls generally suffer more than boys. There is disagreement, too, on the incidence of the disease, some doubting if children with kwashiorkor represent more than 3 per cent of underfed children in developing countries (although up to 70 per cent of pre-school children may suffer from milder forms of protein-calorie malnutrition (85)), while others believe that it is probably the most frequent nutritional disorder in the tropics (86). This seems to be a disagreement on terminology rather than on the importance of protein deficiency as a major hazard to children's health in the developing countries.

Calorie deficiencies can lead to marasmus. This is a form of starvation, the child receiving neither adequate supplies of breast milk, nor of any alternative food (87). It may be that a state of marasmus occurs in the majority of children in these countries, lowering their resistance to infections.

Vitamin deficiencies are widespread and calamitous. Over ten thousand additional children in India go blind every year because they do not receive sufficient vitamin A, and the deficiency is also reported as a major contributory factor to blindness in Malaysia and Pakistan; children in the areas in Africa where palm-oil and fish are not easily available suffer similarly. The Vitamin B deficiencies are numerous; beri-beri (due to thiamine deficiency), pellagra (niacin deficiency), and riboflavin deficiencies, all appear in the statistics for developing Commonwealth countries. Vitamin C deficiency (scurvy) occurs in areas where children have a prolonged milk-flour diet; vitamin D deficiency (rickets) is frequent where children are kept indoors in accordance with traditional customs, or when living in town.

Mineral deficiencies, too, affect very considerable numbers of children. Malaria is a main contributory factor to iron deficiency and consequent anaemia. The replacement of iron cooking utensils by aluminium has removed one useful source of sufficient iron in the diet. Iodine deficiency results in goitre ('Derbyshire neck" in England) and can be easily remedied by the introduction of iodised salt. Unfortunately this is not always acceptable; in Northern Nigeria, for example, desert salt is believed to contribute to virility, and much difficulty was experienced when the authorities attempted to substitute iodised salt. Calcium and phosphorus insufficiencies affect the formation and composition of teeth and bones.

Educational effects of malnutrition

The extent of the effect of malnutrition on the performance of children in school is usually assumed to be considerable, but this assumption does not go unchallenged. Among the assumed effects there may be included apath, a reduction in the child's ability to concentrate, absenteeism and consequent retardation, loss of motivation and drop-out, although these effects may also result at least in part from economic, social and scholastic factors, and the degree of influence of malnutrition must remain indeterminate (88). The effect on the children of a teacher who may well be himself underfed must not be overlooked (89). Poor teaching is frequently a major contributory influence towards effects on the child similar to those attributed to malnutrition. A number of authorities reporting over the last half-century have cast doubt on the "common-sense" pre-suppositions about the relationships between health and educational performance (90).

Nevertheless, common-sense keeps breaking in, and a reasonable statement of the present situation may suggest that a direct relationship between malnutrition and school success does exist, but much detailed research remains to be done. The phenomena are observable enough, but not readily measurable (91). The difference in performance of Moslem boys in the fasting month of Ramadan and at other times of year, for example, is apparent to every teacher, but has not yet been investigated in depth. One particular characteristic of kwashiorkor cannot but have subsequent in classroom performance:

> "It is not infrequent for a mother of a three-year old child with malnutrition to admit that her child has not smiled for

three months. These children stop playing and are content to sit still for hours at a time; this at an age when a child should be inquisitive and by its endless activity undergo an important part of its education." (92)

A Zambian paper puts the case forcefully if somewhat dramatically:

> "The importance of education has rightly been recognised, but the relationship between nutrition and learning capacity has tended to be ignored, thus casting the costly seeds of education on the barren ground of malnutrition." (93)

Nutrition in schools

It seems obvious that much can be achieved through nutrition programmes through the schools, although the most important area for action is still the infant and pre-school population, and among the mothers (94). Appendix B to this chapter shows how a recognition of the need, accompanied by assistance in basic organisation, can help to overcome some basic problems in child feeding. Nonetheless, the organisation of school meals can play an important role in the long-term raising of feeding standards:

> "The methods found to be most effective in other parts of the world is to turn to the most impressionable age, and get school children to learn about eating by eating. This is done through the system of serving free or cheap food of high quality to the children while at school." (95)

