EFFECTIVENESS OF LARGE SCALE NUTRITION INTERVENTIONS

As described above, many interventions work under certain controlled conditions, but are they effective on a large scale? Do they have an impact at national or subnational level? Many large scale nutrition interventions have been studied, [453, 454, 455] including recent studies in Asia[4, 5, 6]. Summary profiles of community-based nutrition programmes in this region are provided in Appendix I.

There are few published examples of well designed evaluations of community-based nutrition interventions. A recent review of attempts to improve complementary feeding[168] stated that even in the very few large scale programmes that have been adequately evaluated in terms of nutrition impact, it is difficult to isolate the effects of the complementary feeding components. This is a common finding. Most of the efficacy findings discussed above relate to single interventions, whereas many large scale programmes are implemented as multicomponent, integrated programmes. It is rare to find a rigorous evaluation which has demonstrated plausibly the net effects that are clearly attributable to a community-based nutrition intervention. The first Tamil Nadu Integrated Nutrition Project (TINP-I) is one well known example[456]. Regional evaluations, in which the relative effects of the various programme components are differentiated and quantified, are even rarer.

Whether an evaluation is complex or simple, it should be rigorous in relating evaluation design to decisions. A useful matrix for deciding on an appropriate design has been proposed[457]. This relates indicators of interest (provision or utilization of services, coverage or impact measures) to the types of inference to be made (adequacy, plausibility or probability), and considers the degrees of confidence that are required by decision makers, as to whether observed effects (in terms of performance and impact) are due to an intervention. Other factors that affect the choice of an evaluation design include intervention efficacy, the adequacy of knowledge, timing, and costs. Evaluation design has been thoroughly discussed elsewhere[7].

Anthropometry is one of the main indicators used in evaluations, yet it does not capture benefits of improved nutrition such as the increased activity, exploration and cognitive skills of children. Severely underweight children are most likely to respond to nutrition interventions with improved growth, but moderately underweight children are more likely to respond with increased activity, greater disease resistance and possibly improved cognitive development. These outcomes are important, albeit very difficult to measure. Nevertheless, following the principle of "plausible inference", it is well known that, for a given anthropometric improvement, other beneficial outcomes are likely; for example, those relating to cognitive development, productivity, and mortality, among others. These have already been demonstrated in longitudinal studies. One well known example is the meta-analysis that conclusively established the contribution of child undernutrition to child mortality[171].

Programmes that are regarded as "nutrition programmes" are broadly similar, across countries and indeed continents. They generally involve one or a mix of the following interventions: growth monitoring and promotion; promotion of breastfeeding and appropriate complementary feeding; communications for behavioural change (nutrition IEC or nutrition education); supplementary feeding; health-related services (including the Integrated Management of Childhood Illness (IMCI)), and micronutrient supplementation[455]. One distinct variation, with important resource implications, is whether or not supplementary feeding is included.

Most of these interventions can potentially affect most of the problems discussed above: low birth weight, growth failure in young children; and the three main micronutrient deficiencies (iodine, iron, and vitamin A). The following guidelines for improving the effectiveness and ultimate impact of interventions are derived from lessons learned through large scale programmes and from programme design manuals; e.g., [458, 459, 460, 461, 462, 463, 464, 465, 466].

The key strategies, for which descriptions follow here are: growth monitoring and promotion,

integrated care and nutrition, communications for behavioural change (CBC), supplementary feeding for women and young children, feeding at schools, health-related services, micronutrient supplementation and food-based strategies. Fortification is described in a separate paper[2].

Growth Monitoring and Promotion

Sustainable improvements in child health and nutrition depend on families and communities being motivated to take timely and appropriate actions and being able to see benefits from these actions. An effective programme design for growth promotion begins with clarity on its purposes, its scope, and the circumstances in which it functions well. The full impact of growth promotion can be realized when it is employed to make decisions about three types of action: i) recommendations for individual children's care, particularly related to illness and feeding, but also to cognitive and motor development; ii) activity plans for the community that aim to make it easier for families to maintain the growth of their children by, for example, addressing problems of food shortages, poor water conditions, or collective child care needs that extend beyond a single household; and iii) programme activities to bolster community actions that affect households with special needs, such as income generating or transfer schemes. Guidance is needed on the selection of appropriate actions and the content of counselling to improve child health and nutrition.

Based on lessons from multiple experiences that achieved significant impacts on child nutrition, the following technical elements of growth promotion are essential for designing new programmes and for assessing existing operations: programmes should be community- or neighbourhood-based, and aimed at universal coverage; monitoring individual weight begun at birth and done frequently (monthly) for the first 18-24 months; child caretakers involved in monitoring; adequate growth (weight gain), rather than nutrition status, as the indicator of action, either alone or combined with other easily obtained information on the child's condition; growth charts to record the growth progress of individual children, to make growth status visible to the caretakers; analysis of the causes of inadequate growth is required, leading to clear and feasible options for action; negotiation with families, guided by tailored recommendations for what they will do to improve their children's growth; and follow-up.

Growth charts should be of adequate size and should have adequate spaces for clear recording of weights and months etc. All charts should be pretested with workers. Culturally relevant details should be included. Nutrition status categories should be replaced with growth trajectories or channels indicated with thin lines or shading. There should be reminders of key behaviour for particular ages. On one panel of the chart, it is helpful to have key counselling points or cues for the worker about what caretakers should be feeding a child of a particular age, to aid in problem diagnosis.

Good management principles are as important for effective growth promotion[6]. Programmes should have community-based workers, who are assigned limited and well-defined tasks (Box 1).

Detailed, area-specific plans should be made, but with room for local innovation. Training should be task-oriented and hands-on, covering the entire growth promotion process, with an emphasis on problem solving. Supervision needs to be supportive, continuing the training of the workers and addressing directly problems that they confront. Commitment to programme goals should be evident at all levels.

Continual monitoring is essential, to alert all administrative levels to developing problems. One example of a good monitoring tool comes from Indonesia, comprising four key indicators: total number of children under age 2 in the community; total number enrolled in growth promotion; total number that attended growth promotion for the current month; and total number who are growing adequately. The ratio between the first and each subsequent indicator should approach 100% as the programme progresses.

Table 11 provides a guide for the evaluation of growth promotion programmes from the World Bank's Nutrition Toolkit[463]: a checklist for assessing their implementation, based on current knowledge for optimizing decision making in response to growth failure. The scale ranges from negligible to excellent use of a concept. A project with a higher score will be more effective, all other things being equal.

Integrated Care and Nutrition Interventions

Adequate care is of fundamental importance to the nutrition status of women and children. Psychosocial stimulation is but one of several caring practices that have been increasingly recognized as key child development strategies (Figure 4).

Large scale programmes that include both nutrition and psychosocial components have been implemented throughout the world and continue to increase. A recent state-of-the-art review[467] concluded that, although only seven combined programmes have been evaluated, such programmes are generally

BOX 1

Example of a Job Description for a Community Growth Promoter

- Maintain a roster of all children under two in the community - enrolling children at birth.
- Organize a monthly weighing of all under-2s in a community, ensuring 100% participation.
- Assist each mother in weighing her child and plotting the weight on the growth chart.
- Help the mother to interpret the growth pattern and diagnose the problem, if there is one.
- Depending on the result and a discussion with the mother about causes, refer her to the appropriate programme activities, including health consultation and supplementary food.
- Counsel her on one or two activities that she can do at home to help her child.
- Make home visits to children not growing well to provide more encouragement to the mother.
- Organize and participate in community meetings to analyze the growth of the community's children and motivate collective action by the community.
- Help different groups organize specific activities.
- Hold group education sessions on common problems that mothers face in caring for their children.
- For some workers, managing records, food, cases of diarrhoea, or coordinating with the health centre might be part of the job description ■

effective. The following conditions tend to maximize their impact: interventions targeted to early life, prenatally, or infancy and early childhood; targeting children in the poorest households, with parents lacking relevant knowledge; employing several types of intervention, and more than one delivery channel; long duration and higher intensity; and high parental interest and involvement.

