Supplementary feeding in programmes in developing countries: lessons of the eighties

PART II: DISCUSSION AND REFERENCES

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This extensive report reviews the important lessons learned during the 1980s on supplementary food distribution for the vulnerable groups in developing countries. These lessons may be useful in making such programmes a more cost-effective option in narrowing the food/nutrient gap in intake among the programme beneficiaries. This report follows a similar report published at the end of the 1970s by the author and George Beaton for UNICEF.

The primary focus in the study has been the food distribution among young children, particularly schoolchildren, and also in pregnant and lactating women. The data have been gathered through a comprehensive search of the literature, official reports and documents from several United Nations agencies, aid agencies, national and international institutions. As well as original research papers on theoretical and applied issues, reports on design and evaluation of specific programmes in over 20 countries are studied.

Consideration of programme design examines objectives, nutrient/food gap, poverty reduction, malnutrition, mother and child feeding practices, foods, ration sizes, leakages, targeting, coverage, integration of feeding and health care. Potential and measured benefits are considered in the light of the reports published at the end of the 1970s and consequent analysis of work up until the end of the 1980s. Programme costs are documented. In a discussion on context and input, the functional significance of mild and moderate malnutrition is considered, together with diet and physical activity. The author offers some thoughts on future directions and high-lights the need for further research. [Part I was published in Asia Pacific J Clin Nutr (1992) 1, 131–152]

Discussion

Context and input

One of the impressive achievements in human growth took place among the Japanese immigrants to the United States. Greulich[49] showed in 1957 that American Japanese schoolboys were on the average 6.4 cm taller and 11.5 kg heavier than the native Japanese by the age of 18 years, while American Japanese girls were 1.3 cm taller and 1.9 kg heavier by the same age. It is interesting that American Japanese girls were significantly taller and heavier until the age of 14 and the difference became much smaller between 15 and 18 years (Table 21).

Another interesting comparison has shown that in 1957 the 18 year old native Japanese boys had grown 2.6 cm taller in 57 years (the difference between 1900 and 1953), while the Japanese girls grew 5.7 taller in the same period. These studies clearly show that what the Japanese boys and girls achieved in one generation in America was greater than that achieved in 50 years in Japan. The authors conclude that the girls were biologically much better geared in coping with an unfavourable environment and performed relatively better in realizing their growth potential. The same study shows that the American Japanese boys had longer legs, which reflects better nutrition and a healthier living environment. Between 1900 and 1957 the average height among 20 year old boys increased by 2.4% while that of girls increased by 4.4%.

Table 21. Differences in height and weight between the American-born Japanese and the native Japanese (1957)

Age (years)	Height		Weight	
	Girls	Boys	Girls	Boys
6	5.3	5.4	2.9	3.1
9	6.0	6.9	4.3	6.9
12	8.8	10.4	8.1	9.2
18	1.5	6.6	1.9	11.5

From Greulich (1957)[49].

A follow-up study by Greulich in 1973[50] showed that the American Japanese in California had relatively little increase in body size between 1953 and 1971 (Fig. 7). This study suggests that the American Japanese had come very close to achieving their growth potential. In

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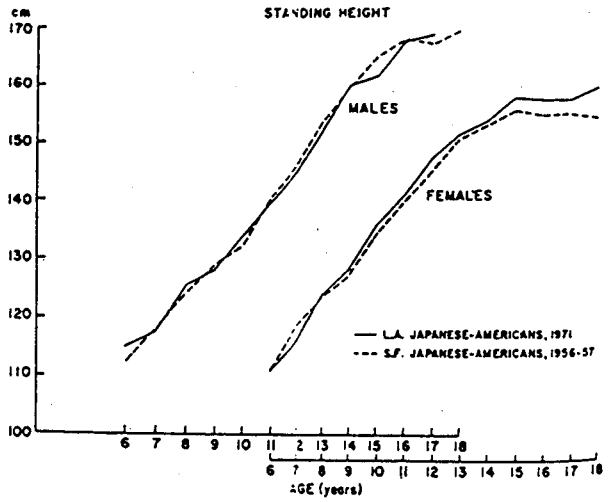

Figure 7. Limits of growth potential among the Japanese Americans. From Greulich (1976)[50].

the same study it has been shown that during 1955–1970 the native Japanese boys have achieved twice as much in body size as they did in the previous 50 years. Such an impressive progress in achieving growth potential is the direct result of socioeconomic development.

