

8. Programmatic interventions to improve complementary feeding

Two major sets of issues must be considered when planning intervention programmes to improve complementary feeding: first the types of foods and/or advice concerning child-feeding regimens that are provided, and second the delivery systems that are employed to assure that these foods or feeding guidelines reach the intended beneficiaries. It should be obvious that the best designed service delivery system will have the desired positive impact on children's nutritional status only if the foods that are offered are nutritionally adequate or if the nutritional advice is well conceived. Indeed, in the worst case scenario it is possible that these programmes could do more harm than good by virtue of any behaviour change that occurs in favour of erroneous nutritional recommendations. On the other hand, appropriate nutritional supplements or feeding guidelines, by themselves, are inadequate to assure improved nutritional outcomes if these recommendations are incompatible with local beliefs or resources, if there are structural impediments to their successful delivery, or if the beneficiaries are not sufficiently motivated to accept them.

The primary concerns of the present document are the nutritional and behavioural aspects of complementary feeding rather than issues of programme design and management. Nevertheless, although a full treatment of programmatic issues is beyond the scope of this review, a brief discussion of some of the major programmatic concerns is presented in this chapter. More detailed information on programmatic issues can be found in several other recent publications (Austin & Zeitlin, 1981; Underwood, 1983; ACC/SCN, 1991a; ACC/SCN, 1991b; Pinstруп-Andersen, Pelletier & Alderman, 1995; ACC/SCN, 1996).

8.1 Types of complementary feeding programmes

Ideally, complementary feeding programmes should encompass the full range of child-feeding practices from initiation of breast-feeding through complete integration of the child into the dietary routine of the remainder of the family. In other words, complementary feeding programmes should take a holistic approach to breast-feeding and transitional foods, including matters related to child-feeding behaviours and food safety. In practice, this type of comprehensive approach has rarely been achieved, in part because responsibility for different aspects of child feeding is often fragmented into different service delivery units. Indeed, current programmatic activities concerning complementary feeding are often difficult to identify as such, because they are imbedded in breast-feeding promotion campaigns, growth monitoring programmes, supplementary feeding interventions, diarrhoeal disease control activities or general community development programmes.

Complementary feeding programmes may employ any one or more of a broad range of intervention strategies. A list of available strategies and the relative importance of food or income transfer versus nutrition education is indicated for each type of intervention in Table 37. For example, individual programmes may distribute precooked foods specially

formulated for young children or they may disseminate educational messages to encourage adoption of recommended child-feeding behaviours. The foods that are distributed may be provided universally to all children or targeted to high-risk households or to children with some identified degree of malnutrition. Likewise, feeding advice may be disseminated widely through mass media or face-to-face counselling sessions with community health or nutrition promoters or may be restricted to families of children found to have growth-faltering at the time of a health centre visit. The following sections present information on some of the general types of intervention programmes that have been developed. The impact of these programmes on caregiver knowledge and practice, and on children's dietary intake and nutritional status is described when relevant data are available. However, it is important to note from the outset that there has been limited investment in rigorous evaluation of the nutritional impact of complementary feeding programmes, and the relative nutritional benefit of different approaches is uncertain.

Table 37. Available intervention strategies for improving complementary feeding, and relative magnitude of programme inputs of food and education

Level and type of intervention	Relative magnitude of inputs	
	Food/ Nutrients	Education/ Communication
Central		
Complete, processed food mixture	+++	+
Food supplement	++	++
Nutrient or enzyme supplement	++	++
Food subsidy/food pricing	++	++
Community		
Complete food mixture (processed or prepared)	+++	+
Home		
Feeding practices/behaviour	-	+++
Recipes for food mixtures	-	+++
General nutritional concepts	-	+++

8.1.1. Food-based interventions

Food-based interventions are those that are designed to provide children with greater access to appropriate foods. This may be achieved by:

- Universal distribution, targeted distribution or marketing of a complete food mixture

- Similar distribution schemes to enhance the availability of specific food ingredients or nutritional supplements that might be incorporated into a household food preparation, thereby enhancing its nutritional quality for young children
- Food production or pricing strategies that makes these ingredients more accessible to the target population.

Processed food mixtures may be fabricated in a limited number of central sites and distributed peripherally or they may be prepared at the community level, as described below.

8.1.1.1. Centrally processed foods

In most cases, centrally processed transitional foods are designed as mixtures of several ingredients blended together in appropriate proportions to assure adequate contents of energy, protein, and micronutrients. These mixtures are often precooked to facilitate rapid home preparation and may be fortified with additional vitamins and minerals when the foods themselves are incomplete. The final products may be marketed through existing commercial channels, with or without subsidization, or distributed through public institutions, such as health clinics or ration shops. The foods may be targeted to particularly vulnerable subgroups of the population, such as low-income families or undernourished children, or they may be distributed universally to children within a particular age range.

The advantages and disadvantages of centrally processed foods have been reviewed in detail previously (Heimendinger, Zeitlin & Austin, 1981; Mitzner, Scrimshaw & Morgan, 1984; Harper & Tribelhorn, 1985). Briefly, these preparations are particularly beneficial because of their convenience and ability to provide a nutritionally complete food source. On the other hand, the costs of processing and packaging these food mixtures make them more expensive than the individual ingredients. Moreover, centrally prepared mixtures require the existence of a reasonably well-developed distribution network to assure that the products reach the intended consumers. It has also been argued that these products may undermine the self-reliance of child caregivers by creating dependence on an externally prepared product.

Examples of centrally processed complementary foods are Incaparina, which was developed by the Institute of Nutrition of Central America and Panama, and Thriposha, which was developed and distributed by the Government of Sri Lanka with international financial assistance. Although these products are still marketed commercially, publicly supported interventions to provide them universally to vulnerable population groups at low cost have generally not proven to be politically or financially sustainable.

8.1.1.2 Community-prepared foods

Another approach to improving complementary feeding is through preparation of special

transitional foods at the community level. This type of programme generally relies on the availability of an existing health or nutrition clinic, mothers' club, "soup kitchen" or other similar community organization or local industry where food can be prepared and distributed, either as a cooked meal for on-site consumption or as a take-home ration (Mitzner, Scrimshaw & Morgan, 1984). This approach has the advantage of stimulating the development of local, small-scale food processing capacity and avoiding the cost of packaging and distribution of the final product from a central production site. However, a relatively large number of local centres must be developed and personnel trained for the programme to have broad impact.

8.1.1.3 Increased availability of selected foods

An alternative approach to providing a complete food mixture is to increase availability of selected food items that may enhance the overall quality of young children's diets. This might be achieved by food-related income transfers, such as price subsidies, food stamps, or other similar schemes (Rogers, 1995). For example, some countries provide subsidized milk or edible oil through ration shops or other distribution centres. Although these programmes are not generally designed specifically for young children, it should be possible to link appropriate educational messages to encourage the use of such foods to enhance the quality of complementary feeding. The same results might be promoted through food pricing strategies or income transfers that are planned to provide low-income households with access to specific items that could be incorporated into complementary food mixtures.

8.1.2 Nutrition education

The other major programmatic option for promoting improved complementary feeding is nutrition education. In general terms, this refers to the transmission of appropriate information to enable and encourage caregivers to improve existing child-feeding practices and/or the types and safety of foods offered. Although educational messages should accompany any type of complementary-feeding intervention, including distribution of centrally processed foods, education is probably most critical for promoting appropriate use of enhanced home-prepared complementary food mixtures and optimal feeding behaviours.