Boarding schools in the developing countries have not always been noted for the diet provided for their pupils. The writer conducted a survey of the meals at the Kano Middle School in 1953 and found it lacking in both animal protein and variety, although this is understandable in view of the fact that only ninepence per boy per day was allowed for feeding and that purchasing of stores was conducted through the Native Authority with a private contractor. An outline of the diet is appended as Appendix C. The Ominde Report (96) recognised the cost of improving existing school diets to acceptable levels but recommended some immediate steps and a long-term policy. The diet suggested for secondary schools is reproduced in part as Appendix D.

In addition to improvements in diet standards of boarding schools, a number of Commonwealth countries are active in the provision of supplementary meals in day schools. Both governments and voluntary bodies are involved. In Zambia, for example, a revision of boarding and day school feeding is linked to curriculum revision, because "to teach nutrition in boarding schools, where the catering is inadequate, would be asking for trouble." (97) In Ghana, the Rotary Club of Accra has for some years supported a supplementary feeding scheme for primary school children at Achimota, in co-operation with the authorities and UNICEF.

Zambia has been particularly active in seeking the best form of supplementary feeding, and after numerous trials with four possible supplements has chosen the milk biscuit developed by the Dairy Division of CSIRO in Australia. The criteria to be met were:

> "(a) A minimum provision of 10g. of protein and 200 calories, with vitamins and minerals added

as required.

(b) The snack must be cheap, palatable, and acceptable to the pupil.

(c) It should have good storage qualities, be easily distributed, involve minimum extra work for teachers, and be easily accounted for.

(d) It should be capable of being manufactured locally." (98)

The milk biscuit meets all these criteria and action is now going forward. Other countries might well consider whether this biscuit might not help in their own campaign to improve the nutritional standards of their school children.

The World Food Programme of the Food Agriculture Organisation of the United Nations is heavily committed to school and pre-school feeding programmes in developing Commonwealth countries. Among the countries mentioned in recent issues of World Food Programme News are Barbados, Botswana, Cyprus, The Gambia, Ghana, India, Jamaica, Lesotho, Malawi, Mauritius, Nigeria and Swaziland. On a world basis the Programme had, by the end of July, 1970, committed more than $200 millions to bring food aid to primary and secondary schools, over $4 millions to prevocational and vocational institutions, almost $22 millions to universities, professional and technical institutions, and nearly $4.5 millions to literacy and adult education campaigns (99).

Despite varying opinions about the range and extent of the effects of malnutrition on children in the developing countries and the most appropriate points at which it should be countered, there is no doubt that widespread malnutrition exists and that programmes should be devised to minimise its consequences.

Conclusions

Speaking of problems of national development, the Report of the Indian Education Commission says:

> "The first and the most important of these is food. Mahatma Gandhi said: 'If God were to appear in India, He will have to take the form of a loaf of bread.' ... Self-sufficiency in food thus becomes not merely a desirable goal but a condition for survival." (100)

The essential need for developing countries is for more food and a higher standard of living, factors which seem to be interdependent. For this reason the "pump priming" role of external agencies seems basic to development in this area. In so many cases, improved nutrition is as much a matter of public attitudes, customs and traditions as of insufficient land or lack of concern for the children. Continuous effective propaganda directed at parents and administrators is a vital supplement to intensive campaigns of health and agricultural extension, and family planning. Teacher-training programmes should stress the importance of adequate nutrition, for the teacher as well as his pupil. Nutrition programmes should be incorporated into overall national economic planning, and a comprehensive and coherent policy for children drawn up. The eventual aim should be to eliminate the effects of malnutrition be removing the cause, although this can only be in the long term. Malnutrition must be considered as an important contributory

factor, primary or secondary, to many of the handicapping afflictions suffered by children in developing countries. To disregard it when considering programmes for the alleviation of handicap may well lead to the expensive error of treating the symptom rather than the disease:

> "It would be possible to go into detail about the diseases which afflict humanity other than the deficiency diseases, but malnutrition is really the backcloth on which all these catastrophes depict themselves." (101)

APPENDIX A

THE MAJOR CAUSES OF MALNUTRITION

Malnutrition is normally a combination of numerous causes. The following suggested causes are purely tentative; the Nutrition Survey and Services Project, described below, will provide the firm data on which to plan.