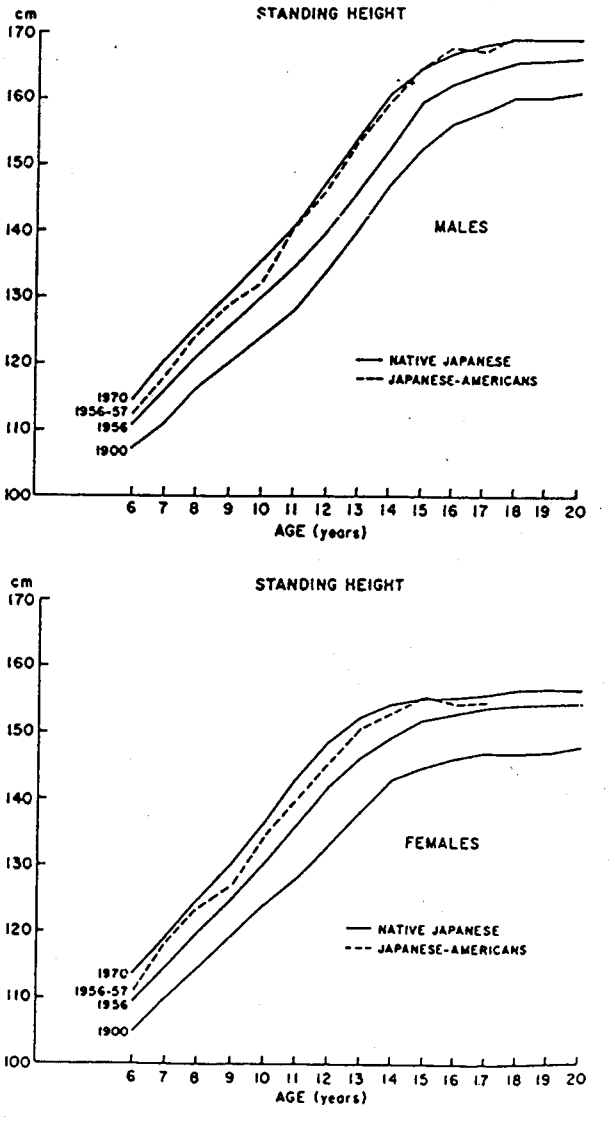

Figure 8. From Greulich (1976)[50].

By 1970 the native Japanese male and female had already passed the body size achieved by the American Japanese (Fig. 8). The American Japanese experience in one generation was achieved in Japan over two or three generations and that was only possible within the context of rapid socioeconomic development. For the low-income Japanese in Japan, achievement of full growth potential should take much longer.

It goes without saying that food distribution programmes, and for that matter most of the programmes in this category in the developing world, could only pursue much more limited objectives in realising human growth potential. Given the context within which they operate and their common levels of input, there is obviously a limit to what they can achieve. To have a proper sense of how these programmes are doing, one needs to have a much better understanding of what is realistically achievable under the circumstances where they operate. In other words, evaluative judgement on programme performance should be made in relation to the "context" and "input" variables. It was shown earlier that research studies which present better models of design and implementation produce somewhere between 0.5–1 kg added weight in 2–3 years. What does this really mean in terms of human growth? We have already shown that 500 grams weight gain is equivalent to almost total eradication of severe forms of malnutrition and reduction of its moderate form by one third to one half. These programmes have limited effects in change of weight distribution towards normal. It is important to recognize that this is not a proof of their failure. In their own proper context, these programmes are short-term measures which at best aim for eradication of severe and moderate forms of malnutrition, and at worst only hold the line and prevent the situation from further deterioration.

The Bogota study by Mora and co-workers[36] provides a good example. It offered a large ration and children weighed an extra 476 g at the age of 3 years. The results were impressive in terms of control of malnutrition. In this study it was possible to prevent third degree malnutrition and reduce the moderate forms by half. In terms of weight gain, at the age of 3 years, the supplemented group weighed 12.350±1.4 kg and the unsupplemented group 11.875±1.186 kg, while the mean weight for the upper class 3-year-old children in Colombia is 14 kg.

It would be interesting to know whether - at least in theory - those children in the Bogota study could have achieved a higher weight gain or whether the study had actually reached the maximum achievable results. If not, then how much additional gain could be expected? One could approach the question of comparison in a different way. It is generally true that food distribution programmes (and others in this class of intervention) have the short term purpose of narrowing social inequalities. A reasonable and realistic expression of purpose would then be to bring the children in the lower end of the distribution curve as close as possible to the upper end. In other words, the programmes rarely shift the entire weight distribution curve to the right. They only narrow the standard deviations. Therefore, the question is how far they can be brought closer in theory and in practice. Theoretically, if one takes a cross section of the child population in the community, the mean weight of the

top 10th percentile could then be considered as the reference curve. In theory, the difference between the achieved and the achievable should be explained by the "input" variables, which include the ration size, synergy of other services, targeting, management and community support.

Over the past decade, a large number of programmes have been carefully analyzed and reviewed for their input, costs and impact. In looking at some of these programmes, there seems to be a threshold effect between input and outcome. For instance, programmes could be ranked for their performance on the scale of 100 to 500 g of weight gain among 0–3 year old children. The 100–200 g level is closer to what most ongoing programmes produce, and 500g is the.top of the scale achieved by very few research studies.

The input/output relation is non-linear and there appears to be an "input" threshold above which the programme impact is relatively much larger. With much more detailed analysis one could explain the relative weight of various input variables. At this point it is not clear as to which variables make the difference. Experiences in Bogota and Narangwal seem to suggest the ration size, targeting and management as being highly influential. The "threshold effect" was raised by Beaton and Ghassemi[1] in the context of programme costs and socioeconomic settings. But the subject has received little attention otherwise. A parallel set of observations on "threshold effects" was made by Habicht and coworkers in Guatemala.[51] They showed in a study that primary health care services with a nutrition focus were effective in reducing infant mortality rates from 138 to 55 per thousand in a period of three years. However, no further measurable reductions were possible, either through such services or by their improvements.