Educational messages may be designed either to influence general feeding behaviours, such as the appropriate frequency of feeding and desirable food patterns, or to transfer more detailed information on specific recipes for improved complementary foods. Communication of these messages may rely on traditional educational techniques or novel social marketing methods (Zeitlin & Formacion, 1981; Manoff, 1985; Hornick, 1988). A complete discussion of the full set of options for nutrition education is beyond the scope of this review, but selected issues will be highlighted below.

Educational messages may be transmitted through public service units, such as health

clinics, schools, and extension services, through community organizations, such as mothers' clubs, religious organizations, etc., or by way of private marketing schemes, particularly in the case of centrally processed foods. The messages may be disseminated through interpersonal contact, or formal print or electronic media. In each of these cases, as much attention must be devoted to formulation and dissemination of the messages as to the development of the dietary recommendations themselves. Communication specialists can provide expertise on issues such as the ability of different communication channels to reach target audiences, the appropriate mix of media, the best design of messages to motivate attention and assure comprehension, and the necessary time for exposure to new concepts and proper staging of messages to meet the communication objectives. The application of communication methods for public health programmes has been described in more detail elsewhere (Rasmuson et al., 1988; Hornick, 1988).

8.1.2.1 General feeding recommendations

As mentioned above, general recommendations on child feeding may include information on 1) optimal feeding behaviours (e.g. the desirable frequency of meals and snacks, the appropriate feeding utensils and techniques, and the recommended intensity of interactions between the caregiver and child), 2) the types of available food items that may enhance the overall quality of the diet (e.g. the use of selected animal products, vitamin A-rich foods, edible oil, complementary protein sources, etc.), and 3) methods of food handling and processing, such as hygienic preparation and storage techniques. These general recommendations are presumably advantageous because they provide the caregiver with simple technical information, while allowing flexibility regarding particular food preparations. On the other hand, the lack of specificity of these recommendations may result in sub-optimal food mixtures or uncertainty about how to implement these recommendations. For example, note the caution described above (Section 3.7 and Table 19) with regard to the potential problem of excessive addition of oil supplements to existing transitional foods.

8.1.2.2 Specific recipes

An alternative or additional approach is to disseminate detailed information on specific recipes for complementary foods. This strategy provides greater precision regarding the amounts of each ingredient to be incorporated in complementary foods and the appropriate preparation techniques, and gives the caregiver a concrete idea of what might be done to improve child feeding. On the other hand, this approach may limit the caregiver's range of feeding options, which could result in monotonous diets or failure to prepare the mixture when a particular ingredient is unavailable. Moreover, because of their complexity, these messages are generally more difficult to communicate and probably require greater reliance on direct interpersonal communication channels and cooking demonstrations than simpler messages that are amenable to transmission by mass media.

8.2 Development and implementation of intervention programmes

There is a considerable amount of information on the basic elements of successful nutrition intervention programmes in low-income countries. (For example, see Austin & Zeitlin, 1981; Underwood, 1983; ACC/SCN, 1991a; ACC/SCN, 1991b; Pinstrup-Andersen, Pelletier & Alderman, 1995; ACC/SCN, 1996). Aside from issues of advocacy to generate political and financial support for these programmes, the major steps in programme development and implementation can be summarized by the UNICEF "triple A" iterative model of repeated assessment, analysis, and action (UNICEF, 1990).

Assessment requires information on current child-feeding practices and intakes of food and nutrients, both from the perspective of the nutritionist and the population served. In other words, to assure that any recommended changes are feasible and acceptable information is not only required on actual feeding practices and children's dietary intakes, but also essential is an understanding of the beliefs and constraints that influence these current practices. This participatory approach to assessment and design of interventions is a critical ingredient for programmatic success (ACC/SCN, 1991a; Cerqueira & Olson, 1995; Pinstrup-Andersen, Pelletier & Alderman, 1995; Shrimpton, 1995).

The full range of desirable information on child feeding and available methods of collecting both quantitative and qualitative data have been summarized in other publications (Mitzner, Scrimshaw & Morgan, 1984; Brown & Bentley, 1988; Griffiths et al., 1988; Bentley et al., 1991b; Dickin, Griffiths & Piwoz, 1997). Although much essential information can be obtained from rapid, qualitative techniques (Scrimshaw & Hurtado, 1987; Bentley et al., 1991b), some quantitative information on the amounts of foods and nutrients consumed by representative groups of children of different ages is indispensable at some point during the assessment process to permit development of appropriate feeding guidelines. The intakes of these groups can be compared with the recommendations set forth in this document to identify problem areas with regard to feeding behaviours (e.g. frequency of meals and amounts of food offered), energy density, nutrient density and estimated bioavailability.

A number of methods are available to collect quantitative information on children's dietary intakes (Brown, 1984; Gibson, 1990). For programmatic purposes, recall histories of food intakes by groups of children of different ages are probably most feasible and sufficiently accurate. Food composition tables are available from many parts of the world to support nutrient analyses of the foods consumed, and software packages for computerized calculations are now widely available. One such package, the WorldFood data base, allows assessment of the risk of low intake of individual nutrients and the estimated bioavailability of selected minerals (Bunch & Murphy, 1994).

Analysis of information collected is necessary not only to identify deficiencies in current practices but also to design feasible interventions. Again, a participatory or consultative approach, by which investigators interact extensively with potential beneficiaries, is

essential for the latter objective. Development of acceptable and desirable recipes through community-based “recipe trials” has been described (Creed Kanashiro et al., 1991; Dickin, Griffiths & Piwoz, 1997). Likewise, household “behaviour change trials” have been suggested as a way of determining whether subsets of target households are able to implement recommended changes in feeding practices before feeding guidelines are disseminated widely (Griffiths et al., 1988).

8.3 Examples of intervention programmes

The following sections provide descriptions of selected intervention activities that have been carried out to improve complementary feeding of young children in different settings. The interventions that were reviewed can be divided according to their original purpose and scale, as follows:

- Small-scale efficacy trials to assess the nutritional impact of particular types of diets or food supplements
- Pilot nutrition education projects that were carried out as demonstrations prior to anticipated expanded activities
- Full-scale intervention programmes.

The first two types of projects are presented in some detail, both to describe the range of activities that have been attempted and to indicate, where possible, which approaches have been successful and which groups of children were more likely to benefit. Very few of the large-scale intervention programmes have included well-designed evaluations of their nutritional impact, and many of the more successful programmes have been reviewed fairly extensively in several recent publications (ACC/SCN, 1991a; Pinstrip-Anderson, Pelletier & Alderman, 1995; ACC/SCN, 1996). Therefore, the present document will not describe these programmes in detail, but will simply indicate selected components that seemed to contribute to their success.

8.3.1 Efficacy trials of food supplements

The efficacy trials considered in this section are those interventions that were conducted according to a prospective, randomized design in which there was an intervention group that received specific foods, usually under carefully controlled conditions, and a concurrently evaluated control group that did not receive these foods. The final nutritional status of young children (or change in their nutritional status during the course of the intervention) was compared in the two groups; and, in those cases where the groups were similar at baseline, differences in their nutrition outcomes can be attributed to the specific interventions. The level of intervention may have been the individual child, the household, or the entire community. Generally, the trials were conducted as independent research activities, although sometimes they were nested within larger-scale programmes.

These projects are being presented to provide information on the range of trials that have

been conducted, the types and amounts of foods that were offered and consumed (in those studies that collected relevant information), and the impacts of the interventions on the children's physical growth. In some cases, other outcomes, such as behavioural development, were also examined; but these results are not reviewed in detail because information is available from only a few of the projects. The set of selected studies is not meant to be comprehensive; in general, those that were chosen for review are ones that have been either completed or re-analysed within the past few years and that have relevant data for the age group of greatest interest with regard to complementary feeding. Previous publications have reviewed other earlier studies (for example, see Martorell et al., 1975b; Beaton & Ghassemi, 1982). Brief descriptions of the projects are listed in Table 38. The studies are identified either by the country where they were conducted or by the institution responsible for their implementation.