Combined interventions are likely to be more efficient than separate interventions, because they are intended for the same population and make use of the same facilities, transportation and client contacts. From an economic standpoint, the marginal costs of integrated programmes, that combine interventions are expected to be low, relative to impact.

From the perspective of the family, a combined approach increases access to services. It may also increase overall effectiveness, because families who need early intervention often have a variety of risk factors (e.g., lack of maternal education, LBW, poverty), several of which may need to be addressed.

The WHO review[467] gives the following examples of combined nutrition and care interventions: incorporation of child psychological development into primary health care through the use of development milestones on health cards and the inclusion of simple messages for parents on how to facilitate psychological development; promotion and support of home-based, group child care, combined with supplementary feeding for children of working mothers, sometimes with a micro-credit programme; a child-to-child strategy in which older siblings learn skills to help improve the psychological development, health and nutrition of preschool children; community development projects that use home visiting and preschool programmes as an entry point for other interventions such as income improvements; interventions with high risk children, such as LBW infants, that combine both psychosocial and nutritional care; parent education courses and mothers' groups including breastfeeding support groups; and mass media programmes (radio, television, videos) that target both physical growth and psychological development.

Recommendations of programme type (e.g., home-based, centre-based, or a combination) depend upon the availability of several critical variables including: responsible caregivers in the home; safety of the home; quality of caregiving in the centre; and stability, support, and training of caregivers in the centre. In general, centre-based programmes are not recommended for children from birth to three years of age, except when the child is an orphan, the mother is in fulltime employment, there is no suitable adult caregiver in the home, or there is extreme family disruption, child abuse, or neglect.

Actions taken to facilitate child development should contain, in addition to nutrition and health interventions at least the following: age-appropriate responses of adults; stable relationships with adult caregivers; supporting the child's development of language through labelling, encouraging the child's vocalizations, expanding, explaining, and two-way conversations; providing an environment for the child

TABLE 11: Guide for assessing the quality of implementation of a growth promotion programme

Implementation Quality Issue	1. Negligible	2. Minimal	3. Fair/Moderate	4. Good	5. Excellent
Participation of mothers and families	Mothers attend only if receive some incentive; attend sporadically; not asked to be involved; chart not made for or kept by family.	Most mothers attend <6 times per year and are passive participants; keep child's chart but have little understanding of it.	Mothers attend >6 times per year; participate in weighing and want to know weight; express motivation to change practices so child will gain weight; ask questions; keep chart.	80% of mothers attend regularly; interpret growth pattern; plan to try specific behaviour; use weight gain to indicate success; growth chart tailored for family.	Mothers help to weigh child, interpret growth pattern; with worker, choose actions to improve growth; offer experiences to other mothers; all materials are developed for mothers.
Guidelines for decision making based on child's progress	No guidelines for decisions.	Guidelines use only nutrition status; status used for supplementary feeding decisions at service delivery point.	Guidelines combine nutrition status with health or weight gain criteria; interpretation not clear; action plan suggestive, not specific.	Guidelines for decisions by gaining, not gaining, or losing weight, but are developed for only one aspect of programme, (e.g. , food) or for one level (e.g., community).	Criteria for adequate and inadequate growth combined with health status; used at all programme levels, with clear guidelines for decisions and action.
Targeting and integration of programme components	Children weighed but weights not used for targeting or integration.	Weighing linked only to decisions such as feeding; or frequency of weighing, based on nutrition status.	Targeted referral within health system, based on nutrition status and/or growth.	Use growth for referral to other services in community and some targeting of programme actions, such as health care, but no follow-up.	Close coordination with programme and community services; good targeting and follow-up.
Community awareness and decision making	No community-level use of data (health system only).	Health system provides some feedback to part of community	Community worker compiles nutrition status data periodically and shares results with community, but information does not trigger actions.	Community organization receives and discusses aggregate growth and status information regularly; and analyses causes of problems.	Community compiles, discusses and frequently bases decisions/ actions on data; takes pride in having few under-nourished children and in children who grow adequately.
Individual nutrition counselling	Either no counselling or messages concern only attendance at weighing.	Group nutrition education talks for mothers; topics are generic.	Individual nutrition education for those targeted, but messages are general, not tailored.	Counselling tailored to the individual child who is not growing; counselling more intensive, as needed.	Adequacy of growth determines content and intensity of counselling; nutrition negotiation used; targeted materials used.
Worker and workload	In a fixed facility; growth promotion is one of many responsibilities; no incentive to give attention to growth promotion tasks.	In fixed facility with occasional outreach has auxiliary assigned responsibility; no incentive to give attention to growth promotion except to food distribution.	In community, extension of health centre, multipurpose; overworked; few incentives.	Community worker with responsibility for nutrition, may work with multipurpose worker; not overworked; some performance-based incentives.	Community worker has help and will make home visits; percent of children gaining weight is part of job performance.

TABLE 11 continued

Implementation Quality Issue	1. Negligible	2. Minimal	3. Fair/Moderate	4. Good	5. Excellent
Training of workers	Emphasis on weighing and charting; one-time occurrence; didactic, theoretical.	Emphasis on weighing and charting, plus nutrition education and rehabilitation are discussed, but low priority and are nonspecific; still theoretical, but divided into shorter sessions.	Emphasis on weighing and charting, plus analysis of causes and how to target feeding, general nutrition advice, recipes, etc.; task-oriented; cases presented; short sessions.	Emphasis on weighing and charting plus analysis of causes and how to target and give general nutrition advice and recipes, plus community dynamics, counselling, using materials and giving targeted advice; task-oriented; cases and practices; short sessions with follow-up of training in community.	Previous accomplishments plus teaching how to negotiate with mothers; emphasis on community motivation and counselling; previous characteristics plus methods devoted to practice, self-assessment and community follow-up.
Supervision of nutrition worker and activities	Check only monthly reporting forms, at best growth charts; visits are at best sporadic.	Check records and frequency of education or receipt of food; visits infrequent; if a problem occurs, blame placed on worker.	Previous accomplishments plus observes growth monitoring session and asks about child nutrition; visits are at least twice a year and attention given to improved performance.	Observe sessions, assess targeting and decisions on actions based on growth data; quarterly visits; work with community; emphasis on improved performance.	Previous accomplishments plus visits to mothers with worker to help solve problems; initial visits monthly; continued training.
Detailed operational planning	Only a few general norms available.	Norms developed with general guidance but not for all aspects of programme.	Guidelines developed for implementation of all aspects of programme; some response to local needs in purchase of weighing scales, etc.	Full set of operational guidelines and tools available to respond to local needs.	Full set of operational guidelines with options and examples of local initiatives; materials respond to local needs; budget for local innovations.
Programme level monitoring	Data not compiled, although can be sent through system.	Data compiled, but not used to affect programme.	Compiled only for nutrition status; decisions taken on supplies of commodities only.	Data on growth and nutrition status compiled, presented, and discussed, but not at all levels.	Data on growth used for programme decisions (design, expansion) and advocacy at all levels
Commitment to sustain programme	Undernutrition part of dialogue at national level only, among programme personnel.	Commitment to reducing undernutrition seen only in general terms, not in local action.	Commitment at all levels to reducing undernutrition.	Adequate growth is used at household and community levels but does not have commitment outside of programme personnel at other levels to sustain resource allocation.	Adequate growth is a national development objective; commitment to achieving this is seen at all levels; local resource allocation.

to explore safely; providing interesting play materials and books that reflect the child's everyday experiences; warm, affectionate, sensitive and responsive behaviour to the child's signals; and play activities with peers and adults[468]. Many children with disabilities can respond as productively as children without disabilities to the same developmental interventions, and should therefore be included.