A. Sociological

1. Bottle feeding is one of the greatest killers, due to unhygienic bottles and unduly diluted feeds.

2. The increased rate of parity and employment of women has resulted in earlier weaning.

3. The lessening period of breast feeding has been unaccompanied by an adequate knowledge of the child's nutritional needs.

4. Thin gruels of maize or cassava flour are used for weaning, with little or no protein added; gravies from relish dishes supply negligible amounts of protein.

5. Traditionally meals are limited to two per day, often much less, e.g. an average of 1.34 meals per day at Shikamushile.

6. The size of a child's stomach precludes adequate intake on a basis of two meals per day.

7. In communal feeding, intake varies with the size of hand and manual dexterity, to the disadvantage of the young child.

8. There is maldistribution of food within the family, the father having the master's share of both staple and relish.

9. The sale of sweet aerated drinks, fostered by massive advertising, has a pernicious effect on young children. On a follow-up recently of 107 serious cases at Ndola, 60% of mothers fed their children with such drinks.

10. Increase in migrant labour since the twenties has denuded the rural areas of man-power for traditional agricultural tasks, resulting in an ever-increasing spread of cassava cultivation replacing millet production.

11. Increased beer consumption results not only in over-indulgence affecting the family budget and preparation of meals, but in the use of beer as a soporific.

12. The effect of food taboos has significance, but in most areas alternative foods can be found.

13. There is no concept of deficiency disease; the explanation of the unknown is deemed to be supernatural.

14. The underweight child is so common that it is regarded as being normal.

15. There is lack of knowledge of human nutrition among all socio-economic levels of the population, and among most professional and auxiliary staff.

16. There is lack of budgetting skill and bad spending habits.

17. Obligatory, traditional hospitality makes heavy demands and although the visitor is seldom the guest of the child, it is the child who suffers.

18. There are plenty of changes in food habits taking place, but most are nutritionally detrimental. Consumption of bread and buns is increasing by about 20% per year.

19. Crowded housing conditions in urban areas make consumption demands beyond the capacity of kitchens.

20. Young children are at special risk when they are twins, illegitimate, children of broken marriages, displaced by a new pregnancy, youngest member of a family over four and when the parents are alcoholics.

B. Environmental

1. There is only one rainy season, which limits production to one harvest without irrigation, and results in shortage of greens at the end of the hot dry season.

2. Rainfall is heavy in the north where the soils are leached, and moderate in the centre and south, where, in years of under-average rainfall, yields are low. Excessive rainfall, as experienced this year, also affects yield.

3. Monkeys, bush pigs and birds cause serious losses of growing crops. The traditional bird scarers now attend school.

4. Research studies have shown that 30% of grain stored under village conditions is lost to insect pests and rats.

5. The usual tropical pests and plant diseases are prevalent, as are diseases of domestic animals.

6. Vector borne diseases are also prevalent, especially malaria, bilharzia and hookworm, all of which are synergistic with malnutrition.

7. The herds of wild game have been reduced from abundancy to scarcity outside the game reserves; thus the most important traditional source of animal protein has been lost.

8. In many areas there is no tradition of cattle-husbandry and tse-tse fly preclude cattle over vast areas.

9. Soil erosion affects not only local resources in the hilly areas, but through silting in the valleys, results in flooding and loss of arable land.

10. Where the chitimene system of cultivation prevailed, much of the woodland has been cut out, and cassava replaces the former grain crops.

11. Traditional land tenure handicaps development; lands are held in trust tribally and a system of usufruct prevails in most lands.

12. A population density averaging 12 per square mile results in dispersed small communities, thus hampering the provision of services.

13. The state of secondary roads during the rains and the distances involved are obstacles to marketing.

14. In urban areas there is little provision for vegetable gardens.

C. Economic

1. About 70% of the population depends in whole or in part on its own production to feed the family; they do not have the purchasing power to buy from commercial producers.

2. The cost of foodstuffs consumed by the lower economic sector has increased in price by 54% during the last four years.