8.3.1.1 INCAP longitudinal study

The INCAP longitudinal study was carried out in two pairs of villages of eastern Guatemala from 1969 to 1977 to assess differences in physical growth and behavioural development of children less than 7 years of age who were offered either a food supplement containing relatively high amounts of protein and energy (*atole*, prepared from Incaparina) or a comparison supplement containing a relatively small amount of energy (*fresco*, a sugar drink). Both supplements were fortified with similar quantities of selected vitamins (thiamin, riboflavin, niacin, ascorbic acid, vitamin A) and minerals (calcium, phosphorus, iron, fluoride) and were distributed daily through centralized, community-based feeding stations. The mothers of the study infants were offered the same supplements during pregnancy and lactation. The design and outcomes of the study have been described in detail in a recent publication, which also presents the results of a series of re-analyses and follow-up research (Martorell, Habicht & Rivera, 1995). Although the original intervention was completed nearly 20 years ago, the careful documentation of methods and results and the rigorous analyses that were completed make the conclusions of this project particularly valuable.

Mean energy intakes from the supplements were 90, 143, and 169 kcal_{at}/d during the first, second, and third years of life in the *atole* communities, respectively, compared with 7, 14, and 37 kcal_{at}/d for the same age ranges in the *fresco* communities (Schroeder et al., 1995). Children in the *atole* communities grew approximately 2.5 cm more in length during the first 3 years of life than those in the *fresco* communities, and these differences could be attributed to the differences in the intervention (Habicht, Martorell & Rivera, 1995). Despite the positive impact of *atole*, the average growth velocity of children in these communities was still considerably less than international reference data; only about one-fourth of the total growth deficit incurred during childhood was recovered by means of the intervention. It is interesting to note that for a given level of energy consumption from either supplement, there was a greater positive relationship between supplementation and growth during the first year of life (3-12 months) than during the second and third years; although the results were not disaggregated by month of age within the first year

Table 38. Summary of selected efficacy trials of complementary foods or dietary advice for young children

Trial	1	2	3	4	5	6	
Author (year)	Martorell (1995) Schroeder (1995)	Mora et al (1981) Lutter et al (1990)	Gershoff et al (1988)	Walker et al (1991)	Husaini et al (1991)	Simondon et al (1996) Simondon et al (1996) Simondon et al (1996) Simondon et al (1996)	Simondon et al (1996) Simondon et al (1996)
Country	Guatemala	Colombia	Thailand	Jamaica	Indonesia	Congo	Senegal Bolivia New Caledonia
Type of programme	Food suppl to mother during preg. & to children 3-36 mos. ^a	Food suppl to mother at 3rd trimester & to children after 3 mos	Food suppl to children only	Food suppl to children only	Food suppl to children only	Food suppl to children only	Food suppl to children only
Type of supplement or dietary advice	Incaparina (cereal-legume blend) vs. sugar drink (+vits & some mins)	Milk & Duryea for infants 1 yr; skim milk, oil, bread for older participants	High fat biscuit + vitamins & minerals	Milk formula	High energy snacks (cereals, tubers, bread, sugar, oil)	Blend of cereals, soybean, milk powder, oil, sugar, vits & mins.	Blend of cereals, soybean, milk powder, oil, sugar, vits & mins.
Method of distribution: duration of participation	Meals twice daily at field station: pregnancy + 36 mos. ^a	Wkly pick-up of rations at field station: 3rd trimester of preg. + 36 mos	Distributed once daily in day care centre: 12 mos per age group	Weekly home delivery: 12 mos.	Twice daily at day-care centre: 3 mos.	Twice daily, home delivery: 3 mos.	Twice daily, home delivery: 3 mos.
No. of subjects/ breast-feeding (BF) status	~330/duration of BF not specified	172/median duration of BF =6.6 mos.	205/BF status not specified	127/non-breastfed	113/BF status not specified	120/BF	127/BF
Age range (mos.)	3 - 36	3 - 36	<36	9 - 24	6 - 20	4 - 7	4 - 7
Amt of energy offered as suppl. (kcal) ^b	unlimited	428-670 ^c	300	750	400	103 - 205 ^c	103 - 205 ^c
						110/BF	90/47% BF at 7 mos.

Trial	1	2	3	4	5	6			
Energy consumed from suppl. (kcal) ^b	128	363-458 ^d	NA	345	NA	189	133	161	160
Est. net incse. in energy consmd (kcal) ^b	93 ^c	200 ^c	NA	106 ^c	(-300) ^{e,f}	NA	NA	NA	NA
Difference in weight gain during particip. period (g or Z-score)	+780g	+476 g	+100 g (NS) ^g	+380 g	+0.30 Z	-250 g (NS)	-10 g (NS)	-70 g (NS)	+60 g (NS)
Diff. in length gain during particip. period (cm or Z-score)	+2.5 cm	+2.2 cm	+0.1 cm (NS)	+1.0 cm	+0.04 Z (NS)	-0.15 cm (NS)	+0.48 cm	+0.25 cm (NS)	+0.05 cm (NS)

^a Study actually continued in children up to 84 months, but current analyses restricted to first 36 months.

^b Energy intakes presented either as total energy offered via supplement or as difference in energy provided to intervention and control groups

^c Amounts offered varied by age group

^d 363 kcal_{th}/d difference at 18 months, 458 kcal_{th}/d difference at 36 months

^e Difference in intake of non-breast milk sources of energy

^f Information available only for non-breast milk energy consumption at day-care center

^g NS = not statistically significant (p>0.05)

(Schroeder et al., 1995). After 3 years of age, there was no further relationship between supplementation and growth. Nevertheless, the positive impact of *atole* on growth during early childhood persisted at adolescence and adulthood (Martorell, 1995). In addition to the growth response, children in the *atole* villages (especially those of lower socioeconomic status) scored higher on psycho-educational performance tests of knowledge, arithmetic aptitude, reading, and vocabulary (Pollitt et al., 1995). Thus, the advantage of dietary supplementation extended beyond just physical growth. Because both the mothers and children received supplementation, it is difficult, if not impossible, to disaggregate the effects of each route of supplementation on the children's growth and development.

8.3.1.2 Colombia trial

A longitudinal study of growth and mental development was carried out in low-income communities of Bogota, Colombia during the late 1970s (Mora et al., 1981). Families with high-risk of having malnourished children were randomly assigned to a supplemented or unsupplemented study group. Pregnant women in the supplemented group and their family members received food rations weekly at the field station beginning with the third trimester of pregnancy and continuing up to 36 months after the birth of the infants. The index infant began receiving supplements directly at 3 months of age. The supplements for infants less than 1 year of age consisted of whole powdered milk and a centrally-produced high-protein "baby food" (Duryea) prepared from maize flour, maize starch, soy flour, and milk powder; and the supplements for all other family members greater than 1 year of age were dried skim milk, enriched bread, and vegetable oil. The supplements were given in sufficient amounts to supply 670 kcal_{th}/d for infants 3-5 months, 428 kcal_{th}/d for infants 6-11 months, 623 kcal_{th}/d for children 1-3 years, and 856 kcal_{th}/d for pregnant women. The supplemented children also received 7.5-15 mg/d of ferrous sulphate, depending on age and 60,000 µg retinol equivalents of vitamin A every six months.