In referring to the threshold effects observed by Habicht, Beghin has argued that control of malnutrition in societies where its incidence is relatively low would require a different mix and level of input in nutrition programmes.[52]

Functional significance of mild and moderate malnutrition

Until the late 1970s most of our scientific knowledge on the consequences of malnutrition came from the studies of its severe forms. If one asked what happens as a result of mild and moderate forms of malnutrition and what are the functional consequences, the world of science had very little knowledge in these areas and could hardly answer such questions. Most of what is known about the effects of malnutrition on physical growth, cognitive development, social development, resistance to infection, reproductive performance and physical activities is based on data from studies on severe malnutrition. Therefore, assessments of a nutrition programme at the population level are based on a set of cause-effect relationships which is not entirely relevant. In this situation, there is a gap in our scientific basis for deciding on the expected benefits as well as the indicators of impact. It was for this reason that in 1977 the World Food and Nutrition Study of the National Academy of Sciences of the United States gave its highest priority to determination of the functional consequences of chronic mild and moderate undernutrition. Results from an intercountry research study in Egypt, Kenya and Mexico, coordinated at the University of California at Berkeley, have made an important contribution towards closing the knowledge gap in this areas.[53] The study, commonly known as CRSP (Collaborative Research Support Programme), was designed to test the hypothesis that food intake is causally related to functional outcomes believed to be important in the development of individuals. In doing so, it measures the effects of food intake on morbidity, cognitive and behavioural performance and reproductive functions among a population where only mild and moderate malnutrition is present. The study had its major focus on pregnant women, the mother and child pair during lactation, toddlers of 18–30 months, and school age children 7–9 years old.

The study has confirmed the broad general hypothesis that mild and moderate deprivation in food intake does have considerable functional consequences, particularly among infants and pregnant or lactating women. Here are some of the findings particularly relevant to this discussion.

Levels of food intake in Mexico and Egypt were satisfactory while in Kenya there was food deprivation which became quite pronounced during a drought period in the middle of the study. Infants were deprived of food in all three countries and infants were stunted by the end of their first year. Interestingly, their rates of growth in later life were satisfactory. There are two likely explanations for stunting during infancy. The first is lack of sufficient breast milk, plus delayed and inappropriate complementary feeding. This picture was primarily observed in Mexico and Kenya, and it was thought that mothers' inadequate food intake during lactation and their low fat reserves following pregnancy were the cause of poor lactation after the first few months. Second, in Egypt mothers had sufficient fat reserves and adequate food intake. Therefore, stunting could probably be due to early introduction of sugar water and suppressed appetite due to repeated illness.

Another interesting finding was poor catch-up growth after the first year which apparently puzzled the investigators. The question was why did the children not catch-up with their growth when they had access to sufficient food in the family? This was difficult to explain. The study even had difficulty in finding a clear relationship between energy intake and growth among toddlers. The only statistically significant relationship was found between dietary fat and protein intake and height. A cross-project analysis showed no strong and consistent effect of diet on the toddlers' rates of growth. This observation is quite important because it touches on the heart of the problems measuring the impact of food distribution programmes, which is based on an assumed cause-effect relationship between food intake and weight gain. But this relationship seems to hold only when levels of food deprivation are high and therefore proportions of severe forms of malnutrition are high. On a population level it is difficult to show the relationship below a certain level of food deprivation. When food distribution does not result in weight gain it is thought to be because of poor programme performance. In other words, the diagnosis is intact but the treatment is inefficient. But data in the 1980s have created new doubts about the diagnosis as well. For instance, Jones and associates in

a major analysis on the effects of poverty on child growth based on two cross-sectional US national surveys showed that differences in growth were not consistently associated with differences in dietary intake of energy between poverty groups or surveys.[54]

In the CRSP study it was also difficult to evaluate the likely effects of morbidity because of the circularity of the diet and disease relations. The fact is that illness affects appetite and lowers intake, which in turn affects the body's ability to deal with illness. The food intake and physical activity and morbidity relationship seems to be much stronger. In the CRSP study physical activity was considered an intermediate variable between intake and behaviour. But the study generated relatively little data on physical activity. It was shown in Mexico that children were more active and vocal if they ate more. Adults' activity was reduced in Kenya as a result of drought and food shortage. Also, incidence of illness was doubled in Kenya during food deprivation. Diarrhoea had an adverse effect on rates of weight gain in Mexican children, but not on Egyptian children, although disease was more severe in Eygpt. This may well be another example of the observations made by Martorell, that in the face of relatively satisfactory food intake, detrimental effects of diarrhoea on growth are not significant. Morbidity was more often associated with size than with growth. Once the child is small, the reserve capacity to deal with repeated illness is diminished. Also, in Egypt, where family food supplies were adequate, poor child feeding practices and poor sanitation seemed to be major operating forces. Another interesting finding was that the dietary fat and animal protein intake of mothers was a good predictor of family socioeconomic status as well as the growth of preschool and school age children.

In the CRSP study, it was shown that there is no cost-free adaptation to dietary constraints. In other words, human beings cannot adapt to lower levels of food intake without compromising their health. Therefore, it is clear that in a food distribution programme among children, added intake should influence both growth and physical activity.

Diet and physical activity

During the 1980s there were some new reports on food intake and physical activity. Such studies show that children with sub-optimal dietary energy intakes modify their physical activity by becoming less active or by changing their activity pattern in favour of the less energy-demanding ones. This is more evident among the younger age groups where peer and social pressures do not play an important role.

Torun and co-workers[55] showed that poor underweight young children (2-6 years old) in Guatemala, under free-living conditions, spent more time in sedentary activities and relatively less on moderate and heavy physical activity (Fig. 9), and the difference between the groups was significant. Then, in a longitudinal phase of this study the children were given a food supplement and nutrition education. Those who improved nutritionally, reduced their sedentary and light activities and increased the time spent in moderate activities. In contrast, those whose conditions had deteriorated shifted from heavy to sedentary activities (Fig. 10).

Chavez and co-workers have shown that supplemented children were six times more active by the age of two years than the non-supplemented, and the supplemented showed a sharper rise in their activity levels with age. They have also shown that the physical activity pattern and play habits differ between the two groups.[56] The non-supplemented children spent 90% of the time indoors compared to 50% in the supplemented groups.