Actions should be taken to strengthen the parent's or caregiver's sense of effectiveness as a promoter of child development. Interventions with parental and nonparental caregivers are needed: to help them to use developmental materials appropriately; to provide challenging activities at the appropriate level of difficulty in which the child can be successful; to become increasingly involved with their children; to respond verbally to the child's vocalizations; to be responsive to the child's emotional needs; and to avoid physical punishment as a standard child rearing practice. Parents or caregivers should be taught how to integrate child development activities into activities as much as possible of daily living. Involving other family members in these activities has the potential to increase their impact.

Systematic and continuous training and supervision, for both professional and paraprofessional staff, and larger-scale studies of effectiveness with careful evaluation of process and impact are two other critical elements of programme expansion[7].

Adaptation of direct (developmental scales and cognitive tests) and indirect (e.g., parent's report) assessments of development in children aged 18 months to 6 years, (focusing on psychomotor, gross motor, reasoning, language, and adaptive tasks, including social and emotional behaviour) can be used to evaluate programme success, when programmes are intended to promote and to enhance these outcomes.

There is need for an investment to develop new instruments and to improve existing instruments for assessing the cognitive and noncognitive development of children below the age of three years. This is particularly true for large scale evaluations of programme interventions. Further research is needed on the use of parental reports and other approaches, including brief observations.

Process measures of developmental interventions are critical for the continuous improvement of programmes and for providing assessment of the strengths and weaknesses of programme practices; e.g., children's and parent's responsiveness to the intervention, children's level of development and change over time, parental level of participation, and factors that inhibit participation. Such process measures can also serve to provide caregivers with information about how to modify their behaviour with their children. Simple checklists, combined with training and supervision, can be used for this purpose.

The importance of care practices and resources, particularly the linkages between health, nutrition, psychosocial care and stimulation, and cognitive development, justify their inclusion within programming. Early nutrition and care interventions with children have long term consequences on later growth, development and functioning[4]. A key element in psychosocial care is the sensitivity or responsivity of the caregiver to the child's emerging abilities. Programmes that include care are likely to be effective in increasing nutrient intake and improving growth and development of children, particularly if they begin prior to 3 years of age. In developed countries, effects on children are most likely to be seen with high intensity interventions that are made directly with children. However, in developing countries with more "collective" cultures, the effectiveness of interventions that are made directly with caregivers is likely to be greater. Although there is a general recognition of the importance of care, much more needs to be learned about the best approaches for improving it. Assessment instruments and outcome indicators are being developed and will require careful efforts to become accepted. One of the main strategies for improving caring practices is 'communications for behavioural change' (CBC), as discussed below.

The evolution of the Tamil Nadu Integrated Nutrition Project (TINP) provides an interesting illustration of the need to go beyond supplementary feeding and to focus on improving caring practices within the home, in order to achieve an impact on moderate levels of underweight The TINP-I initiated in 1980 and a forerunner of the Bangladesh Integrated Nutrition Project (BINP) became well known in international nutrition circles during the 1980s as a success story, having achieved a highly significant reduction in severe early childhood undernutrition. Evaluations indicated a decrease in underweight prevalence of about 1.5 percentage points per year in participating districts, twice the rate of nonparticipating ones[469]. The success of the TINP-I was founded on several factors including: selective feeding, careful focus on supplementing the dietary intake of young children when their growth faltered and until their growth resumed; favourable worker-supervisor ratios; clear job descriptions; and a well-focused monitoring system. The second Tamil Nadu Integrated Nutrition Project (TINP-II) was launched in 1991, in 318 of Tamil Nadu's 385 rural blocks. It sought to move beyond reducing severe undernutrition to make a significant reduction in the high prevalence of children suffering from moderate undernutrition, i.e., shifting towards a more preventative focus. The core strategies were: regular

growth monitoring and promotion; nutrition education and health checks for all children; and supplementary feeding of moderately/severely underweight and growth-faltering children, and high risk pregnant and lactating women. The Implementation Completion Report[470] of the TINP-II found that: "*While the project was successful in achieving its severe undernutrition and infant mortality rate reduction objectives, moderate undernutrition and low birthweight prevalences were not significantly reduced, although some progress was made*".

The main lesson learned from the TINP-II concerned the need to intensify the focus on localized capacity-building, community mobilization and targeted, interpersonal communications, aimed at improving the home-based care and feeding of 6 to 24 month-old children in order to prevent their becoming malnourished. An overarching recommendation was that supportive counselling of caregivers and high quality service delivery, allied with a concerted move towards social mobilization and participatory planning, should be the pillars of a future nutrition improvement strategy for Tamil Nadu.

Most of these substantive lessons are relevant beyond Tamil Nadu. The TINP-I showed that nutrition interventions that are targeted using nutrition criteria, integrated within a broader health system, and effectively supervised and managed, can significantly reduce severe undernutrition. The TINP-II showed that to attempt to go further so as to prevent children from becoming moderately malnourished is, in many ways, a harder task and one that requires a significant shift in emphasis. Nutrition programming in Tamil Nadu is still evolving towards such an approach: emphasizing human capacity building for home-based action, a proactive integration with the health system, and the mobilization of communities to sustain the process beyond the project[470].

Communications for Behavioural Change

Communications for behavioural change (CBC) is a self-explanatory strategy. Other terms in the past have included nutrition information-education-communication (IEC) or nutrition education; though the latter has tended to imply a fairly didactic and often top-down approach, that has seldom been effective in the long term.

CBC has drawn from the literature on social marketing to improve its relevance and effectiveness. It operates on the basis that new ideas, services, or products can best be introduced if the intended beneficiaries see them as fulfilling their own aspirations and wellbeing. People will not accept new ideas and technologies designed solely from specialists' concepts. CBC follows a disciplined series of programme development and implementation phases, each with steps designed to learn from the community itself: conducting formative research to formulate the whole programme's strategy; testing those strategies; designing, testing, and improving messages; designing, testing, and producing communication materials; and monitoring and making necessary revisions in programme strategies to better address people who have not tried or who have stopped desired practices. As the programme matures and behavioural changes begin, the design of communication and other programme elements should be revised and adapted to that change.

CBC may be directed to several nutrition-related objectives; e.g., improved feeding or caring practices, or compliance with supplementation regimens, among others. It may be employed as a complementary strategy alongside, for example, supplementary feeding or growth monitoring (as growth promotion).

There is a need, however, to redirect some CBC toward women, particularly wirh regard to eating practices. These are important for the health of the women themselves and for that of their children, particularly in rural areas where women endure the dual burden of moderate to high levels of physical work and frequent pregnancies without noticeable increases in energy and nutrient intakes. Studies show that female discrimination in developing countries may be to a large extent self-inflicted as a result of a "self-sacrificing" role through which they meet their own needs last[471]. For example, increased female wages were associated with improved nutrient intakes of most household members except the women themselves[472]. CBC activities targeted toward women could be specifically designed to reduce, and to ultimately remove, these attitudes.

It is also important to delay childbearing among adolescents. First births can be delayed by postponing the age of marriage and the onset of sexual activity and by using effective methods of family planning. This requires culturally sensitive CBC programmes for changing individual and societal motivations for early childbearing and enhanced opportunities for formal education of girls.

There are few well designed, large scale evaluations of CBC for nutrition in the existing literature. Several large scale programmes aimed at improving complementary feeding through nutrition education or CBC, have been reviewed[168]. Few had been adequately evaluated but this review[168] stated that: "*it is clear that nutrition education can have a large impact on complementary feeding practices*".

One type of programme, currently implemented in Haiti, Viet Nam and Bangladesh, is the Hearth Programme (Box 2).

BOX 2

The Hearth Model

The Hearth Model is currently being implemented in countries such as Haiti, Vietnam and Bangladesh. It is intended to function as part of a comprehensive programme that includes growth monitoring, deworming, vitamin A and iron supplementation, and treatment for infectious diseases. In this approach, volunteer mothers from the community are trained to conduct feeding sessions (called 'hearths') in their homes, to provide malnourished children with one nutritious meal per day in addition to their normal diet. Mothers attend with their malnourished children each day during the two-week rehabilitation period, to learn how to prepare nutritious foods and observe the improvement in appetite, activity and overall health of their children. The meals fed during the sessions are usually developed using a positive deviance-approach, by determining which foods are fed by low income mothers in the same community whose children are well nourished. This ensures that local, affordable foods are chosen and, through the process of discovery, convinces participants that a solution exists that is within their means. Social learning theories are the basis for the nutrition education component of the model.