The study groups were generally similar with regard to initial socioeconomic status, family composition, and maternal nutritional status. The median duration of breast-feeding among study infants was less than seven months, and approximately 65% of them were fully weaned by six months. These results did not differ by study group. The index children reportedly consumed 458 kcal_{th} from the supplements at 18 months and 363 kcal_{th} from the supplements at 36 months. Twenty-four hour dietary recall histories at each age indicated that consumption of the supplements resulted in a net increase in energy intake of 177 kcal_{th}/d and 213 kcal_{th}/d, respectively. The supplements produced a considerably greater proportional intake of protein, but their impact on micronutrient consumption was not reported. Infants born to supplemented mothers weighed 68 g more at birth and their lengths were 0.5 cm greater, although these differences were not statistically significant. By 3 months of age the intervention children were significantly heavier by 197 g, and their lengths were 0.9 cm greater. Because the infants themselves had not yet received any supplements, this suggests that maternal supplementation during pregnancy and/or lactation may have influenced the infants' postnatal rates of growth. At 36 months there

was a cumulative difference between groups of 476 g in weight and 2.2 cm in length, both of which were statistically significant. Subsequent secondary analyses found that the greatest relative difference in growth rates (compared with an internal growth reference) occurred from 9 to 12 months, and the next largest relative difference from 3 to 6 months of age (Lutter et al., 1990). There were no significant differences in rates of specific infections by study group.

8.3.1.3 Thailand trial

A study was conducted in five groups of villages in northern Thailand in the early 1980s to determine the effects of a high-energy, micronutrient-fortified supplemental biscuit distributed through day care centres on young children's growth (Gershoff et al., 1988). Several different control groups were studied, but for the sake of simplicity only the two day care groups that either did or did not receive the fortified biscuit will be considered herein, and the presentation of results will be limited to children less than 3 years of age. Consumption of the biscuits, which provided approximately 300 kcal_{in} and 6 g of protein per day in addition to a broad range of micronutrients (including iron and zinc), was reportedly "high", although no quantitative information was published. Unfortunately, there were no data on home food consumption or breast-feeding practices; so possible displacement of other foods or breast milk cannot be excluded.

Even though the study subjects were several centimetres shorter than middle-class Thai children, there was no detectable additional impact of the food intervention on the village children's length or weight increments during 22 months of observation. However, there were only 16 children less than 1 year of age in the intervention group, so the number of young children, who might be most likely to respond, may have been too small to detect a positive impact of the programme. There were no differences in growth responses by initial nutritional status. The authors concluded that nutrition may not have been the primary factor limiting the study children's growth, although it is possible that the intervention simply missed the age group with greatest potential for a detectable growth response, or that the intervention did not provide a net positive impact on the children's dietary intake.

8.3.1.4 Jamaica trial

The study by Walker et al. (1991) provided milk-based supplements and/or psychosocial stimulation to randomly selected children aged 9 to 24 months in Kingston, Jamaica, who had low length-for-age Z-scores (LAZ < -2.0) and reported birth weights > 1 800 g. Non-intervention control children with either similarly low LAZ-scores (stunted) or LAZ-scores > -1.0 (non-stunted) were also evaluated. Because the children were not breast-fed, this study does not, strictly speaking, meet the definition for an intervention on complementary feeding. Nevertheless, because the children's age range is potentially compatible with complementary feeding, the results are being presented.

The supplement was a milk-based formula which was delivered to the home weekly and was estimated to provide 750 kcal_{th} and 20 g of protein per day. Additional skimmed-milk powder and corn meal were given to households of children who received the dietary supplements in an attempt to reduce sharing of the target children's allotment. An average of 345 kcal_{th} of the supplement was consumed per day after six months of the intervention, resulting in a net increase of 106 kcal_{th}/d in the children's dietary intake compared with that of the non-supplemented control groups.

There were no effects of stimulation on the nutrition outcomes, so study groups were combined according to whether or not they received supplementation. The supplemented children had significantly greater increments in length, weight, head circumference, mid-upper arm circumference and triceps skinfold thickness after six months of intervention, and no further benefits thereafter. The supplemented children gained approximately 1.0 cm more in length than the stunted control children, although the final LAZ-score of children in the former group (approximately -2.0 Z-score) was still considerably less than that of the non-stunted control children. The investigators were uncertain why the supplemented children's growth improved during the first half of the study only. Possible explanations put forward were decreased use of the supplement during the second half of the programme or greater nutritional impact in younger children than older ones. No information was published on age-specific responses.

8.3.1.5 West Java trial

This study examined the impact of supplemental foods on the growth and behavioural development of 113 children aged 6 to 20 months who were cared for in day care centres on tea plantations in west Java, Indonesia (Husaini et al., 1991). Non-supplemented children in adjacent centres served as control subjects. The supplements were provided as snack foods twice-daily six days per week, and were composed of cereal and tuber flours, bread, sugars, and vegetable oils. Thus, they were primarily a source of energy and limited amounts of protein, although specific nutrient contents were not described. No additional micronutrient supplements were offered. Although at least some of the children were breast-fed, no specific information on breast-feeding rates and practices was published.

The supplements provided approximately 400 kcal_{th} and 5 g of protein per day in addition to the usual meals. Intake of breast milk was not quantified, nor were the foods that were consumed outside the day care centre measured. Thus, the impact of the supplement on the total daily dietary intake is uncertain. Nevertheless, supplemented children consumed about 317 kcal_{th} per day more than unsupplemented children while at the day care centre. Supplemented children gained 0.29 SD in weight-for-age Z-score (WAZ) during 3 months of observation, whereas the WAZ of control children diminished by 0.01 SD during this same period. These differences were highly statistically significant. There were no differences between groups in change in length-for-age Z-score (LAZ). Supplemented children also had significantly greater increases in psychomotor developmental test scores than unsupplemented ones, primarily because of greater improvement in motor skills.

The authors speculated that the observed difference in weight and length responses to supplementation was due to the short duration of the study. An alternative, and perhaps more plausible, explanation might be that the composition of the diet was inadequate to support increased linear growth. This latter interpretation would be consistent with the results of a previous study in which energy supplements composed of margarine resulted in increased increments in weight, but not height of New Guinea schoolchildren, whereas skimmed milk supplements which provided a broad range of nutrients in addition to their energy value yielded greater increments in both weight and height (Malcolm et al., 1970).

8.3.1.6 ORSTOM four-country study

The effect of early food supplementation on the growth of infants from 4 to 7 months of age was studied by investigators of the French Scientific Research Institute for Development in Co-operation (ORSTOM) and their local counterparts in four countries: Bolivia, the Congo, New Caledonia and Senegal (Simondon et al., 1996). A total of 90-127 infants in each site were randomly assigned to receive the supplement or not. The centrally prepared, precooked supplement was composed of several cereals, soybean flour, milk powder, vegetable oils, and sugar and was fortified with vitamins and minerals. The food was delivered to infants' homes twice daily, seven days per week by project field workers, who mixed the dry blend with an appropriate amount of water to form a semi-solid porridge and then observed the feeding. A maximum of about 200 kcal_{th}/d was offered to 4-month-old infants and twice that amount to older ones. The amounts consumed at each serving were recorded, and anthropometric assessments were completed at monthly intervals. Consumption of foods other than the study supplements was monitored by weekly recall histories.

All infants in each site were breast-fed during the course of the study (although none exclusively), except in New Caledonia, where approximately half were no longer breast-fed. Mean consumption of the study supplement ranged from 70 to 161 kcal_{th}/d in the four sites. Mean daily intakes of supplements increased from month four to five, coincident with the increase in the amount offered, but stabilized thereafter.