This seems to depend not only on the mothers' attitudes but also on the children's demands and independent movements. The studies in Uganda, Guatemala and Mexico seem to suggest that low energy expenditure is

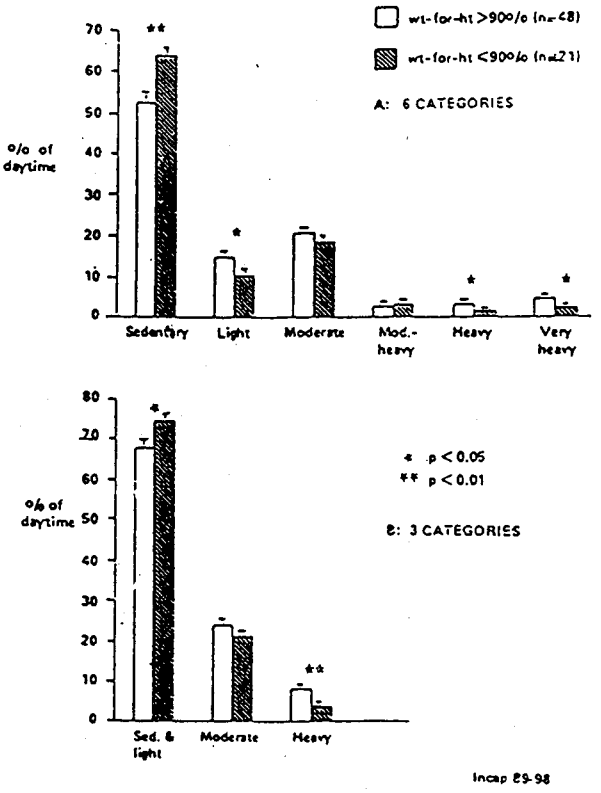

Figure 9. From Torun & Chew (1989)[55].

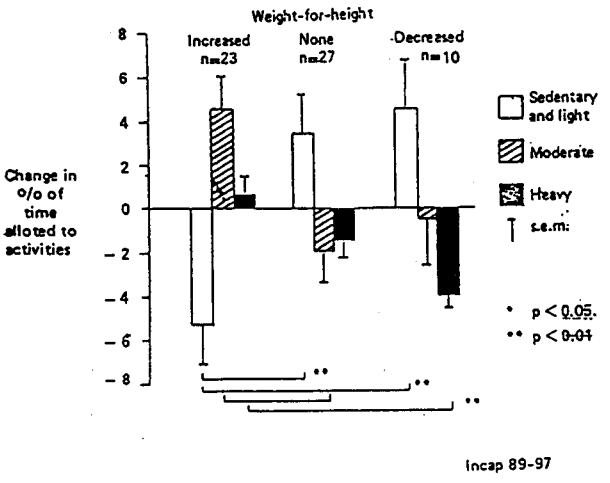

Figure 10. From Torun & Chew (1988)[59].

likely to decrease interactions between children and their environment.

Viteri and Torun[57] have shown that when energy intake of children 2–3 years old was reduced form 90 to 82 kcal/kg/day they reduced their total energy expenditure ($p<0.05$) and the rate of weight gain was not affected. When dietary energy was further reduced to 71 kcal/kg/day there was an additional, insignificant decrease in energy expenditure and growth rate was markedly reduced ($p<0.01$). This study seems to suggest some kind of physiological regulation between use of energy for growth and physical activity and it looks as though this is related to the levels of food deprivation. However, the mechanism is not known and it is not clear how it functions in relation to various levels of food deprivation.

If the data from this study hold true for the child population in food distribution programmes, then the first level of compensation in food deprivation should be a decrease in physical activity and in a later stage it would be slowed growth. By the same rule, narrowing the food deprivation should show its results in increased physical activity. In what order this would occur in relation to weight gain is not clear and whether such findings apply to the marginally malnourished remains to be seen.

This is an important issue in measurement of benefits in food distribution programmes. We need to know not only the mechanism for regulation but the rules in apportioning the added energy intake between growth and activity. Which one comes first, under what conditions, and how does it relate to the levels of deprivation? Is there a competition for sources of energy between growth and physical activity? This question has never been posed in the scientific literature so far.

Torun and Viteri[58] studied the interrelation between growth and physical activity among a group of malnourished young children. They showed that physically active children grew more in length and gained more lean body mass, but their overall weight gain was similar. Whether physical activity has any effects on growth of moderately malnourished children remains to be shown. In the Torun and Chew studies,[59–61] the level of energy expenditure among the well nourished and more active Guatemalan children was 81 kcal/kg/day and that of mildly malnourished was 77 kcal/kg/day.

All the evidence cited so far points strongly to the possibility that children in food distribution programmes change their pattern of physical activity, which in turn increases their energy expenditure. What would be the order of magnitude is hard to know. Given the fact that the proportion of malnourished children among the participants of such programmes is high compared to Torun's study, one can conclude that many children are likely to change their pattern and extent of their activities, and the extra cost per unit of body weight could be higher than the 5 kcal/kg/day, shown in Torun's study, i.e., the difference between well nourished and mildly malnourished children in Guatemala.

Therefore, for a three-year-old child weighing 10–12 kg it is very likely that the energy costs of activity will be in the range of 60–120 kcal per day, which is about 20–40% of the energy intake added through food distribution. The relationship between intake, nutrition and activity is now clear. However, it is difficult to establish relationships between activity and behaviour and cognitive development. The CRSP study hypothesized that there is a relation between food intake and cognitive development and behaviour, and defined physical activity as the intermediate variable. The only striking result reported in the final report was an association between mental test scores and body size across projects and age groups, which only implies that whatever factors affect childhood growth, also affect mental functions. Based on his studies, Chavez[56] concludes that deprivation in food intake and under-nutrition depresses activity, which turn isolates the child from its environment and reduces interaction and stimulation, which in turn affects the child's functional development.

