

Chapter 2

Community-based programs and service delivery

Issues

Much of the information for this chapter comes from the second chapters of the country reports [1–8]. Programs which bring individual families into contact with village-level workers can succeed in improving in child health and nutrition. While the evidence is not extensive—impact evaluations are not common enough—data from within Asia (e.g., Thailand) and elsewhere point firmly in this direction [9]. Programs that are developed to the point that individual vulnerable children are identified and helped should be effective; in fact this is what happens in countries with fully developed social services.

A key feature of community-based programs is that they are owned largely by the community, with significant input from outside, often from government services. Service delivery usually refers to the health system and is facility-based (clinic or health center); schools may also be involved. Occasionally new organizations are formed for this purpose, such as the Integrated Child Development Services (ICDS) in India (under the Dept. of Women and Child Development). Some involvement of government services is usually essential for supporting community activities. The core of community actions is the village worker, often a volunteer, referred to as a ‘mobilizer;’ support, supervision, and training are provided by a ‘facilitator,’ generally a full time employee of the government (or non-governmental organization (NGO)). The ratios of mobilizers to households, and facilitators to mobilizers, is a crucial factor. In Thailand [10, 11] these were both 1:10–20; here, 1:20 at each link is taken as a benchmark; this implies one supervisor (facilitator) to 400 households. These ratios refer to part-time volunteer workers, and could be higher for full-time workers, especially with remuneration.

The content of community-based programs, and of facility-based activities aimed at nutrition, depends in part on the local causes of malnutrition. A question of scope arises too. In general, there is a core of activities likely to be included under most circumstances (which

may be viewed in relation to the lifecycle [12]) in support of antenatal care, safe delivery, breastfeeding, immunization, growth-monitoring, management, and referral in sickness, micronutrients, weaning practices (some of these are described as caring practices [13]). For health facility-based service delivery, these generally fall within the scope of the Integrated Management of Childhood Illness (IMCI) [14]) initiative. A number of more fundamental actions may be included, depending in part on what other programs are under way—water and sanitation, home gardens, and public food distribution are often regarded as within the scope; microcredit and social safety nets, while clearly relevant, may be supported by other organizations [9]. In Thailand, for example, nutrition policy encompassed, or linked with, poverty alleviation and primary health care; and village programs included rural job creation, village infrastructure development, provision of basic services, and agricultural production [15, 16].

Here, as in the country studies, nutrition activities while not rigidly defined are mostly viewed quite narrowly in the sense of those over which the nutrition community has some direct influence [17, p.16]. In no way does this overlook the importance of basic causes, but is for a practical reason: resulting projects will need to be anchored in actions that are recognized as stemming from concerns about nutritional problems (as reviewed in chapter 1). In the context of ‘supporting policies’ (chapter 3) some broadening to address more basic causes is possible.

The guidelines for the country studies (given in Annex 1) suggested that current and planned programs relevant to nutrition should be analyzed first by indicators of their *coverage* and *targeting*. That is, as percent of the at-risk population participating in the program; then by how far this coverage is oriented towards the most needy. A third criterion is described as ‘*intensity*’: how much resources are used per participant—which may be quantified as US\$/participant/year, or by the number of children per mobilizer, facilitator/mobilizer ratios, and so on. Some levels of resource use for

comparison purposes can be suggested. Around US\$5 to \$15/participant/year seems to be associated with effective programs, at least those that do not include provision of supplementary food, which could double the cost [9, ch. 5]. In principle, these three measures—coverage, targeting, and intensity—can be obtained from program data. In many cases well-conceived programs may be ineffective simply because their coverage is too low to have a broad impact on the problem, or because they do not reach those most in need. In other cases, the principles may be correct but an unrealistically low level of resources is committed, so nothing much really happens. These indicators pick up such issues.

The next question in analyzing nutrition-relevant activities concerns the program *content*. If programs are reaching the needy, and are adequately resourced, they should be effective if they address real causes of malnutrition, ones that are open to modification, and if interactions with other conditioning factors are taken into account. Programs need to fit the local context. In the earlier study of about 20 successful programs in South Asia [18], factors were grouped as ‘contextual’ and ‘programmatic’—one point being that program activities can be successful under some conditions and not others—and both need to be taken into account. Examples of the contextual factors defined in the study are political commitment at all levels of society, literacy, and empowerment of women. Program factors, influenced by those responsible for the programs, included processes for participation, shared program ownership, identification of mobilizers and facilitators, good management, and others.