Many of the infants in Bolivia, the Congo and Senegal were already mildly or moderately stunted at four months of age, with mean length-for-age Z-scores ranging from approximately -0.50 to -1.00 Z-score. The initial lengths of infants in New Caledonia were similar to the international reference data. Compared with control infants, supplemented infants in Senegal grew significantly more in length (0.58 cm) from 4 to 5 months, but not during any other age interval; and those in Bolivia had greater length increments (by 0.41 cm) from 5 to 6 months. There were no positive effects on growth during any other period in any of the four countries, and only in Senegal, where infants had the lowest initial length-for-age, was the total length gain from four to seven months significantly greater (by 0.48 cm) with supplementation. There were no significant impacts of supplementation on weight gain in any age period except for a small negative effect (-0.17 kg) from 5 to 6 months in the Congo.

The lack of significant impact of supplementation on growth of infants in New Caledonia was not surprising, given that their nutritional status was similar to that of the reference population. However, the inconsistent effect of supplementation in other study sites was unexpected by the authors. The investigators speculated that the supplements simply displaced intake of breast milk or other foods, as was seen in the aforementioned study of Honduran infants from four to six months of age (Cohen et al., 1994; see section 2.2.4). Alternatively, the authors proposed that infant growth during the period of observation may have been determined primarily by prenatal rather than postnatal factors. It is also conceivable that the absorption of micronutrients from the study diet was inadequate to meet the children's needs, thereby limiting growth. Finally, it is possible that the sample sizes provided insufficient statistical power to identify growth responses of smaller magnitude than originally anticipated by the investigators.

8.3.1.7 Summary

As indicated in the previous sections, the results of available food-based efficacy trials have been quite variable, and the reasons for the different results are not always evident. In most cases the supplements either included some high quality animal products, with or without cereal flours, or provided additional micronutrients, although one study intentionally provided primarily supplemental energy. There was no obvious relationship between the composition of the supplement and the growth outcomes, however, the small number of available studies, the limited range of different diets, and the disparate age ranges of children enrolled in each study preclude any definitive conclusions on these diet-growth relationships. The amount of energy available from the supplements offered to infants greater than five months of age ranged from 295 to 750 kcal_{inf}/d, except in one case where the amount provided was not limited; whereas the mean energy consumption from the supplements ranged from 128 to 458 kcal_{inf}/d in those studies that measured intakes. Thus, the children's intakes were considerably less than the amount of food made available. The supplements resulted in estimated net increases in average energy intakes of 93-200 kcal_{inf}/d. In no cases, however, was breast-milk consumption quantified; so these presumed net increases in energy intake may be over-estimates if the foods displaced breast milk. Regrettably, the food intake data are not broken down by age categories that would allow comparison with the recommendations of this document. Likewise, few of the studies examined the impact of the supplements on micronutrient intake or micronutrient status.

In some studies the foods were given only to the child, and in others to both the child and his or her mother during pregnancy and lactation. In the latter case, where both child and mother are supplemented, it is impossible to distinguish between the possible effects of each route of supplementation on the children's growth. Interestingly, a recent trial in East Java, which provided either "high-energy" or "low-energy" supplements only to mothers during pregnancy, found increased growth during the first year of life among infants whose mothers received the high-energy supplement (Kusin et al., 1992). This is consistent with the results of the Colombia study reviewed above, which found that infants of

supplemented mothers had greater gains in weight and length even before the infants themselves received any supplementation.

With such a small number of available studies it is not possible to determine why growth responses were detectable in some projects but not others. It is well recognized that a positive impact of food supplements would be expected to occur only when the nutritional status of the target population is impaired and feeding practices are sub-optimal. This may explain the lack of responses in New Caledonia, where children's nutritional status was similar to international reference data, and in Thailand, where children received their meals in the day care centres and food consumption may have already been adequate. Furthermore, it seems likely that food interventions that were delivered before six months of age may have simply displaced breast milk, as was observed in the Honduras study discussed earlier (section 2.2.4). This may explain the negative results in the Congo, where the centrally processed complementary foods were given from 4 to 7 months. On the other hand, in settings where breast-feeding was already discontinued, as was the case in Jamaica and in the majority of children in Colombia, earlier supplementation with high quality foods may have been beneficial. However, as discussed previously (section 2.2.4), it would seem more appropriate to promote exclusive breast-feeding until about six months of life than to recommend early supplementation of weaned children. In the two publications from Colombia and Guatemala that reported age-specific responses to supplementation, there was a considerably greater response during the first year or two of life; and in Jamaica the positive response occurred only during the first six months of intervention, when the children were younger. Thus, the critical target age range for supplementation appears to be within the period from 6 to 12 months, with possible additional, although diminishing, benefit for growth during the next 1 to 2 years.

It is important to note that, despite the positive growth responses to supplementation that were observed in some of the studies, in no case did the children achieve expected growth velocities for age. This may have been because of nutritional inadequacies of the supplements, insufficient total dietary consumption (possibly due to poor caregiver feeding techniques, depressed child appetite, or displacement of other foods and breast milk), frequent infections, or long term effects of intrauterine malnutrition or possible inter-generational effects due to previous maternal malnutrition. Thus, even with optimal complementary-feeding practices, expectations for reference growth patterns may need to be tempered by these observations, and growth responses to supplementation may fall short of reference patterns.

This section has focused almost exclusively on growth outcomes of child-feeding interventions. However, it should also be recognized that several studies found enhanced psychomotor development with improved child feeding (Mora et al., 1981; Husaini et al., 1991; Pollitt et al., 1995). It is also important to note that children's micronutrient status has rarely been assessed in relation to complementary-feeding interventions. Thus, although the benefits of improved complementary-feeding practices may extend beyond any positive impact on physical growth, there is still limited information on these other

outcomes.

8.3.2 Nutrition education demonstration projects

Demonstration projects are those that are undertaken to develop the specific components of nutrition intervention programmes and to test their feasibility before expanding to a full programmatic scale. Often these projects contain a component of formative research and impact evaluation. Three nutrition education demonstration projects have been selected for consideration because they have produced a substantial amount of information on the methods used in programme development and on the results achieved.

8.3.2.1 Dietary Management of Diarrhea (DMD) Project

The DMD project was originally developed with the objective of improving the nutritional component of diarrhoea case-management strategies in the context of national diarrhoeal disease control programmes. The project was carried out in the highlands of Ancash, Peru and in Kwara State, Nigeria from 1986 to 1988. The initial assumptions of the project team were that food withdrawal during diarrhoea was a major cause of diarrhoea-associated growth failure and that caregivers had to be encouraged to continue feeding children during illness. However, the investigators learned from initial ethnographic and dietary assessments that feeding practices were not generally altered during diarrhoea, although children often refused to eat. More importantly, energy and nutrient intakes were considerably less than theoretical requirements, even when the children were free from illness. Thus, the intervention consisted of the community-based development of enhanced, home-prepared food recipes that could complement breast-feeding for children both during diarrhoea and between episodes of illness.

Specific attention was devoted to energy density, frequency of feeding, protein adequacy, density of selected nutrients (especially carotenoid sources of vitamin A), and food hygiene. In Peru the recipe ("*sanquito*", or *sanco* for children) consisted of pre-toasted wheat and pea flour, grated carrots, vegetable oil, and sugar, which were mixed together according to the same methods used to prepare a simpler, traditional adult snack food ("*sanco*") (Creed Kanashiro et al., 1991). In Nigeria, the recipe consisted of fermented maize or sorghum paste, pre-toasted cowpea flour, palm oil, and sugar cooked as a traditional porridge ("*eko*"). Nigerian mothers were also given information on optional preparation and use of malt flour to reduce the viscosity of the porridge. Both recipes were limited in mineral density and possibly in mineral bioavailability, although they were presumably of higher quality than the preparations customarily given to young children (Guptill et al., 1993).