The impact of the Hearth model has been formally evaluated in Haiti[a] and Vietnam[b] by collecting data on child weight (though not height). In Haiti, a quasi-experimental longitudinal design was used to compare 192 participants and 185 comparison children from nonprogramme communities who were similar in initial weight-for-age Z-score (approximately -2.7). In multivariate analysis, there was a significant difference between groups in change in Z-scores during a 12-month period, in favour of the hearth programme. The effect was greater among children with higher initial weight-for-age (WA), which was unexpected.

The authors speculated that the Hearth Programme was most effective at preventing further deterioration among moderately malnourished children, but for those who were severely malnourished the local growth monitoring programme may have been more effective because such children were more likely to be referred for medical care. In Vietnam, the Hearth Programme is called the Nutritional Education and Rehabilitation Programme (NERP), and is part of a larger strategy (formerly called Poverty Alleviation and Nutrition Programme and now called Community Empowerment and Nutrition Programme) implemented by Save the Children/US that involves multiple components, including a programme to promote health of mothers and infants, pre- and postnatally. Data collected before and after implementation of the programme in 52 hamlets indicated that within two years, the prevalence of severe underweight (< -3 WAZ) decreased from 23% to 6%, a trend not observed in other parts of the country. Improvements in child weight appeared to be maintained even after NERP sessions were discontinued (which occurred when the number of eligible malnourished children was too low to warrant the sessions), suggesting long term improvement in child feeding and caregiving practices. The scope of the programme in Vietnam (i.e., both pre- and postnatal interventions) makes it difficult to attribute the changes in child weight solely to complementary feeding, but the sustained effectiveness of the overall approach is encouraging ■

Sources: a Burkhalter BR, Northrup RS (1997) Hearth Programme at the Hôpital Albert Schweitzer in Haiti. In *Hearth Nutrion model: Application in Haiti, Vietnam and Bangladesh*, ed. O. Wollinka et al. Arlington, VA, 1997: 13 – 42.

[b] Sternin M, Sternin J, Marsh DL (1997) Rapid, sustained childhood malnutrition alleviation through a positive-deviance approach in rural Vietnam: Preliminary findings. In *Hearth Nutrition Model: Applications in Haiti, Vietnam and Bangladesh*, ed. Wollinka O. Arlington VA: BASICS.

The following process guidelines for CBC on nutrition have been derived from various articles and reviews.

First, focus on behaviour: on understanding existing attitudes, perceptions, and practices; the social context in which these practices exist; the blocks or obstacles that impede uptake of desired practices, such as social, cultural, cost concerns, availability, poor service, lack of appeal; and how these constraints may be overcome.

Second, take a systems approach to managing behavioural change, integrating the technical (or clinical) aspects of the programme with service or product delivery and with motivations for change. To address truly behavioural and development objectives, the social marketing process keeps in mind larger intersectoral processes as well.

Third, appreciate that not all target audiences are the same and that even within one audience (e.g., mothers), there may be important segments (e.g., nursing mothers, mothers with children who "don't want to eat") that need to be identified and addressed differently.

Fourth, enforce rigorous discipline in the message development processes, to ensure that messages always: call for and motivate a desired action; surmount all known obstacles convincingly; offer meaningful benefits; are memorable; and are presented by a convincing authority. Linkages with commercial advertising agencies may enhance this process and the presentation of ideas to identified audiences.

Fifth, base media strategies upon sound research, to ensure that message reach and frequency are sufficient to achieve the required behaviour-change objectives. The choice of communication channels is location-specific and may include: direct counselling from fixed sites or door-to-door; generation of word-of-mouth within the community; traditional drama, singing troops, or puppet shows; promotional events; point-of-sale display material; and innovative use of available mass media.

Sixth, give special attention to service personnel and train them in sound counselling practice to be real motivators of behavioural change.

Seventh, recognize that effective programmes must achieve a balance between centrally managed activities and initiatives that are developed locally, within target communities themselves. This often means that project funds must be allocated in a decentralized fashion.

Specific Nutrition-Related Recommendations

The following recommendations relate to content:

First, find a balance between food and practices. Unless breastfeeding techniques and complementary feeding practices are both addressed, providing food alone has a minimal impact. For example, just promoting "breast is best" is not useful when almost all mothers of young babies are already breastfeeding but need to do it more frequently and exclusively.

Second, target changes in feeding practices. In any culture, the following appear to be important factors: viscosity of food, frequency of feeding, nutrient density, quantity, hygiene, patience, and persistence. Very specific behavioural recommendations must be developed for each age group of children: an important step that can be achieved only on the basis of thorough qualitative research.

Third, do not ignore the first days of life. Bad practices begin with prelacteal feeding. In addition to traditional and nontraditional prelacteal foods, there is an increasing tendency to introduce foods early to "accustom the child to food" often because the mother must return to work.

Fourth, expect the worst characteristics of the daily feeding pattern during, and immediately following illness. If mothers give only a small amount of food regularly, they typically reduce the quantity even more during illness. What commonly happens is that mothers try to feed a sick child but give up because the child "just won't eat." Rarely does the concept or practice of recuperative feeding (feeding during recovery from illness) exist.

Fifth, recognize the extent to which families can do more for themselves. Poverty and lack of coping skills may be so prevalent that the mother, family, and community cannot change their practices enough to have a significant nutrition impact.

Sixth, define clearly the barriers to change. Both environmental and attitudinal barriers need to be identified. Environmental barriers include the lack of certain foods and feeding utensils, as well as health care professionals' misinformation to mothers about child feeding. A common attitudinal barrier to improved feeding practices is a mother's feeling that she lacks control, which derives from her low social status. The feeling that she exists to serve her family often means that she lacks the confidence to overcome resistance from her child. Also, mothers may feel they lack time to employ new practices.

Seventh, pinpoint motivators or enabling factors. For example, fathers, whose potential contribution is often undervalued, particularly when it comes to purchasing "special" calorie or nutrient dense foods for young children may play important roles, as can food vendors and owners of small food shops or stalls, and individuals who are credible and available sources of information related to food purchases.

Supplementary Feeding of Young Children and Women

The efficacy of prenatal food supplementation (during pregnancy) and postnatal supplementation to young children has been reviewed above. This section considers whether such approaches work in large scale programmes and whether they represent the best use of resources for nutrition improvement.

The most common purpose of supplementary feeding is to prevent or to alleviate undernutrition, through reducing the gap between an individual's actual consumption and requirements. A secondary objective may be to improve household food security, through a food or income transfer effect, and thus to facilitate the caring capacity of the household.

Prior to any consideration of appropriate nutrition-relevant action, it is essential to ensure the problem of undernutrition has been assessed and its causes analyzed. The essential stages in problem analysis may be broken down into four stages: assessment of the nature, extent, severity and distribution of undernutrition; analysis of the main causes of undernutrition to clarify whether supplementary feeding is a potentially relevant action; analysis of the resources and institutional capacity for action, to reveal whether it is feasible; and cost-effectiveness analysis, as far as data permit, of supplementary feeding and other alternative relevant and feasible interventions aimed at reduction of undernutrition. This will ultimately lead to a decision on whether supplementary feeding is ultimately the most appropriate intervention to initiate, given the existing context.

In order to assess the relevance of supplementary feeding, it is necessary to assess the degree to which the problem of undernutrition is associated with inadequate dietary intake at the individual level. The priority for supplementary feeding will be "food insecure" households, where target individuals do not consume adequate food. In such situations, there will also be a need for household food security actions: particularly if the household is "ultra poor" (or "food poor").