3. Although wage rates have increased since independence, the basic labourer's wage is very close to the poverty datum line.

4. Payment of wages monthly results in lavish spending at the beginning of the month; and near destitution at the end.

5. The introduction of cash crops, an essential diversification of production, can be detrimental to food production.

6. The historic dependence on fruit and vegetable supplies from the south, results in short supply and inflated prices.

D. Demographic

1. According to the results of the last census (1963), it was deduced that the natural rate of increase is 3.2% per year, thus the population is doubling every 22 years.

2. Food production per caput is falling behind the rate of population increase.

3. In 1963, 46.6% of the population were under the age of fifteen years. It can be assumed, therefore, that at least half of the population is non-productive.

4. The drift to the towns from the rural areas is marked. Urban dwellers are increasing at an estimated rate of 8% per year, resulting in the creation of septic fringes round the cities, which generate their own peculiar problems.

(extract from "An Assessment on Activities in Zambia," Lusaka, National Food and Nutrition Commission, 1969).

APPENDIX B

"A great improvement in the children's health came about very quickly in 1963 when the village had little land cleared and consequently hardly adequate food supplies. This first improvement was brought about by better management of the children's feeding. Every evening there was a lot of crying amongst the village children and much shouting at them by their mothers. An African mother is a very busy person cooking for her family, collecting firewood, carrying water from the river, doing the family washing, bathing the children, all on top of the biggest of the jobs, working in the fields. When she returns to the house at night she is understandably tired and thus easily irritated by her children. The youngsters are also tired at that time of the day and hungry, both of these making them miserable. The food has to be cooked, during which time it grows dark and the children, sitting around the kitchen fire, after a few bites tend to drop off to sleep when they are picked up and laid down for the night, not having eaten properly. It was suggested that one or two of the women should come in early from work and prepare food for all the children - explaining the reason. The idea was strange to the women and not easily accepted at that time. It was in fact the men who first saw the value of it and asked for it to be put into operation. These sorts of operation generally need a time of helping whilst people come up against and overcome the inevitable problems. For instance, in this case the feeling amonst the women that everything had to be fair meant that the women had to do the children's cooking in turn, it not being "fair" that one pair of women always do it while the rest are still out in the fields. This meant that every week started with having to explain everything to new mothers. It was possible in quite a short time to see the benefit of this and later it was extended almost automatically to the midday meal."

Ibbott, R. An Account of the Origins, Growth and Destruction of the Ruvuma Development Association (unpublished) 1971.

APPENDIX C

Kano Middle School Diet, 1953

Normal constituents

Tuwo	-	a dough made from powdered guineacorn or millet, eaten either by dipping in soup or as cakes fried in groundnut oil.
Rice		
Gari	-	powdered cassava
Soup	-	a liquid made from some or all of: marrow (kabewa), locust beans, tomato, onions, baobab leaves, peppers, palm oil and salt.
Milk		

Average weekly menu per boy

Monday to Thursday

0700 hours	1 tuwo cake
0915	tuwo, soup, meat (small piece)
1400	guineacorn and milk
1830	tuwo, soup, meat (small piece)

Wednesday (occasionally)

1830	rice and soup or gari and soup

Friday

0700	1 tuwo cake
0915	tuwo and soup
1400	guineacorn and milk
1830	tuwo and soup

Saturday

0915	tuwo cake, tuwo and soup
1400	rice, beans, groundnut oil, salt
1830	1 tuwo cake, 1 banana

Sunday

0915	tuwo and soup
1400	guineacorn and milk
1700	tuwo and soup

A Unified Diet for Secondary Schools

6. Cost of feeding - The costs of food vary according to season, locality and availability. Cost per head decreases with an increase in numbers and, when adequate storage and transport facilities are available, with bulk buying. Thus the larger secondary schools recommended in this report offer prospects of economies.

7. A Unified Diet - At present Nairobi wholesale prices for schools, using cheaper alternatives, some fresh and some dried skim milk and very little variety, an adequate diet could be provided at a minimum cost of Shs.2/- per head, but this would not allow scope for reconciling different customary feeding habits. A diet with a little more variety, an occasional better cut of meat, rice and bread could be provided for Shs.2/50 per head. Shs.3/- is a more realistic figure. This diet is calculated on the basis of the menu shown in paragraph nine (below).