Information on the preparation of these enhanced recipes was disseminated through interpersonal and mass media channels, and professional training was included as part of the pilot intervention. Evaluation of the programme in Peru consisted of the collection of representative data on reported knowledge, trial, and adoption of the recommended recipe.

Within five months of initiating the pilot intervention, 82% of mothers were aware of *sanquito*, 16% had prepared it at least once in the home, and 12% (three-fourths of those who had prepared *sanquito*) intended to continue using it. All of these rates exceeded the original project goals. Because the recipe was originally targeted as a food for treatment of diarrhoea, a major reason that was stated for not preparing the recipe was lack of an intervening episode of diarrhoea in the target child. Also, absence of food ingredients in the home at the time of illness was cited as another important reason for failure to prepare the recipe. Exposure to the educational message only through mass media (radio) was ineffective in promoting trial and adoption; interpersonal communication was also necessary.

Benefiting from the experience in Peru, the local recipe in Nigeria ("*eko ilera*," or *eko* for health) was promoted as a complementary food that could be used every day, not just as a treatment for diarrhoea. Educational messages were delivered through a cascade of nutrition educators and "teaching mothers", to the "target mothers" of children from 4 to 24 months of age who were already receiving non-breast-milk foods. Samples of ingredients were given to the target mothers to encourage their trial of the recipe. In addition to collecting information on the reach of the educational message within eight weeks of the pilot intervention, the evaluation team in Nigeria measured children's dietary intake before and after introduction of the programme in both intervention and control communities. Of the mothers participating in the intervention, 57% knew the recipe, 48% tried it, and 17% intended to continue using it in the future. Only 2% of mothers in the control communities were aware of the recipe (Guptill et al., 1993). The mothers' level of education was significantly associated with adoption of the recommended diet, and their perception of the cost of the recipe and its preparation time were negatively associated with its adoption. There was little impact of the intervention on mean total energy intakes by children in the intervention communities, largely because the *eko ilera* replaced other complementary foods (Guptill et al., 1990). Importantly, this is perhaps the only study in which breast-milk intake has been measured before and after introduction of the feeding recommendations in older children, and there was no evidence that the complementary foods displaced breast milk. Among the intervention children, change in energy intake following the intervention was positively related to the degree of adoption of *eko ilera*. It could also be hypothesized that the overall quality of the diet was enhanced by consumption of *eko ilera*, although this was not specifically reported.

8.3.2.2 Weaning Food Project

The Weaning Food Project was carried out during the late 1980s with the objective of developing nutritionally sound, low-cost, sustainable methods to improve young child-feeding practices in several countries (Manoff Group, 1991). The Indonesian component of the project has been evaluated extensively and therefore the results from that site are presented herein. The Indonesia project developed specific communication strategies to improve feeding practices for children less than 2 years of age in selected subdistricts of east Java and west Nusa Tenggara provinces. Initial assessments were carried out to

characterize the current feeding practices and to identify any constraints impeding proper care and feeding of children and the resources available to alleviate or solve these problems. The assessment protocol included dietary studies of young children's intake, market surveys of available foods, and anthropological research on factors influencing child-feeding practices.

Based on the problems identified during the initial assessment period, a well-conceived set of educational messages was formulated to promote immediate breast-feeding after birth, the use of both breasts for feeding, the use of a specific recipe ("*nasi tim bayi*") as a home-prepared transitional food composed of rice, a legume, and a fat source beginning at 6 months of age, offering sufficient quantities of food at meals and snacks, later introduction of semi-solid and adult foods, and appropriate feeding during recovery from illness. An extensive set of communication materials was produced for use by local health volunteers ("*kaders*") and other health personnel, midwives, and local community leaders. These materials included dialogues and a jingle for radio dissemination, posters, counselling cards for use by the *kaders*, a leaflet with the recipe for *nasi tim bayi*, and a special child-feeding insert to be included in the local growth charts.

The communication activities were evaluated by using cross-sectional surveys of mothers and *kaders* in project and control communities at the beginning and about one year after starting the intervention. Within the project areas more than 50% of mothers correctly recalled the contents of at least one of the mass media training materials and an additional 25% remembered seeing or hearing the materials, but could not describe their contents. More mothers in the project areas indicated that they received child-feeding information from their *kaders*, and the *kaders* in programme communities likewise reported that they provided mothers with this information more frequently than *kaders* in control communities.

Mothers' knowledge of appropriate feeding practices was significantly greater in project areas and was associated with changes in specific feeding practices, notably, use of colostrum, proper preparation and feeding of *nasi tim bayi*, and later introduction of adult foods. For infants from 6 to 9 months of age and children greater than 24 months of age, there was a small, but significant increase in energy intake from complementary foods, as reported from 24-hour dietary recall histories. However, breast-milk intake was not measured, so the impact on total energy intake is not known. Significant, albeit small increases in the programme children's weight-for-age and height-for-age were also noted.

The project documents provide extensive information on the ability of different media to communicate messages successfully. As found in other projects, the use of multiple channels of information and direct interpersonal communication (in this case, by the *kaders*) were noted to be important. Furthermore, the *kaders*' use of detailed counselling materials was thought to be instrumental to their success.

8.3.2.3. Bangladesh complementary-feeding education programme

The Bangladesh Rural Advancement Committee's (BRAC) Child Survival Program developed educational messages in the late 1980s to encourage better complementary-feeding practices for infants greater than 5-6 months of age (Brown et al., 1992). Messages on specific recipes for snack foods and other meals, appropriate feeding behaviours, and improved food hygiene were disseminated to child caregivers (mothers, fathers and grandmothers) by village workers who provided in-home demonstrations. Specific advice was given on enriching meals with energy, protein, and micronutrients by adding oil, molasses, milk, fish, and lentil flour to existing diets and by increasing intakes of local vegetables and fruits. The educational messages were developed with village representatives and subjected to preliminary field trials to assure comprehension and feasibility.

The impact of the intervention was evaluated by recording reported dietary intakes of non-breast-milk foods and assessing anthropometric indicators of children aged 4 to 18 months in programme and control communities at baseline and five months later. The change in estimated energy adequacy of the whole diet (including imputed values for breast-milk consumption) was calculated in relation to theoretical requirements for age. The estimated energy adequacy declined in both groups during the course of the study, but less so in the intervention group. Programme children consumed approximately 8 kcal_{th}/kg body weight/d more from complementary foods than the control children, but it is unknown whether there were any simultaneous changes in breast-milk consumption that might have affected the groups differentially. Estimated adequacy of post-intervention protein intake was also greater among the programme children than the controls, but no programme-related differences in adequacy of dietary vitamin A and iron were noted. (These were the only micronutrients specifically studied).

Although the absolute weights and weight increments were not reported, it appears from the adjusted weight-for-age data that programme children gained several hundred grams more body weight than control children during the interval of observation. The decrement in weight-for-age Z-score (WAZ) of programme children of -0.19 SD was significantly less than the change of -0.65 SD in WAZ of the comparison group. Unfortunately, the children's lengths were not measured, so it is not certain whether the response was restricted to weight gain or whether there was also greater linear growth in the programme children.