There are risks attached to supplementary feeding (Box 3), which should be borne in mind when considering the relevance of a programme.

Food supplements are costly. In addition to the cost of the food itself (often financed by food aid) there

BOX 3

Common Causes of Failure in Scaling Up Supplementary Feeding Programmes

- Irregular or inefficient supply, delivery and/ or distribution of food for various reasons, including corruption.
- Inadequacies in institutional capacity, training, supervision, monitoring, evaluation, community involvement
- Leakages, due to poor targeting
- Irregular participation of the target group
- Inappropriate timing or duration of supplementary feeding
- Leakages, due to intrahousehold sharing of food with the non-needy, or sale of take home rations
- Leakages due to the substitution of a portion of the normal diet by the on-site food consumed by the target individual.
- Inadequate quantity or quality of food basket to close nutrient gaps.
- Insufficient calorie density of foods, rendering it difficult for the target child to consume enough to meet the nutrient gap
- Types of food culturally inappropriate
- Lack of understanding of beliefs and perceptions underlying intrahousehold food distribution practices
- Lack of counselling on the need to actually feed supplementary foods to the targeted child.
- Lack of attention paid to combatting other important causes of undernutrition, including through communications approaches aimed at improving home-based caring practices ■

Source: Gillespie SR (1999) *Supplementary Feeding for Women and Young Children*: Nutrition Toolkit Module No. 5. World Bank Nutrition Toolkit. Washington DC: The World Bank.

are hidden costs: transportation and storage; leakages and corruption; and disincentive effects on local agriculture. Food supplements may also cause dependency: not only from an income substitution point of view, but also from the behavioural point of view. Food supplements may create adverse dietary beliefs; from example, the ubiquitous use of cow's milk gives mothers the false impression that this is necessary for healthy child growth, even though most poor families cannot afford to buy milk and do not own dairy cows. Widespread and long term feeding programmes may have a pernicious effect by disempowering families from resolving their problems and parents from meeting their obligations.

If it appears, from causal and resource analysis, that supplementary feeding is relevant to a given problem and its causes, and that the selected infrastructure appears capable of supporting it, a further question is: is supplementary feeding the most efficient or cost-effective approach in this situation? Cost-effectiveness analysis may be carried out prior to the choice of intervention, if data are available to compare options on the grounds of efficiency. Otherwise (or additionally) it may be carried out as part of the evaluation process.

As discussed earlier, there is evidence for the efficacy of maternal supplementation, mostly from The Gambia. The lower a woman's prepregnancy weight, the greater is the potential increase in birthweight from a given unit of supplemental food. Given the higher prevalence and severity of low prepregnancy weight in South Asia, it may be assumed that the benefits to birthweight there would be at least as high.

In many situations, the choice of "food or no food", of supplementary feeding versus some other intervention, is not one that can be completely determined by the logical process described above. Food is a political issue. Giving food is an effective vote catching device for populist governments. Nevertheless, in such situations, there should be some scope for influencing the actual use of food, so as to improve nutrition outcomes more efficiently, through nutrition logic.

Once a decision has been made to undertake a supplementary feeding programme, an early and critical stage of project design is targeting, to increase efficiency through focusing on the most needy and responsive. The beneficiaries should be those individuals who are at risk of becoming malnourished (or are already malnourished), as a result of factors which can, at least in part, be addressed by supplementary feeding.

Targeting may be: i) geographical, to the most needy areas in a country; ii) functional, to those population subgroups who are most vulnerable, as usually defined by age or physiological status (e.g., 6 to 24-month-old children, pregnant and lactating women; and iii) individual, to those who are becoming malnourished (e.g., children whose growth is faltering). As well as being needs-based, the chosen targeting mechanism must also take account of the available infrastructure, administrative capacity, and any important sociocultural and political considerations which may be antagonistic to the notion of selection.

Transparent and enforceable entry and exit criteria are required for food supplementation. This means that the indicators for screening must be modifiable with food. Growth of children (monthly weight gain) is the best indicator for children. Too frequently, static weight-for-age is used as the indicator despite it being less sensitive for food intake, especially in children older than two years. Unfortunately, the use of children's growth in screening for food supplements is widely believed to be a disincentive for mothers to do whatever they can to improve their child's growth[462]. One solution is to enforce a maximum duration of benefit, and to have growth promotion efforts isolated, in time and place, from food distribution.

The next design stage concerns the strategy adopted to distribute food, which requires consideration of: the nutrient content of the food supplement; the type of foods used; systems of supply and distribution; and the timing, frequency and duration of feeding. Supplementary foods should be culturally acceptable and should permit the preparation of meals which are digestible, palatable, energy dense, and micronutrient rich, without being bulky. Other important prerequisites include: cost-effectiveness in closing the nutrient gaps of recipients; reliability of supply; feasibility of transport, storage and processing; short cooking time; low fuel costs; and adequate shelf life. The choice of local versus external production should be based on such criteria.

Supplementary feeding, if it is considered appropriate, should never be seen as the pivotal intervention in a strategy to combat undernutrition, but rather as an adjunct to approaches designed to optimize the use of existing household level resources, such as CBC. Because growth failure starts between 6 and 24 months of age, it is clear that supplementary feeding alone cannot offer the best means of prevention. At this time the child does not need much food *per se*. The quality of food (including, most importantly, its micronutrient content), how it is prepared and how it is fed to the child that are crucial concerns, along with the protection of the child from disease.

The benefits of supplementary feeding will be enhanced by complementary actions which address the health- and care-related causes of undernutrition, to the extent that these exist. Important nutrition-relevant, complementary actions, aimed at young children, include: growth monitoring and promotion; protection and promotion of breastfeeding and appropriate complementary feeding practices; immunization; disease management, including oral rehydration therapy; micronutrient supplementation; and deworming. For women, high quality and timely ante- and postnatal care is essential, including: tetanus toxoid immunisation; micronutrient supplementation (iron and folic acid tablets for pregnant women; possibly postpartum vitamin A megadosage, where VAD is a problem, and iodised salt consumption); malaria chemoprophylaxis, in endemic areas; and reproductive health education.

Other prerequisites include adequate technical and operational capacities of implementing institutions. Functional administrative support systems are crucial for programme operation, including: effective logistics, supplies, transportation, storage and delivery systems, and efficient funding mechanisms for regular support. Strong managerial capabilities and efficient technical support systems (including staff training, retraining, technical backstopping, supervision, monitoring and evaluation) are also critical, as is the adequate selection and motivation of programme staff. A functional management information system is especially important for the collection, processing, timely analysis, interpretation, and regular feedback of information required for ongoing decision-making and motivation.

School Feeding

The physical growth of school children aged 6 to 9 years is mainly the result of environmental and genetic factors and their interaction[473]. In population groups that have experienced constraints to economic and social development, most of the factors affecting the physical growth of school children are related to environmental factors experienced before puberty, including poor food consumption patterns, illness, lack of sanitation, and poor health and hygiene practices[474].

Data on the nutrition status of school children are scarce. The ACC/SCN's Fourth Report on the World Nutrition Situation[11] provided data for only the Latin America and Caribbean region. Height census data on school children has been used for planning, evaluation, and advocacy in Central America[475]. This information has allowed governments and other organizations and institutions to detect growth retardation, to screen high risk groups, and to target social interventions for nutrition security and human development.

As discussed earlier, the potential for catch-up growth among stunted school children is thought to be limited after 2 years of age, particularly when such children remain in poor environments[145]. In a study in the Philippines, some catch-up was observed between the ages of 2 to 8.5 years, for children who were not of LBW or severely stunted in infancy[476]. However, stunting at age 2 years, regardless of whether catch-up is achieved or not, has been shown to be significantly associated with later deficits in cognitive ability[152]. This further emphasizes the need to prevent early stunting.