The studies of Barret and co-workers[62] on schoolchildren seem to support findings of Chavez among preschoolers. In a study on the effects of energy supplementation on school age behaviour in a chronically undernourished population in rural Guatemala, Barret showed that supplementation groups were more interested in explorating a novel environment and being involved in competitive games, greater persistence in tackling a frustrating task, and had better motor impulse control and greater initiative. In free play with peers, the high supplementation group showed more frequent happy effects and social involvement. The study further confirms the effects of undernutrition on child behaviour and suggests long term consequences for the child's development.

In his critical review of research on malnutrition and behavioural development, Pollitt[63] points out the difficulties in isolating the nutritional component from other factors that affect behaviour and development of children. Torun rightly believes[61] that from a practical point of view this is irrelevant, because nutritional interventions are a part of a comprehensive strategy to improve health and quality of life of the target population.

Some thoughts on future directions

The experience gained during the eighties has shed new light on the ways in which food can be used effectively as a resource base for different purposes under different socioeconomic settings. Under the conditions of severe poverty and in situations where the community infrastructure is limited, access to health and education services is poor, and the overall development is stagnant, food distribution on its own can serve as an effective instrument in poverty reduction and in nutrition support among the vulnerable groups in the short run.

In socioeconomic settings where the community is poor but developing and there is a reasonable infrastructure in place, use of food in an integrated community-based nutrition programme can in fact result in control of moderate and severe malnutrition among young children to a significant degree. Such programmes could also contribute to improvements in weight of newborn infants as well as the health of pregnant and lactating women. This has been shown to be possible within a primary health care approach, specially when control of common diseases, and improvements in dietary intake and environmental health are brought about simultaneously. Such programmes are usually mounted and implemented within the health sector.

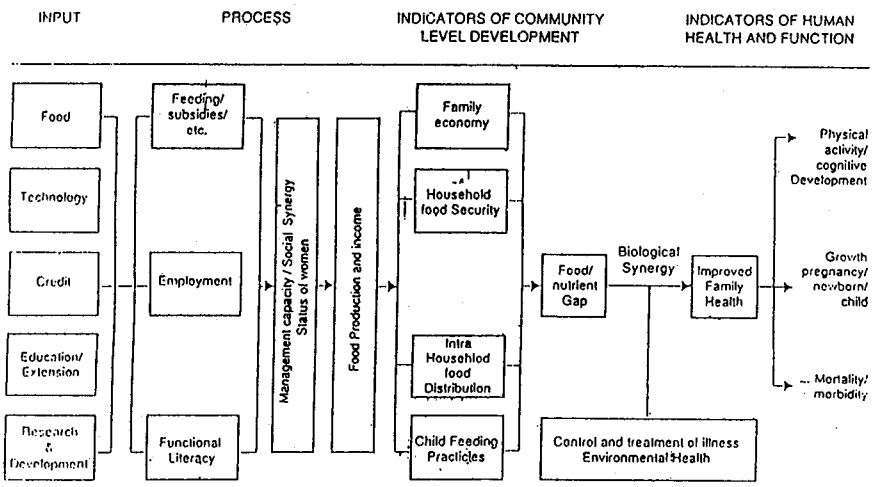

Figure 11. A comprehensive approach to closing the food/nutrient gap and improving health of vulnerable individuals.

The third option would be use of food as a resource in creating a food and nutrition focus in community development. This approach is much more feasible within agriculture and rural development projects. The conceptual basis for this approach is shown in Fig. 11. There are aspects in this approach which merit attention. For example, it illustrates an approach towards reducing the risk of malnutrition among the poor with proper use of food as a resource base, while supplementary feeding programmes in their current context often use food as a short term palliative measure and do not fully succeed effectively in controlling malnutrition at the population level. It also takes careful note of the analysis made by Anderson and Scandizzo that food risk for the poor is a matter of both food availability and income.[64] Furthermore, four household level indicators are being being evaluated for the assessment of the potential for improved access to food and for nutritional improvements at the household level. These are family economy, household food security, intra-household food distribution, and child feeding practices. So far as implementation is concerned, the most critical factors in the process are identified as (a) management capacity; (b) status of women, and (c) social synergy. Management capacity is a key determining factor in translating well-designed programmes into successful operations. There is also growing evidence that the status of women is a major contributing factor in food production, child health and family income, particularly in Africa.[65]

Mosley, in explaining why some biomedical interventions have had less impact than expected, argues that an element of "social synergy" may be operating.[66] He considers "social synergy" as an independent risk factor. It implies that some social determinant, e.g. poverty, can operate independently on more than one variable, which influences morbidity and mortality. This concept offers some explanation as to why basic social changes such as mothers' education have considerable independent influence on human health, especially among children. Such influence is difficult to explain through biomedical interventions. As a matter of fact, "social synergy" as defined by Mosley could very well be the missing variable in the equation between food intake and child growth. When increased food intake does not result in the expected weight gain, could it be that an independent social variable (from the gamut of the poverty syndrome) is interfering in this process?

In this approach there are three key elements of particular significance. First, food resources are being used as a resource for improved agricultural productivity and income, second improved food consumption is considered as a key outcome objective, and finally, improved family health is shown to be the next step in the process. This is to be achieved through improvements in family diet combined with control of illness and better environment. Naturally, changes in family health can be measured through a number of well known indicators of human health and function such as growth, activity, mortality, and morbidity.