8. Trained Caterers - To deal with the problem of a Unified Diet and to ensure good value for money, it is recommended that each school should have the services of a trained caterer (see paragraph 399) and that the Kenya Polytechnic should provide courses of training for this purpose.

9. A suggested menu for a Unified Diet - The following menu has been drawn up by Miss Norah Gibbs, a dietitian working with the W.H.O. team in Kenya. It meets the nutritional needs of an average secondary school pupil and can be used as a basis for other menus. The greater the variety, the safer the diet will be nutritionally.

	Girls	Boys
Maize and other cereal	10 oz.	16 oz.
Sugar	1½	1½
Meat or beans	4	4
Milk	30	30
Potato or Arrowroot or Casava	8	8
Fruit or Vegetables (at least half of this should be of the dark green or yellow type, e.g. spinach, pumpkin, curds, pawpaw, mango, etc.)	6	6
Fat	1	1½
Salt	½	½

10. Maize or other cereal = same quantity of maize flour, wheat flour, rice. Wheat flour could be used in cakes, pastry, bread - 1 oz. maize flour = 1½ oz. bread.

A variety of these cereals should be served during the day. Thus, for the girls' menu (10 oz cereal), this could be:

BREAKFAST: 2 oz. Maize flour as porridge
3 oz. Bread

LUNCH: 2 oz. Rice, served with meat, etc.
1 oz. Cereal with milk for pudding

EVENING: 3 oz. Maize (served with beans)

11. Meat 4 oz. = Fish (fresh) 6 oz. = Fish (dry) 4 oz. = 4 eggs = 4 oz. cheese = 4 oz. beans or other dry legume (i.e. peas, lentils, dahls, etc.) (or groundnuts), = 1 pint milk.

Again, a variety of protein food may be served thus:

Lunch - 2 oz. meat
Evening - 2 oz. beans

12. MILK - Could be dried skim milk.

13. At least half (3 oz.) of the fruit and vegetables recommended should be in the form of dark green or yellow vegetables, or fruit. This is to ensure an adequate source of Vitamin A.

If there is difficulty in obtaining these foods, it is suggested that the fat used be oil or margarine, fortified with Vitamin A. (Suggested vitaminised oil, produced by the East African Industries, which contains 4,000 I.U. Vitamin A per oz.).

(extract from Kenya Education Commission Report, 1964).

Notes and References

1. "Underfeeding puts seven in 10 children 'at risk'," The Times, 25 September 1970; "How well do schoolchildren eat?" The Times, 25 September 1970.

2. Coombs, H.C. "Human values in education: the educational status of Aboriginal Australians," The Australian Journal of Education, Vol.14, No.3, October 1970, pp.241-252.

3. Satge, P. et al. "Problems related to the health of the child in tropical zones: research of solutions," Children in the Tropics, No.58, 1969, pp.2-14.

4. Canosa, C.A. "Nutrition, physical growth and mental development." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970, (mimeo).

5. Raoult, A. "The nutritional condition of school-age children." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970 (mimeo).

6. Babini, A.M.E. de. "Malnutrition, endemic diseases and education in Argentina." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970 (mimeo).

7. Boyd, A.M. "Malnutrition, endemic diseases and education: the Nigerian case." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970 (mimeo).

8. Aujoulat, L.P. "Conclusion". Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970 (mimeo).

9. Aujoulat, L.P. "An approach to the problem." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970 (mimeo).

10. Hayward, R. "A human development approach to education." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970 (mimeo).

11. Sinnette, C.H. "The Handicapped child in tropical Africa," Courrier: Revue Medico-Sociale de l'Enfance, Vol.XX, No.4, 1970, pp.335-345.

12. Phillips, M. "A background paper on blindness." McGregor, G.P.(ed.) Educating the Handicapped: The Report of a Special Committee of Enquiry into the Education and Training of the Handicapped in Zambia, Lusaka, Government Printer, 1967.