The investigators concluded that culturally appropriate nutrition messages were successful in changing complementary-feeding practices, resulting in greater amounts and variety of complementary foods being consumed. Although the apparent net impact of the intervention on energy intake from non-breast-milk foods was marginal, the children in the intervention villages had greater weight gain during the period of observation. Nevertheless, these gains were not sufficient to reverse completely the decline in weight-for-age. Notably, the mothers reported that they were unwilling or unable to prepare

separate food for the baby on a daily basis, and they were more likely to implement recommendations that required little extra time or money.

Unfortunately, possible causal inferences concerning the relationship between the educational intervention and the observed outcomes are somewhat weakened because the control communities were from a different area from the intervention communities, and the two sets of children were not randomly assigned. However, this study represents one of the few attempts to assess the nutritional impact of an educational intervention to improve complementary-feeding practices. More efforts are needed to evaluate rigorously the impact of such interventions on feeding practices and children's nutritional status.

8.3.3 Large-scale programmes

International organizations and governments of developing countries invested considerable resources during the 1970s and 1980s to improve complementary feeding, often by attempting to increase the availability of complementary foods through centralized production of low-cost food mixtures. The size of these programmes varied, though many were conceived to be of national scope. Some of these efforts have continued into the present decade, although frequently at a reduced scale or with divestment to the private sector. Unfortunately, there are relatively few good evaluations of these programmes and virtually none that have related programme activities to specific nutritional outcomes.

The World Health Organization recently convened a series of workshops to review the experience of complementary feeding programmes in Africa, thereby facilitating the task of summarizing relevant activities in that region (WHO/AFRO & WHO/EMRO, 1996; Trèche et al., 1995). Because industrially produced complementary foods have formerly been relatively unavailable or unaffordable in much of sub-Saharan Africa, governmental and nongovernmental organizations have promoted centralized production of these foods. National experiences with manufactured complementary foods are summarized in Table 39. Most of the formulations were based on a cereal grain with added legumes (soy, lentils, peas, or groundnuts), sugar, and occasionally dried skim milk. Notably, few of these preparations contained vitamin and mineral supplements, despite the fact that the mixtures were nutritionally incomplete and rich in anti-nutritional factors, such as phytates and, in some cases, tannins.

With few exceptions, it is not known how many young children have depended on these manufactured products and what proportion of the total diet they represent. Most of the presentations at the WHO workshops concluded that these products were not affordable by the neediest families. A 1987 workshop in east Africa similarly concluded that pre-packaged, manufactured foods were unlikely to be effective means of improving complementary feeding in that region because of their relatively high cost (Alnwick, Moses & Schmidt, 1988). In some cases, however, these foods have been distributed through health systems or other outlets at subsidized prices. In the case of Botswana, for

Table 39. Summary of national experiences with manufactured complementary foods in Africa

Country	Manufactured comp. food	Related activities	Targetting: comments
Algeria	<u>Superamine</u> , 1969-84: wheat flour, crushed lentils, skim milk, vitamin/mineral mix		Widely bought at subsidized price, which was no longer possible after cost of ingredients rose. Also, similar imported products appeared on the market and attracted consumers
Benin	<u>Quando</u> flour: maize, sorghum, rice flour + sugar; for older children, beans and groundnuts added. 100 MT/yr produced from 1984.		Gradual removal of price subsidies since 1977. Over 85% consumed in urban areas. 200 sales points, 120 in Cotonou. Marketed for children 3 mos. and older.
Botswana	<u>Tsabana</u> : sorghum, soy, vitamins/minerals		Received by ALL children 4 - 36 mos.
Burundi	<u>Musalac</u> : maize, sorghum, soy flours, skim milk, sugar. 1990 production 40 MT/mo.	IEC, songs, etc. on use of <u>Musalac</u> with other health and hygiene messages.	No price subsidy but <10% cost of imported blended products. Use has been considered widespread; also used in emergencies.
Cape Verdi	<u>MICAF</u> : wheat, maize, beans, all ground. Small scale production.		1/6 the price of similar imported goods; industrial production being tested.
Chad	<u>Vitafort</u> : cereal, niebe, groundnut, sugar		Mostly used in drought-stricken areas and health facilities. Some concern about price being too high and energy density too low.
Congo	<u>Vitafort</u> : maize, cassava, soy, sugar, vitamins/minerals	Training of health workers; nutrition education	Limited consumption; competes with cheaper, less enriched flours. Sale largely through health centres.
Eritrea	Factory to produce <u>DMK</u> , local complementary food, is established but not yet in production.	National programme of breastfeeding promotion	
Ethiopia	<u>Faffa</u> : wheat, soy, DSM, pea flour, vit/min		No information on targetting/coverage
Ghana	<u>Weanimix</u>	Assessment of feeding practices; education and recipes re: enriching comp foods	No information on targetting/coverage

Country	Manufactured comp. food	Related activities	Targetting: comments
Malawi	<u>Likuni Phala</u> : maize and bean flours		Targetting of <u>Likuni Phala</u> not reported
Morocco	<u>Actamine</u> : wheat and soy flour, skim milk, sugar, Ca, multivitamin mix		Milk provided as US food aid. Greatest use in health centres for children already malnourished. Has limited general consumption. Competition with less nutrient-rich imported foods. Subsidized distribution in disadvantaged areas.
Niger	<u>Bitamin</u> : millet, niebe, groundnut flours		Consumption and production have remained small-scale.
Rwanda	<u>SOSMA</u> : sorghum, soy, maize flours		Limited consumption. Current production status not clear.
Tanzania	<u>Lisha</u> : low-cost food, not widely distributed; studies of fermented porridge and use of germinated flour ongoing.	Education on improved complementary food is extensive; assessment of practices; continued operations research; Code and breastfeeding activities extensive	
Togo	<u>Nutrimix</u> : maize, sorghum, rice-flours + sugar for younger children; niebe and groundnut or soy for older children		Product for younger children marketed for 3-6 mo of age; will change following WHO workshop. Price is subsidized. Sale through pharmacies and health centres; relatively limited consumption.

DSM = dried skim milk

Sources:

(1) Treche, S.; B. de Benoist, D. Benbouzid, F. Delpeuch. *L'Alimentation de complement du jeune enfant* (proceedings of a WHO/ORSTOM workshop, 1994, Alexandria, Egypt). Paris: ORSTOM, 1995.

(2) WHO. *Complementary feeding of infants and young children* (Report of a WHO workshop, Regional Office for the Eastern Mediterranean, Regional Office for Africa). Geneva: WHO, 1996

example, all children receive the vitamin and mineral-fortified complementary food, *Tsabana*, through a government programme.

Several Asian countries have experimented with similar approaches, using centrally processed, pre-packaged foods (Gibbons & Griffiths, 1984). In the Philippines, the *Nutri-Pak* programme supported local production of plastic packages of powdered, dried sea food. Mothers were instructed to add the powder to their children's usual complementary

foods. In Sri Lanka, a fortified blended food, *Thripasha*, was initially distributed through health centres and later sold commercially. In Thailand and Indonesia, village-level units were established to help women convert raw ingredients, such as rice and soybeans, into mixed transitional foods. These interventions were all believed to have positive nutritional benefits, though since they were delivered as one component of a package of interventions, their unique impact is difficult to assess. In all these countries, centrally processed complementary foods are now widely marketed by multinational and, in some cases, local companies, although their affordability for the poorest families is dubious.