Needs for research

An argument presented earlier in this study is that science is driven by data and data are very much shaped by the availability, ease of measurement, and costs of measurement techniques. Anthropometric measurement is a good case in point. It has the comparative advantage of being easy to measure at relatively low cost. Because of such advantages, it has found a prominent place among the indicators used in nutritional studies and it has made a major contribution to our understanding of mild and moderate forms of malnutrition. It has been highly instrumental in demonstrating that kwashiorkor and marasmus were only the tip of the iceberg. It has been the technique through which some basic concepts in nutritional epidemiology have been redefined during the last two or three decades, for instance, the concept of "underweight" children being already malnourished as against being on the way to malnutrition.[5] Anthropometry has also played a role in delineating the effects of poor diet and infection on human nutritional status. The latest case in this process is growth monitoring as a tool in growth promotion. In spite of many advantages, anthropometry has its own limitations which need urgent attention.

Anthropometric indices demonstrate the existence of a problem without giving any indication of what the possible causes are. In other words unspecificity is a major drawback in anthropometry. There is plenty of evidence that growth failure is caused by several factors operating with different levels of influence under differ-

ent circumstances. In the absence of sufficient analysis and careful assessment of such factors, it would be quite difficult to design programmes which result in strong anthropometric response. Those programmes which demonstrate response are highly curative and rehabilitative.

Another good example is application of anthropometry in growth monitoring. Historically, "weighing" a young child has been and still is a diagnostic tool in clinical paediatrics. When growth failure is detected by a physician, he has at his disposal several other diagnostic tools to determine the causes for growth failure. In growth monitoring as practised in the villages of the developing world, the village health worker can only identify poor weight gain without having the necessary skills and tools to identify the causes at the individual level. The follow-up action is based on a set of epidemiologically determined causes which often make it difficult to tailor the action around an individual child's curcumstances.

Furthermore, a wide use of anthropometry has resulted in strong focus on the rather broad database of symptoms of malnutrition at the cost of having a relatively much smaller database and analysis of the causal factors. For instance, the first report on the world nutrition situation prepared by ACC/SCN in 1987 is entirely structured around estimates of food supply, underweight population and mortality, while the basic conceptual frame of analysis indicates that malnutrition is primarily a product of poor diet and infection. What is strikingly missing in this report, and practically all others, is data on morbidity and food intake, simply because the world database on those aspects is very small.

In 1979 there were only one or two studies available on the effects of food intake on physical activity.[1] In this review, after 10 years, it is clear that there are still very few new data in this area, although there is an increasing consensus that food intake through increased physical activity has effects on a child's response to stimulation, learning and behaviour. The only reason that data on food intake, physical activity and energy expenditure are limited is the fact that measurement techiniques on all three require special skills, and are time-consuming and costly.

Finally, studies like that in Narangwal[8] have clearly shown that feeding programmes have major effects on mortality. Given the context within which feeding programmes operate and the nature of their design, and input levels, it is quite likely that their survival effects could be more significant than their impact on growth. Naturally, anthropometry does not lend itself to any understanding or assessment of survival effects. Any attempt in assessment of survival effects of such programmes requires surveillance of morbidity and mortality.

The discussion so far shows an inconsistency between the choice of indicators and the nature of the potential benefits, an issue which needs attention at two levels. The first is in the context of programme design where a careful selection of indicators would lead into a better basis for programme analysis and impact measurement. Secondly, this is an issue for consideration in the field of nutrition assessment technology. The main challenge would be to develop measurement techniques for food intake, physical activity and energy expenditure which are easier to measure, take less time and involve lower costs.

Expanded research and development in these areas would be quite critical in the establishment of a better balanced database on food and nutrition. It goes without saying that such a database is critically important for better programme planning.

Summary

1 The purpose of this study is to review the important lessons learned during the 1980s on supplementary food distribution for the vulnerable groups. A number of comprehensive reviews were made on this subject by the end of the 1970s. A decade later, a review of new lessons was judged to be useful in making such programmes a more cost-effective option in narrowing food/nutrient gaps among the vulnerable.

2 Food distribution programmes often do not have clearly stated objectives and, when stated, they are highly unspecific and have no time frames. In the past, programmes have implicitly pursued an overall health and nutritional objective and the most commonly used indicator of achievement is gain in weight and height. Sometimes mortality and morbidity are also considered as health indicators. During the 1980s the economic value of the foods distributed was also measured. In general, such programmes can pursue one or more of three sets of objectives: (a) increasing food intake and narrowing or closing the food/energy gap among the target population; (b) poverty reduction while using food as a resource transfer to the family; and (c) control of severe and moderate malnutrition and improving mother and child feeding practices.

3 Major determinants of net increase in food intake are (a) the ration size; (b) the extent of sharing of food with other family members and substitution of family food share for the supplement; (c) the regularity of attendance; and (d) the health status and appetite of the child.

4 During the 1970s rations were often designed to close the energy gap by 40–70% and effectively did so by 10–25%. In the 80s the extent of leakages in such programmes was reduced and in some programmes ration size was increased. In general, ration size is determined in relation to the mean baseline intake figures. Given the wide variations around the mean intake as well as between age groups, the ration size should be around 50% above the mean baseline intake in order to close the energy gap.

5 During the 1980s three approaches were tried to minimize leakages: first, increasing the ration size and distributing food to the entire family; second, education and motivation of mothers; and third, use of special foods for children. Studies have shown that leakages should be examined in the context of intra-household food distribution, which has strong socioeconomic and cultural roots. Families have a protective pattern in sharing food with the household. Priority is given to the breadwinner and the perceived, rather than the physiological,

needs. Research on intra-household distribution is essential in this area. So far, provision of special foods (not perceived as adult food) and on-site feeding are the options which tend to reduce leakages.