13. Christian, E.C. "Why our children die," Ghana Medical Journal No.6. pp.111-114.

14. Satge, P. op.cit.

15. National Food and Nutrition Commission. "An assessment on activities in Zambia by the Office of the National Food and Nutrition Commission." Paper presented to the East African Conference on Nutrition and Child Feeding, 1969.

16. Pearson, L.B. Address to the Second World Food Congress, 16 June 1970.

17. "Statistics of Hunger," World Hunger, Vol.1, No.5, 1968, p.8.

18. Smart, K.F. "Malnutrition, endemic disease and education: an overview." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970 (mimeo).

19. "Botswana: Mother and Child Care," World Food Programme News, July-August, 1970, p.8.

20. Klefstad-Sillonville, F. and Cusset, J.N. "An experiment of health education in the region of Dschang, in the Cameroons," Children in the Tropics, No.58, 1969, pp.22-26.

21. "The organisation of maternal, child health and basic health services." Paper prepared by the Government of Ghana, CMC(68)35, Commonwealth Secretariat, Marlborough House, London, 1968.

22. "Nutrition among children," Nigeria Magazine, No.57, 1958, pp.98-109.

23. Satge, P. op.cit.

24. Anderson, E.M. The Education of Physically Handicapped, Blind and Deaf Children in East Africa, London, National Foundation for Research into Crippling Diseases, 1968, p.38.

25. National Food and Nutrition Commission, op.cit.

26. World Food Programme News, May-June, 1970, p.13.

27. Bhatt, U. The Physically Handicapped in India, Bombay, Usha Bhatt, 1963, p.50.

28. "India II - Malnutrition," World Hunger, Vol.II, No.4, July 1970, p.10.

29. World Food Programme Intergovernmental Committee, 18th Session, Agenda Item 7, September 1970.

30. Chang Min Kee. "Deprivation and disadvantage in developing countries with special reference to West Malaysia." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute of Education, November 1970 (mimeo).

31. Rubin, V. "Deprivation and disadvantage: nature and manifestation: the non-Hispanic Caribbean." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Institute of Education, November 1970 (mimeo).

32. "FAO is 25," World Hunger, Vol.II, No.4, July 1970, pp.12-14.

33. U.N. Economic and Social Council. Report of the Population Commission: World Population Situation: Report of the Secretary-General, January 1970.

34. International Planned Parenthood Federation, "Population problems in the Commonwealth." Paper prepared for the information of the Fifth Commonwealth Education Conference, Canberra, 1971. (mimeo).

35. Pearson, L.B. Partners in Development, London, Pall Mall, 1970, p.2.

36. Smart, K.F. op.cit.

37. Collomb, H. et al. "La malnutrition protidique chez l'enfant (references senegalaises)". Paper presented to the Pan African Psychiatric Workship on Mental Health of Children in Developing Countries, Mauritius, June 1970 (mimeo), and Dan, V. et al. "Child development in Senegal in the face of malnutrition and infections." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Institute of Education November 1970 (mimeo).

38. "Nutrition among children," Nigeria Magazine, No.57, 1958, pp.98-109.

39. Onabamiro, S.D. Food and Health, London, Penguin, 1953, p.82.

40. Thompson, E.C. "The assault on hidden hunger in Zambia" World Hunger, Vol.I, No.8, March 1969, pp.2-3.

41. Caine, A. "Where hungry children die of measles," World Hunger, Vol.I, No.10, July 1969, pp.10-11.

42. "Statistics of hunger," World Hunger, Vol.I, No.5, August-September 1968, pp.8-9.

43. Abuor, C O. "A grain storage project in Kenya," World Hunger, Vol.I, No.10, July 1969, p.15.

44. United States Science Advisory Committee. World Food Problem.

45. Anderson, E.M. op.cit.

46. Raoult, A. op.cit.

47. Boyd, A.M. op.cit.

48. Chang Min Kee. op.cit.

49. Barry, B.O. "Rehabilitation of the handicapped in Africa," Children in the Tropics, Nos.62-63, 1970, pp.33-36.

50. Satge, P. op.cit.

51. Fofana, B. "Nutrition and health," Children in the Tropics, Nos.62-63, 1970, pp.33-36.

52. Ibid.

53. Raoult, A. op.cit.

54. Ibid.

55. Quarcoopome, C.O. "Prevention of blindness in Africa." Report of the First African Conference on Work for the Blind, Lagos, 1966, p.112.