The fact that hunger alleviation in school children improves school performance has been documented in developing and developed countries. Studies in Jamaica, for example, have shown that those children who benefited most from nutrition improvement were wasted, stunted, or previously undernourished[181].

A review of school feeding programmes[477] has highlighted the following, as key concerns, when considering the option of feeding at schools. First, clarify goals. The following are possible goals: alleviate short term hunger (evidence strong); increase enrollment and attendance (evidence strong); improve micronutrient status (evidence available from a few programmes); improve learning outcomes (evidence weak); raise community participation (depends on modality and local circumstances); improve health and nutrition of school children (evidence weak); and improve health and nutrition of children's families (no evidence).

Second, identify and target population sub-groups (e.g., using socio-economic, geographical, gender and/or age indicators) according to goals and which groups need food to achieve those goals. Targeting should be transparent, with clarity on whom is targeted and why.

Third, consider timing, which again depends on goals: a breakfast or morning snack is generally better than lunch, for alleviating hunger and achieving learning objectives.

Fourth, define lowest cost rations to achieve the goals. This requires consideration of: calories (amount to supply 25% to 50% of daily needs); micronutrients, especially iron (to supply up to 100% needs); cost-effectiveness of fortification vs. supplementation; prior preparation (prefabrication) vs. cooking on site (prefabrication can be cheaper and obviates the need for a school kitchen and cooking equipment); on-site vs. take-home feeding (eating at school does not guarantee that food is "supplemental" and food taken home is generally

shared and is more like an income transfer); and local vs. imported foods (consider comparative costs, foreign exchange, shifts in dietary habits).

Fifth, estimates the cost per person. These have been found to be in the range US$20 to 200/1,000 kcal/yr, with a median US$81. It is important also to consider the opportunity cost (i.e., how else might this money be used to achieve the same goals) and other options (including parental education, deworming, micronutrient supplementation and cash transfer) and their costs.

Sixth, assess the complementary services that are necessary to achieve nutrition, health or education goals. These include: a curriculum for the nutrition education of children and their parents; water supply and sanitation at school; health services and first aid at school; parental education; deworming; detection and compensation for learning disabilities (e.g., hearing, vision); and CBC.

Deworming can have a high payoff for school children. Helminth burdens are most intense during the years of schooling[478]. Single and multiple helminthic infections have been shown to be associated with growth retardation[316] and catch-up growth has occurred in preschool children after deworming[479]. Deworming preschool and school children has improved physical growth[480, 481]. Where hookworm is heavily endemic, primary school deworming programmes can also improve iron status and prevent moderate and severe anaemia, but such deworming may be needed at least twice yearly[304]. Iron supplementation and deworming have the lowest cost/DALY in school health programmes[465].

Increasingly, early childhood learning centres (ELCs) are being put in place with World Bank support. Together with primary schools, they facilitate interventions to reach children aged 2-9 years, as well as older children who are still in primary school. But because not all children go to school, child-to-child nutrition-related activities need to be explored further and tested. This may be particularly relevant in situations such as India, where many girls do not go to school.

Health-Related Services

Health services can benefit nutrition directly with regard to disease prevention and management, health promotion, and delivery of nutrition-relevant services. This includes the enhancement of maternal (and foetal) health and nutrition through antenatal care and micronutrient supplementation; counselling mothers at delivery on early initiation and exclusivity of breastfeeding (vitamin A can also be given as a single high dose at this time); growth monitoring during infancy and early childhood to give timely warning of health and nutrition problems; use of immunization contacts for vitamin A supplementation and for counselling on complementary feeding; periodic deworming with iron supplements; and management of disease, with an emphasis on the importance of continued feeding, including breastfeeding, diet composition (energy density, micronutrient content), and administration of vitamin A in VAD endemic areas.

Maternity care that is effective, affordable, accessible, and acceptable is essential. It should include prenatal health and nutrition services, safe delivery, and postpartum care. The well documented increase in the coverage of prenatal services enables pregnant women to be reached with health and nutrition services, including education, counselling and micronutrient supplements. Many women, however, especially poor and uneducated women who live in rural areas, still lack access to good quality health services during pregnancy and childbirth.

For adolescent girls, the prevention and management of unwanted pregnancies is a priority through improving access to birth spacing information and to counselling, education, and family planning services. Family planning services still need to be fully integrated with other health and nutrition services for women of childbearing age. Family planning IEC strategies need to incorporate women's health and nutrition concerns. Existing service delivery channels for contraceptive products can be used effectively for the provision of iron supplements and other nutrition services for women.

Some of the interventions that are regarded as essential for nutrition (e.g., antenatal care, safe delivery, immunization, disease management) are by their nature normally part of the regular health services, and a "nutrition minimum package" has been proposed[461]. The BASICS project, supported by USAID, has provided a strong justification for a concerted focus on interventions, through the health system, that aim to improve the following six nutrition-related aspects of behaviour: exclusive breastfeeding for about six months; appropriate complementary feeding, starting at about six months, in addition to breastfeeding until 24 months; adequate vitamin A intake for women, infants and young children; appropriate nutrition management during and after illness; sustained consumption of iron/folate tablets taken by all pregnant women; regular use of iodized salt by all families. Such a minimum package of interventions should be integrated in to all primary health care projects, with health workers playing an important supportive role in catalysing improvements in home-based caring practices.

Some nutrition activities within health services are being promoted and codified in the WHO/ UNICEF Integrated Management of Childhood Illness (IMCI) programme. The IMCI is a comprehensive programme to improve child health and to reduce deaths from major childhood illnesses (Box 4). Because undernutrition is a contributory factor in an estimated 54% of child deaths[171], the programme includes extensive guidelines on child feeding, for health care workers and for parents. The ultimate aim is to break the vicious cycle of inadequate dietary intake and disease.

BOX 4

Integrated Management of Childhood Illness (IMCI) Evaluation

To evaluate the impact of the nutrition counselling component of IMCI, a randomized controlled trial was conducted in Pelotas, Brazil. The 28 government health clinics in the city were stratified by baseline levels of child malnutrition and socioeconomic status of the neighbourhood, and then randomly assigned to intervention and control groups. In the intervention group, all doctors in charge of child health care received a 20-hour course in nutrition counselling using a local adaptation of the IMCI guidelines. In total, 33 doctors were included in the study and 13 patients < 18 months of age were recruited from each doctor's practice. The nutritional advice promoted in the intervention group was specific to the child's age, and included: promotion of exclusive breastfeeding for at least 4 months; frequent breastfeeding; avoidance of bottles; 3 meals per day (or 5 if not breastfed) for children 6-24 months; inclusion of specific foods such as mashed chicken liver, shredded or minced chicken or meat, egg yolk, and mashed fruit; use of dense mixtures of foods; addition of a teaspoon of oil or fat to the food; and stimulation of the child to eat. The study included an evaluation of doctor's knowledge immediately after training and six months later, observations of consultations, and home visits of study children at 8, 45 and 180 days after the initial consultation to assess maternal knowledge and practices and child dietary intake and anthropometric status.

The results indicated that doctors' knowledge of child nutrition and counselling skills improved, although their performance waned six months after the training had been completed. Maternal recall of key messages and satisfaction with consultations were significantly better in the intervention group. There were no significant differences between groups in energy or protein intake of children, but fat intake was higher in the intervention group (34 vs. 31 g/day) (micronutrient intake was not reported). Although there were no significant differences between groups in growth of children under 12 months of age, weight gain (though not length gain) and change in weight-for-height Z-score among children older than 12 months were greater in the intervention group than in the control group. Mean height-for-age Z-scores at the last home visit in children > 12 months were 0.24 in the intervention group and -0.13 in the control group, suggesting relatively little stunting in this population. Thus, it is not surprising that linear growth did not differ between groups, but it is also unclear whether increased weight gain can be considered a beneficial outcome. Parallel studies of the impact of IMCI in other populations are currently underway ■

Source: dos Santos I, Victora C (1999) Evaluating the efficacy of the nutritional counselling component of the Integrated Management of Childhood Illness Strategy. Final Report submitted to WHO. Geneva: WHO.