6 The regularity of attendance is very much dependent on the opportunity costs (work time lost, transport cost, etc.), the incentives that the programme offers, such as the economic value of food rations in relation to household economy, the complementary services, and finally on the perceived effectiveness of the programme as well as the education and attitudes of the participants. The data during the 1980s further confirm the observations made in the seventies in this area. There is now much more evidence that food distribution serves as a strong incentive in using health care services.

7 Several studies in the eighties further confirm that repeated episodes of illness and sometimes inappropriate child feeding may have a suppressing effect on the child's appetite which interferes with ingestion of food rations. There are also further reports that bulky foods low in energy density have a negative effect on increasing net energy intake. In the 1980s, preparation of special foods for infants and young children has been tried in a number of programmes with reasonable success.

8 During the 1980s considerable progress has been made in targeting, i.e. selection of programme beneficiaries. A programme often cannot cover the entire "at risk" population; therefore beneficiaries are selected out of the population at risk through a number of selection criteria which can be geographical, socioeconomic, or individual. It has been shown that all programmes make errors of inclusion and exclusion, i.e. include the non-needy and or exclude the needy. The ideal targeting strategy needs to be error-proof, but in reality it does not exist. In very poor communities, geographical targeting is more appropriate, while in economically better off communities individual targeting is desirable. Costs of targeting can be small in an ongoing service. In areas where service infrastructure is very limited, the costs of targeting can be rather high. Individual targeting increases a programme's cost-effectiveness but negatively affects coverage of the needy through errors of exclusion. Socioeconomic targeting is the best preventive method which is not likely to produce high levels of anthropometric response, because its errors of inclusion are high. This may be a partial explanation for small response in terms of weight gain in a population as a result of food distribution.

9 During the 1980s there has been increasing interest in integration of food distribution and health care services. Studies which showed a programme synergy in simultaneous attack on poor diet and infection have influenced such trends. It was also shown that effects of poverty on child growth are primarily mediated through poor diet and illness. It was further shown that among common diseases of childhood, diarrhoeal diseases have particularly strong effects. It is on this basis that integrated programmes in the 1980s have focused on growth monitoring, oral rehydratation therapy, immunization, deworming and food supplements. Maternal health services have focused on health checks, distribution of vitamins and minerals, selective food distribution, anti-tetanus shots, education and postnatal care. The breadth of services and the quality of care varied a great deal between programmes.

10 The indicators of effective management are five:

(a) an active programme which reaches out to the community in order to serve instead of passively waiting for the recipients to come;

(b) an adequate staff/beneficiary ratio which allows for sufficient time for delivery of service, monitoring and supervision;

(c) a high level of staff skill, which requires intensive training and re-training

(d) clear and concise definition of methods and procedures prepared in advance in the form of programme manuals (periodically revised in the light of experience)

(e) the "community energy" which is derived from self-reliance, participation of the beneficiaries, and their sense of ownership and support.

Naturally, effective management requires built-in incentives for the staff. The effective incentives reported include: economics (such as salaries and benefits), and a sense of prestige (the "white coat" effect for the village health worker; the emotional sense of helping your neighbour and the community through voluntary services).

11 The initial preparations in mounting a programme operation are very important and the costs involved are a worthwhile expenditure. This is a programme phase which helps to establish a bridge between programme management and the community, which in turn would lead to community support, better programme image, regularity of attendance and help in energizing the community, as distinct from having a programme which only amounts to a top down handout to a passive group of recipients.

12 The overall conclusions in the 1970s, based on several reviews, were that food distribution is too costly for its effects. However, Beaton and Ghassemi called for caution in drawing conclusions from the available evidence for several reasons. Ambiguities in definition of objectives, narrow examination of a wide spectrum of expected benefits, wide variation in quality of database, extremely limited knowledge on the functional significance of mild and moderate forms of malnutrition, and uncertainties in selection of proper indicators, were among the important reasons for caution.

13 The Narangwal study published in 1983 probably represents the best achievable results from an integrated health and nutrition programme. It in children at the age of 3 years it produced an additional

600 g in weight, and 1.3 cm in height. Programme benefits also included decrease of illness by 22 days and a decline in infant mortality by one third to one half. Data from Narangwal and Bogota showed that, given adequate design and implementation, it is possible to prevent third-degree malnutrition and it reduce its moderate forms by one third to one half.

14 Similar results were shown in food supplementation programmes during pregnancy. Under well-managed controlled studies birthweight increased by the order of 100–200 g, which represents a 4–18% decrease in low birthweight incidence. This experience was accompanied by a significant increase in weight gain during pregnancy.

15 Another important development in the 1980s was measurement of the impact of large-scale ongoing programmes, something which was not available in the 1970s. For instance, reports from Chile, India and Tanzania showed that ongoing programmes can almost eliminate third degree malnutrition and reduce its moderate forms by one third. Variations in programme effectiveness are explained by design, relative levels of input, the context within which they operate, and the implementation quality. An important report from the Dominican Republic has shown that growth monitoring and nutrition education can produce similar levels of benefits at comparable costs.

16 During the 1980s information on cost has improved. The programme costs were in the range of US$ 25–30. During the 70s programmes were designed to provide 300–400 calories at the approximate cost of US$ 15–25 (1976 dollar value). The cost figures in the 1980s reflect some inflation over the years.