56. Clifford, P. "Causes of deafness in Africa." Report on the First Seminar on Deafness to be held in Africa, London, Commonwealth Society for the Deaf, 1968, p.57.

57. Raoult, A. op.cit.

58. National Food and Nutrition Commission. op.cit.

59. Masse, N.P. "Infant Feeding and mental retardation," Children in the Tropics, Nos.66-67, 1970, pp.23-24.

60. Cravioto, J., quoted by Mandl, P.E. Preparation of the Child for Modernization, Geneva, United Nations Research Institute for Social Development, 1969, p.33.

61. Aujoulat, L.P. op.cit.

62. Mental Health Services in the Developing World, The Commonwealth Foundation, 1969.

63. Pan African Psychiatric Workshop on the Mental Health of Children in Developing Countries, Mauritius, 1970 (mimeo).

64. Rubin, V. op.cit.

65. Thomson, E.C. "Improved nutritional status in rural areas." Paper prepared for the Commonwealth Conference on Education in Rural Areas, Ghana, 1970.

66. Boyd, A.M. op.cit.

67. Canosa, C.A. op.cit.

68. Raoult, A. op.cit.

69. Pan African Psychiatric Workshop on the Mental Health of Children in Developing Countries, Mauritius, 1970 (mimeo).

70. Sinnette, C.H. op.cit.

71. Fofana, B. op.cit.

72. Masse, N.P. op.cit.

73. "The organisation of maternal, child health and basic health services." Paper prepared by the Government of Ghana, CMC(68)35, Commonwealth Secretariat, Marlborough House, London, July 1968.

74. Dan, V. and Van den Bossche, J.O.J. Report of the meeting on 3 November 1970 of the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Institute for Education, November 1970, (mimeo).

75. Klefstad-Sillonville, F. and Cusset, J.N. op.cit.

76. Canosa, C.A. op.cit.

77. "Nutrition among children," Nigeria Magazine, No.57, 1958, pp.98-109.

78. Annual Medical Report. Gold Coast, 1931, quoted by Onabamiro, S.D. op.cit., p.80; Dan, V., op.cit., gives a translation as "child marked by fate."

79. Aujoulat, L.P. op.cit.

80. Haskell, S.H. and Anderson, E.M. The Psychological Assessment of Young Cerebral-Palsied and Brain-Damaged Children in Uganda, London, National Foundation for Research into Crippling Diseases, 1969, p.4.

81. International Planned Parenthood Federation, op.cit.

82. Collomb, H. op.cit.

83. Dan, V. op.cit.

84. Halligan, Sister and Rubin, V. Report on the session of 4 November 1970 of the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute for Education, November 1970 (mimeo).

85. Canosa, C.A. op.cit.

86. Dupin, H. "Nutrition surveys." Children in the Tropics, Nos.66-67, 1970, pp.19-23.

87. Anderson, E.M. op.cit.

88. Canosa, C.A. op.cit.

89. Ibid.

90. Epstein, E.H. "Extra-societal effects on academic performance." Paper presented to the Meeting of Experts on Deprivation and Disadvantage in Developing Countries, Hamburg, Unesco Institute for Education, November 1970 (mimeo).

91. Smart, K.F. op.cit.

92. "Nutrition among children," Nigeria Magazine, No.57, 1958, pp.98-109.

93. National Food and Nutrition Council. op.cit.

94. Babini, A.M.E. de. op.cit.

95. Onabamiro, S.D. op.cit., p.108.

96. Kenya Education Commission Report (Ominde Report) Part I, Nairobi Government Printer, 1964, paragraphs 49 and 50.

97. Thomson, E.C. op.cit.

98. National Food and Nutrition Council. op.cit.

99. "Food aid to education and training," World Food Programme News, November-December, 1970.

100. Education and National Development: Report of the Education Commission 1964-66, Delhi. Manager of Publications, 1966, paragraph 1.05.

101. Smart, K.F. op.cit.