Since the 1980s, the Netherlands Royal Tropical Institute (KIT) has promoted household production mixtures of roasted and milled locally available cereals, legumes, and oilseeds for complementary feeding in about 10 countries (Dijkhuizen, 1992). A number of these programmes have evolved into large-scale operations in which production of these foods is sustained by the non-subsidized sale of the mixed product at about twice the unit-cost of the locally available raw ingredients. Dijkhuizen (1992) concludes that changing complementary-feeding practices through introduction of processed, blended foods requires that the new foods be affordable i.e. no more than twice the price of the local staple food; easy to prepare (preferably easier than the traditional practice); and continuously available. Moreover, child caregivers must be convinced of the importance of good complementary foods for their children's health and well-being.

Large-scale programmes in several countries have promoted household-level processing of complementary food mixtures. The experience with household production of porridges based on fermented or germinated grains was discussed at a conference in east Africa (Alnwick, Moses & Schmidt, 1988). The Joint Nutrition Support Program (JNSP) of WHO and UNICEF in Tanzania included a widespread and intensive effort of this kind to promote the use of "*kimea*," a germinated sorghum or millet flour. Several JNSP reports indicate that the use of *kimea* was widespread in the 1980s and that its use was associated with nutritional improvement (Svanberg, 1995; Seenappa, 1988). Others have pointed out, however, that *kimea* was just one component of a broad package of interventions, so its specific contribution is difficult to isolate. In Nepal, the *Sarbottam Pitho* Project was successful on a relatively small scale in promoting the use of a children's supplement based on household production of roasted soy, wheat and maize (Gibbons & Griffiths, 1984). The aforementioned roasted, blended foods supported by the KIT were also targeted for household-level production in some cases.

Regardless of the site of production of complementary foods and the nature of their ingredients, educational programmes must continuously reinforce the importance of maintenance of breast-feeding. This has been overlooked by many programmes (Armstrong, 1995), possibly contributing to declines in the duration of breast-feeding in some parts of the world.

8.3.4 Factors contributing to programmatic success

Several documents have been published during the past few years on specific aspects of nutrition intervention programmes that appear to contribute to their success and sustainability (ACC/SCN, 1991a; Pinstrup-Andersen, Pelletier & Alderman, 1995; ACC/SCN, 1996). Notably, these publications have concentrated almost exclusively on management issues and contextual factors, generally disregarding the specific nutritional components that may have influenced programmatic outcomes. Major management issues can be summarized in terms of community involvement in planning, supervision, and evaluation; use of information in design and evaluation; availability and commitment of financial, physical, and human resources; targeting of resources; recruiting, training, supervision, and compensation of field staff; design and methods of dissemination of educational messages; and so on. Some of these issues will be highlighted briefly in the following paragraphs. Contextual factors, such as the rate of economic growth, level of political commitment to social welfare, degree of literacy of the population, and cultural notions of equity and sense of communal responsibility, can also independently influence programmatic success (ACC/SCN, 1996).

Active community involvement in programme development is becoming increasingly recognized as a key ingredient for long-term success of development programmes. Criteria for assessing community participation have been described recently in relation to needs assessment, leadership, resource mobilization, management, evaluation, and other programmatic components (Shrimpton, 1995). Unfortunately, there appears to be some degree of trade-off between the short-term efficiency of establishing a new programme and the level of community involvement because of the time required to mobilize community interest, reach consensus on desirable programmatic actions, and train previously inexperienced individuals to carry out technical tasks. Nevertheless, because of the link between community participation and longer term sustainability, it may be necessary to sacrifice some short-term efficiency to assure greater sustainability. Enhanced collaboration between technical experts from outside the community and local residents with regard to problem solving and resource management may be the most reasonable compromise to achieve technically valid, sustainable programmes with greatest efficiency.

In general terms, it appears that the targeting of resources to specific geographic regions and age groups or sex or physiologic categories can lead to greater cost-effectiveness of nutrition interventions. Programmes in which food supplements are distributed often use an additional tier of targeting to reach only malnourished individuals, identified through growth monitoring activities or clinical examinations. However, complementary feeding programmes are more appropriately designed to prevent malnutrition, so the latter form of targeting should probably be used only when universally delivered complementary-feeding packages are insufficient to promote desired rates of growth and nutritional status.

Training and supervision of field staff are also key elements of well functioning programmes. Guidelines are available on the minimal duration of training that is required

by individuals with different levels of prior education who will be assigned specific tasks. Likewise, the optimal ratio of supervisors to community workers and the recommended frequency of supervisory visits have been described (ACC/SCN, 1991a). Further discussion of each of these programme management issues is beyond the scope of this document; but, as noted above, relevant information is available from a number of other publications.

8.4 Evaluation of intervention programmes

As with programme management issues, much has been written on evaluations of nutrition intervention programmes, so this topic will not be covered in detail (see, for example, Sahn, Lockwood & Scrimshaw, 1984). However, it is worth reiterating here that in any intervention programme the evaluation should be designed and built into the planning phase. Broadly speaking, evaluations may include:

- Assessment of the programme's impact on the nutrition knowledge and practices of the target population or on their nutritional status
- Information on the process of implementing the intervention programme
- Combinations of these two types of outcomes, such as might be accomplished through cost-benefit and cost-effectiveness analyses
- Additionally, information on client and professional satisfaction may be of interest to guide any future modifications of the programme.

An example of a useful indicator of programme impact on feeding practices might be the median age of reported introduction of recommended complementary foods. An illustration of a suitable indicator of impact on nutritional status might be rates of low weight-for-age, clinically detectable xerophthalmia, or low plasma retinol concentrations. Examples of process indicators might be the numbers of community workers trained to provide nutrition counselling, vitamin A capsules distributed, or radio messages designed and delivered.

Despite the extensive literature on evaluation methods, there has been some confusion regarding the appropriate use of biological indicators of nutritional status at different stages of programme implementation. Ordinarily, new approaches to control a particular nutritional problem should be subjected to efficacy trials, in which the intervention is provided under ideal conditions to determine whether the desired biological impact can be achieved when it is certain that the intervention has actually been delivered to (and received by) the target population. Once the efficacy of an intervention has been ascertained, effectiveness trials can be carried out to determine the magnitude of nutritional impact when the intervention is delivered under realistic programme conditions. It is generally assumed that the impact of an effectiveness trial will be less than that of an efficacy trial because of reduced coverage and other losses of quality control that may occur when "scaling-up" to full programmes.

Biological indicators of nutritional status, namely clinical and anthropometric examinations, biochemical analyses, and other tests of physiological function, are useful both to characterize the initial nutritional condition of the population and to assure the efficacy of any newly implemented intervention activity. The latter objective is only necessary, however, when the intervention itself is untested or the context in which it is being carried out is sufficiently different from the settings where the intervention is already known to be efficacious. For example, it would probably be justified to assess change in vitamin A status following the introduction of home garden projects, the objective of which is to improve vitamin A status because of current uncertainty about the absorption of plant-derived vitamin A precursors. Likewise, assessments of growth, morbidity, and other outcomes following zinc supplementation are worthwhile because of difficulties in determining whether a particular population is actually zinc deficient. Similarly, an evaluation of the impact of vitamin A supplementation on child mortality in settings where xerophthalmia does not occur would be of value because previous studies of the mortality impact of vitamin A have been conducted only in settings with some clinical evidence of deficiency.

In most other situations, where efficacy is already known, assessment of biological impact of an intervention is less important than collection of programme process indicators. For example, in regions where it is well-known that consumption of high dose vitamin A capsules causes a marked reduction in xerophthalmia, it is more important to monitor the coverage of the capsule distribution programme than to measure biological indicators of vitamin A status repeatedly. One exception would be the periodic reassessment of the population's status (desirably every 5-10 years) to identify any temporal changes in status and to determine, thereby, the need for ongoing intervention.