The Tamil Nadu project in India has improved cost-effectiveness. It has been shown to be three times as effective as similar programmes in India for the same cost of around $20 per recipient per year. It has also shown substantial savings on food costs, but spends these savings on targeting. Another interesting analysis in the 1980s is provided in Indonesia's nutrition programme. This demonstrates the feasibility of having a community nutrition programme with some selective feeding at costs comparable to a food distribution scheme. It was also shown in this analysis that the community shares up to 20% of the programme's costs.

The lowest programme cost reported in the 1980s was from a nutritional programme in Iringa, Tanzania. The programme cost is $17 per child per year for measured benefits comparable to or better than other programmes. Finally, in a large-scale pilot experiment in the Dominican Republic it has been shown that comparable benefits can be achieved through nutrition education and almost the same costs.

17 It has been shown that the Japanese born in the United States achieved their growth potential in one generation, and the native Japanese came very close to it in the last two decades as a result of a rapid economic and social development. Improvements in human physical stature in the last 20 years in Japan far exceeded that of the previous 50 years. For the low-income Japanese it may take two or three generations to achieve comparable progress. Obviously, nutrition and health programmes are no substitute for economic and industrial development and their expected performance should be judged in their own context. These programmes - as short term measures - can at best eradicate severe and moderate malnutrition and at worse hold the line and prevent the situation from deteriorating further. The difference between the achieved and the achievable could be explained by the "input" variables such as ration size, synergy of other services, coverage, management and community support. The analysis on programme inputs and outputs seems to show a threshold effect and there is an input level above which the programme impact increases considerably. An explanation of the phenomenon requires further analysis. It is interesting to know the relative weight of various input variables. Threshold effects on reduction of infant mortality have been reported as far back as 1973.

18 A very important report on the functional consequences of moderate malnutrition became available in the 1980s. It showed for the first time that moderate food deprivation does have considerable consequences on human function, particularly among infants, preschool children, and pregnant and lactating women.

Infants were stunted in the first year, after which they resumed a normal rate of growth. Explanations for early stunting and lack of catch-up growth are not conclusive. Poor lactation due to low food intake during and after pregnancy, as well as poor infant feeding practices, are cited as possible reasons. Obviously these observations are rather important in relation to benefit measurements.

It was also difficult to evaluate the likely effects of morbidity. Food deprivation showed clear effects on physical activity, among both children and adults. Also, incidence of illness was doubled as a result of food deprivation. It was further shown that human beings do not adapt to food deprivation without compromising their health. Morbidity was associated with size rather than growth rate. When the child is small, the capacity to deal with repeated illness is diminished.

19 Interrelations between food intake, physical activity and energy expenditure were further studied in the last decade. Several studies have shown that children with suboptimal energy intake modify their physical activity either by becoming less active or by changing their activity pattern in favour of less demanding ones.

It has also been shown that improvements in nutritional status result in reduced sedentary and light activities and increased moderate activities. Supplemented children were shown to be six times more active than the non-supplemented by the age of two years. Reduced energy intake first results in reduced physical activity and further reduction leads to significant reduction in weight gain. There is apparently some kind of physiological regulation between use of energy for growth and physical activity, which may be related to levels of depriva-

tion of food intake. The mechanism is not know. The new evidence shows that food distribution and the extra energy intake increase physical activity as well as energy expenditure among children. There seems to be growing evidence that improved energy intake improves a child's response to environmental stimulation, learning and behaviour.

20 Relative ease of measurement and costs of various measurement techniques strongly influence the nature and scope of data available on various aspects of malnutrition. These data in turn form the basis of our scientific analysis, problem definition and impact measurement.

21 Anthropometry has the comparative advantage of being easy to carry out at low cost. Therefore, it has found a prominent place among indicators used in nutritional studies. In spite of its important contributions, anthropometry has limitations. Wide use of anthropometry has unintentionally resulted in a lopsided world database. Consequently, there is much more known about the symptons of malnutrition at the cost of knowing less about the causes. This is due to the fact that anthropometry is highly non-specific. It states the problem without explaining the causes. In the absence of sufficient analysis of causes it would be very difficult to produce strong anthropometric response in food distribution programmes.

22 Under current circumstances there is an inconsistency between the choice of indicators and potential benefits in nutrition programmes which can be remedied through development of "easy" and "low cost" techniques in measurement of physical activity, food intake, and energy expenditure.

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Supplementary feeding in programmes in developing countries: lessons of the eighties. Part II: Findings of the report

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摘 要

這個廣博的報告評論了１９８０年代在發展中國家的一些貧困地區補充食物的分配。這個報告也許對制定一個縮減食物／營養素差距的方案是有用的。報告之前，作者與GEORGE BEATON 曾爲聯合國國際兒童教育基金會（UNICEF）於１９７０年代末期發表了相似的報告。研究主要集中在幼兒，特別是學齡兒童，懷孕和授乳的婦女。數據是進行廣泛的文獻探索，和通過聯合國機构，援助機构，國家和國際學會的官方報告與紀錄而搜集得來的。作者同時研究了２０多個國家有關特殊方案的設計與評估的，理論和實用的論文。

這個方案主要考慮的目標是：營養素／食物差距，減少貧困，營養不良，母親與兒童喂養，食物，配給量，配給對象，配給者占總人數的百分比和健康護理等。作者在１９７０年代末發表的報告已考慮可能和確切的效益，其后完成了分析工作於１９８０ 年代末期。方案的花費是計算在内。作者討論了食物和經費的來源，同時考慮了輕微和中等度營養不良，膳食和体育活動等因素，並著重進一步研究的需要，和提出一些將來研究方向的設想。