Complementarities Between Health Service Delivery and Community Nutrition

Community-based programmes are different and complementary to health services in several important respects. They are aimed primarily at preventing undernutrition, although they need to facilitate referral to health services for those that become malnourished. They usually include some developmental activities, e.g., infrastructure (water/sanitation, food storage, buildings), income generation, safety nets, or credit. Community involvement and ownership are crucial, in contrast to the top-down delivery of health care (parts of which, like supplies, equipment, and trained personnel, remain necessary).

Community-based, nutrition programmes have an important role in ensuring wide and timely coverage of key health services, such as immunization. Women's visits to health services, whether for curative or preventive child health care, are excellent opportunities for health workers to provide health and nutrition preventive services to women (e.g., education, counselling, and micronutrient supplements).

Another important connection is that health (and other) services can provide supervision and support for community workers. They are often the crucial link with government and other more central resources[6]. Strengthening nutrition-relevant activities in the health services thus provides a synergistic opportunity for addressing undernutrition. The incremental nature of the costs of strengthening nutrition activities within the health services may also make it an attractive option.

All of this emphasizes the complementarity of community programmes and health services and the fact that each needs the other for combatting undernutrition which in turn benefits health. Some examples of health service-based programmes are given in Appendix I.

Effectiveness of Supplementation for the Control of Iron and Vitamin A Deficiency

Iron

In contrast to vitamin A and iodine deficiency control, there remains a significant gap between the efficacy (potential effect) and the effectiveness (actual effect under expected conditions) of programmes aimed at controlling iron deficiency anaemia (IDA) among highly vulnerable subgroups, such as pregnant women and older infants. Most large scale iron supplementation programmes have not been evaluated with respect to impact. The main operational constraints, identified in a review of six large scale programmes aimed at pregnant women[482], were: inefficient and irregular supply, procurement and distribution of supplements; low accessibility and utilization of antenatal care by pregnant women; inadequate training and motivation of frontline health workers; inadequate counselling of mothers; and low compliance of the intended beneficiaries with the supplementation regimen. Similar problems were found in later assessments[483].

Micronutrient supplementation programmes thus share many of the problems that hinder primary health care and essential drugs programmes in developing countries. Many of these deficiencies can be avoided or rectified in supervised clinical trials but, in the real world, small scale trial efficacy does not readily translate into large scale programmatic effectiveness. Iron tablets are not 'magic bullets' and interventions to combat anaemia in women and children must be seen in the context of overall quality of care. A severely anaemic woman, for example, is at much greater risk during child birth if birth care is not adequate.

Examples of large scale programmes which have not in the past led to a significant decrease in the prevalence of anaemia include those in Indonesia[295, 484]; India[482, 485] and the USA[486].

In many programmes, problems in supply-side factors have been so serious as to render it difficult to know the full extent of poor compliance as an obstacle to success; i e., the tablets have just not been getting to people regularly for them to consume. Recently in Bolivia, one million tablets deteriorated in storage as they were not distributed to peripheral health centres, nor was there a demand for them (E. Schoffelen, personal communication). The reasons for dropout from a supplementation programme are more likely to be related to poor supply and availability of the tablets than to side-effects[482]. For example, in India, the rate of beneficiary dropout from the National Anaemia Control Programme in the mid-1980s, ranged from 9-87% between different states with a mean of 58%[487]. Over 80% cited tablet supply failure as the reason, whereas fewer than 3% cited side-effects from consumption. Similarly, a publication from MotherCare[483] stated that: "*there is little evidence that non-compliance due to gastro-intestinal side effects is an important reason that women are not taking the recommended number of iron-folate pills*". Nonetheless, there is some evidence that compliance has been a significant problem in current daily regimens[488, 489], possibly related to undesirable side-effects[297, 490] and/or poor communications[491].

The effectiveness of iron supplementation programmes is likely to primarily depend on the following factors, starting at the community level.

There must be community demand, based on community awareness of the problem, consequences of IDA, and the benefits from supplementation. There must also be motivation to continue taking supplements. To generate such awareness and demand, an explicit communications component is required, aimed at both women and men, Communications need to evolve from an understanding of local terms, perceptions, beliefs, traditions and perceived obstacles to compliance, including side-effects.

Motivated, well trained, approachable and supportive community-based programme functionaries are essential. They must be able to explain the nature of the problem and how it can be tackled successfully, including other diet-based approaches. Supplements should be promoted positively as "health-promoting" rather than negatively as "disease-curing". Adequate supervision and performance monitoring is also required. Community leaders should also be involved as educators.

There must be good population coverage and targeting to groups at risk (e.g., pregnant women, adolescent girls) and areas at risk (e.g., endemic malarial or hookworm infested areas) with early initiation of supplementation during pregnancy. Late initiation cannot be compensated for by higher doses (e.g., 120-240 mg daily) later. These would also lead to more side effects.

Delivery systems should be of good quality, accessible to the target population, and as far as possible, functionally integrated within (but not necessarily limited to) existing channels; e.g., schools, traditional birth attendants (TBAs) and EPI outreach, among others. Supplements can also be made available at retail stores, for free, at-cost, or in exchange for a coupon from the health centre. These delivery systems require in turn an organized procurement process and a regular and timely supply of low cost supplements to delivery outlets, based on appropriate targeting criteria.

The supplements should have good quality, stability, shelf life, colour, smell and should be acceptable to the local population.

There should be simple, but effective, monitoring at all levels of the system from supply of supplements, through coverage and compliance with consumption, to biological impacts.

Operational research is needed to improve understanding of how to implement appropriate interventions effectively on a large scale. Allied to this, more effective advocacy and communication on the national importance of iron deficiency prevention and control is urgently required. Combatting IDA is further hampered by uncertainties that persist over its aetiology in different situations: particularly in Africa, where causes of anaemia other than iron deficiency may be significant. Working criteria are needed, to distinguish different types of anaemia, in order to define better the target groups as well as the most appropriate actions. A recently developed tool, the life cycle anaemia risk matrix, may help in organizing aetiological assessments, with a view to better determining and prioritizing appropriate control strategies[281].

Vitamin A

There is both an opportunity and a need for targeting[11] vitamin A deficiency (VAD) control programmes to particular sectors of the population within VAD affected countries. Unlike iodine, VAD is linked much more to the nature of foods available and to feeding practices than to geochemical or other conditions that affect the whole population of geographic areas. Many studies suggest that VAD has, like iron deficiency, strong socioeconomic associations. Indeed, iron and vitamin A deficiencies often coexist in the same subpopulations.

Most countries where VAD is a major public health problem have policies supporting the regular supplementation of children, an effective approach for reaching subpopulations affected by or at risk of VAD. Supplementation coverage has increased significantly in the last few years, spurred on by the linkage of supplementation to immunization. Integrating vitamin A supplementation with immunization services, which contact 80% of the world's children, has been WHO and UNICEF policy since 1994, but progress has been slow and somewhat limited. However, vitamin A supplementation during polio immunization campaigns has been quick to catch on and is proving to be one of the most successful implementation strategies for reaching large numbers of children at risk. National Immunization Days (NIDs) offer a ready made delivery infrastructure and unparalleled reach. In 1997 alone, more than 450 million children were immunized during polio NIDs. In 1998, 88% of the countries where VAD was a severe to moderate public health problem conducted NIDs, and two-thirds included vitamin A, benefiting more than 24 million children at risk from VAD. This success was the result of a coordinated strategic effort between UNICEF, WHO, major international donors, NGOs, and academic institutions[8].

The main limitation of NIDs is that they provide the opportunity for only one dose of vitamin A per year, whereas VAD children need to receive supplements at least twice a year. A minor setback has been the report WHO[366] that coupling vitamin A administration with immunization, while safe, may

not have been as effective as had been hoped, at least in terms of mortality reduction. While recognizing the dramatic progress made with supplementation coverage, the NIDs linkage should not be considered as a panacea, and new approaches should be sought.

Almost all would agree that food-based approaches (including fortification where feasible) are the logical, preferred, long term strategy. There is urgent need to expand efforts in fortification where foods reaching the target population groups are processed and where local fortification is feasible[2].

Food-Based Strategies for Control of Iron and Vitamin A Deficiency

Recent evidence for the impact and effectiveness of food-based strategies to reduce vitamin A and iron deficiencies has been reviewed[345]. The main strategies reviewed were food-based interventions aimed at: increasing production, availability and access to vitamin A and iron-rich foods through promotion of home production; increasing intake of vitamin A and iron-rich foods through nutrition education, communication, social marketing and behaviour change programmes to improve dietary quality among vulnerable groups; and increasing bioavailability of vitamin A and iron in the diet, either through home preservation or processing techniques. Plant breeding strategies were also briefly discussed, because of their potential to increase the content of vitamin A and iron in diets. With regard to vitamin A, the literature points to the potential of home gardening, combined with promotional and education interventions. However, few of the projects that were evaluated quantified the impact of home gardening on home production, income, market sales and women's control over income. And only a few studies actually measured their impacts on vitamin A and other micronutrient status indicators.

With regard to iron, production and education interventions to increase the supply and intake of iron from plant foods have not been as popular as for vitamin A. Experience with food-based approaches to increase production and consumption of haem or nonhaem iron-rich foods is very limited. However, some lessons are clear. In addition to the well-known problem of low bioavailability with iron from plant sources, experience with animal production suggests trade-offs between increased income from selling home-produced animal products and increasing consumption of these products, to improve dietary quality. As with home gardening interventions, a strong nutrition education component is critical in animal production interventions in order to achieve improved dietary diversity.

The review[345] highlights two contrasting facts. On the one hand, it is clear that some of the technologies and strategies reviewed have the potential to address many of the concerns about both the intake and the bioavailability of vitamin A and iron among impoverished populations. On the other hand, critical information gaps still exist in relation to both the efficacy (with respect to new information on vitamin A bioavailability from plant sources) and the effectiveness of many of the strategies reviewed, even for approaches as popular as home gardening. There is potential for existing home processing technologies to address some of the concerns about the bioavailability of vitamin A and iron. Cooking, preservation techniques, home processing techniques, and food-to-food fortification (to increase promoters or to reduce inhibitors of iron) were reviewed. Many of these technologies are simple, low cost, home processing techniques and in some cases, are part of the traditional food practices of the target populations. However, there has been a limited effort to promote, to implement and to evaluate such technologies in community trials. Plant breeding strategies are at a very early stage compared to other approaches and the information is not yet available on their potential efficacy and effectiveness. Additional studies on bioavailability to humans are needed to understand the full potential of plant breeding to increase micronutrient content.

In the past 10 years, significant progress has been achieved in the design and implementation of food-based approaches, particularly with respect to the new generation of projects integrating production and nutrition education and behaviour change strategies. Yet, little has been done to evaluate their efficacy, effectiveness, feasibility, sustainability and their impact on the diets and nutritional status of populations at risk. In particular, information on the cost-effectiveness of food-based interventions is noticeably absent from the studies. Despite their complexities, it remains critical to demonstrate both the efficacy and the effectiveness of food-based strategies, in order to provide the most basic information to promote further their use in the fight against micronutrient deficiencies. Food-based approaches could be an essential part of the long term global strategy to alleviate vitamin A and iron deficiencies, but their real potential has still to be explored[345].

Control of Iodine Deficiency Disorders

By far the main method for the control of iodine deficiency disorders (IDD) is salt iodization, although other vehicles have been used; e.g. tea in Tibet, and drinking water in Thailand.

In some countries, although the problem of iodine deficiency was known, rigorous assessments, using such indicators as goitre prevalence and urinary iodine excretion, were needed to convince policy-makers and salt producers of the need for action. The next step was to analyse these results, along with the workings of commercial salt networks and the organization of the salt industry. Using advocacy and attention to legal detail, it was also necessary to pass appropriate legislation to ensure correct levels of salt iodization, and to protect iodized salt producers by eliminating noniodized salt from the market.

It is estimated (from survey data) that 65-75% of households in Asia consume adequately iodized salt. All countries have legislation for salt iodization, and the variations come in implementation and quality control. Most constraints are known in

BOX 5

Strategy for Control of Iodine Deficiency Disorders (IDD) in Nepal

IDD strategy in Nepal comprises three pillars:

1. *The Goitre Control Project (GCP)* was established under the Salt Trading Corporation (STC) in 1973 with bilateral support of the Indian Government with the primary responsibility to coordinate and manage the salt iodization programme. Since then, the GCP/STC has been distributing iodized salt throughout the country. As of 1996, about 120,000 mt of salt has been imported from India annually, of which about 80% is iodized. Salt is distributed through 17 depots of STC and through a network of over 1,000 dealers in the country. These dealers supply salt to retailers who in turn are the primary providers of salt to the population in general. In the accessible areas of the country (60 districts), the existing marketing channels are operating satisfactorily and STC salt is readily available for purchase and consumption. In fifteen remote districts, GCP/STC has been involved directly in the distribution of iodized salt to the people by issuing sale coupons through the Chief District Office. This salt is distributed with assistance of a transport-subsidy. In addition to the transport subsidized salt, other salt is also marketed by local retailers who purchase salt from the nearest accessible areas to help to satisfy the demand in the remote areas. Information regarding the iodine content of this salt is not available.
2. *The Goitre and Cretinism Eradication Project (GCEP)*, under the Expanded Immunization Programme of the Ministry of Health was established in 1978. Forty districts located in the hill and mountain belts were targeted for iodine oil injections. Between 1983 and 1993, iodized oil injections were administrated every five years by the GCEP. In 1993, the GCEP become integrated within the Nutrition Section of the Child Health Division, Department of Health Services in the Ministry of Health, and iodine capsules administered orally were delivered through the existing network of the Primary Health Care system including mobile Village Health Workers. The number of districts targeted for supplementation has decreased significantly as infrastructure has improved and areas previously difficult to reach by road have been able to gain access to iodized salt. Iodine supplementation will remain important as a short term measure to control IDD as efforts are intensified to reach universal salt iodization, and will be phased out only once it is assured through appropriate monitoring that populations living in IDD-endemic areas have access to, and are consuming adequately iodized salt.
3. *Direct supplementation through iodized oil capsules in the most endemic and remote areas.* This intervention will be carried out only for the most difficult to reach districts on a temporary basis until iodized salt is made available. Since 1989/90, transportation facilities have improved in most districts of the country and iodized salt has also become available. The target population for iodized oil supplementation includes all children up to the age of 15 years and all women under 45 years of age. As distribution of iodized capsules is only a short term strategy, the number of districts for capsules are being decreased gradually as efforts are increased towards achieving universal salt iodization ■

principle: many small producers, pricing problems, and control of imported salt.

Iodine supplementation will remain important in areas of endemic IDD as a *short term* measure as efforts are intensified to reach universal salt iodization, and should only be phased out once it is assured through appropriate monitoring that populations living in IDD-endemic areas have access to, and are consuming adequately iodized salt.

The example of IDD control strategy in Nepal (Box 5) illustrates the primacy of salt iodization as a long term strategy, with short term supplementation undertaken in parallel until the former becomes effective.

At the level of children and their families, IDD control in Asia is clearly improving lives by the thousands. The gains in salt iodization came about largely because of the work of an alliance of responsive and knowledgeable partners. WHO, in collaboration with UNICEF and the International Council for the Control of Iodine Deficiency Disorders (ICCIDD), not only helped raise awareness of the importance of IDD but also worked to ensure scientific consensus and information on standards for: levels of salt iodization, the safety of iodized salt in pregnancy, and indicators for monitoring and evaluation. UNICEF, WHO and ICCIDD also provided technical and financial support for many steps of the process.