A further level of detail is necessary. For example, the actual changes in behavior aimed at need to be relevant and important. As seen in chapter 1 some common practices are not optimal for infant feeding (like late initiation of breastfeeding), but these are not always adequately addressed in programs. As another example, the misconception still persists that inadequate protein intake is a major issue; even though some 30 years have passed since it was realized that protein requirements had been overestimated, some programs still treat this as an issue. Further, program components must be recognized as a priority by the communities themselves. Water supply is a common concern, for instance, and village health/nutrition programs that fail to address this may be seen as of marginal relevance to real problems. On the other hand, growth-monitoring is remarkably popular, but all too often it is not linked to anything that actually promotes growth; it should form the basis for many community actions, but obviously without these actions it has no effect and can be a waste of resources.

In most of the programs reviewed in the country studies not much detail of the content of different activities is given. This may not be a major constraint

in deciding how to strengthen them, because reorientation of programs that have good coverage and adequate resources may be feasible at a later stage. On the other hand, some details are crucial, for example, some programs specifically do not target the most vulnerable age groups. In other cases, such as public food distribution, some entrenched programs are not cost-effective in changing nutrition conditions, although perpetuated ostensibly for this reason, but are very difficult to change, largely for political reasons.

A final introductory point: it is very striking that none of the country reports can rely on rigorous program evaluations. Most of the analysis and planning is based on supposition of what works. Hardly any evaluation results suitable for the planning needs actually exist—it is not the fault of those doing the country studies! It is urgent to set up some well-designed evaluations, as soon as possible, to support the kind of conclusions we are trying to reach here. In the meanwhile, it should be recognized that much of this is (hopefully) educated best-guesswork.

Characteristics of current programs (aimed at general malnutrition) and gaps to be filled

A large number of nutrition-oriented programs are underway in the eight countries in the study. Those discussed here are selected (about three per country) as large-scale with significant population coverage; or as providing particular insights for future program design. A summary of some of the program characteristics is given, for general malnutrition, in table 2.1, which contains examples of the data discussed below. Micronutrient deficiencies are discussed in a later section in this chapter. In table 2.1, selected programs are described in terms of type and content, then coverage and targeting, followed by resources used. The data are derived largely from the country reports.

Community-based nutrition-oriented programs

All the countries have some experience with community-based programs (summarized in table 2.1). Generally the geographical coverage is rather low, not much positive targeting exists (towards the most needy), and the intensity of application of resources, except in pilot exercises, is low and likely to be inadequate. The content of the programs needs to be revised and updated in many cases. Examples are discussed below.

The first conclusion is that there is no one factor that if fixed would allow the present programs to suddenly accelerate nutritional improvement. Most aspects need development, and a major issue is inadequacy of

Table 2.1. Characteristics of selected current programs addressing general malnutrition

Project	Type, content	Coverage, target group	Resources/intensity
Bangladesh			
Bangladesh Integrated Nutrition Project (BINP)	Community-based nutrition; includes supplementary food	Children < 2 yr, pregnant and lactating women. 8m people (7% of population)	1 mobilizer (community nutrition promoter) per 1000 population. US\$14m/yr ~US\$18/capita/yr
Family welfare	Family planning	Pregnant and lactating women, 49% of couples	1 family welfare assistant per 7,000 population
Control of diarrheal disease	Diarrheal disease control	Children in health centers with diarrhea; about 50% of areas covered	Oral rehydration therapy, ~ 1 unit per 40,000 children
Overall: 10 large programs/service delivery systems are in the country study (mostly governmental); coverage usually <50%, especially rural areas; in area covered, resources of trained and supported staff low. Expansion of coverage and increased intensity needed.			
India			
Integrated Child Development Services (ICDS)	By Anganwadi worker (ANW) in village centers; include supplementary food, health, and education services	Children 0–3 and 3–6 yr, pregnant and lactating women. In 3900 of 5300 blocks (74%). Less coverage of 0–3 yr olds.	1 ANW per 1000 people, i.e., 200 children; 1 supervisor/20 ANW. Supplementary food takes substantial resources. Non-food costs ~ US\$2/yr
Public Distribution System (PDS)	Subsidized food and basics thru fair price shops (FPS)	Poor are targeted, but much leakage. Coverage 85% of areas	350,000 FPS, 1/2500. About 20kg/capita/yr cereals distributed
Tamil Nadu Integrated Nutrition Project (TNIP)	Thru paid community nutrition workers (CNW). Feeding for underweight, plus services	Children 6–36 mo, pregnant and lactating; selection of those with growth failure. 40% of blocks, 20% children participated in 1990 TNIP II 0–6 yr children	US\$9/capita/yr (1985) plus ~US\$3 on food. TNIP II supervision ratio 1:10 1 CNW: 300 children
Others: many programs, e.g., poverty alleviation (Integrated Rural Development Program (IRDP), National Rural Employment Program (NREP)-employment guarantee-Jawahar Rozgar Yojana are relevant; coverage usually poor for worst-off, and US\$/capita low.			
Overall, in a country this size, state level analysis is needed. Generally there are a considerable number of relevant programs, with incomplete coverage (<50% often), usually targeted away from the most needy, and under-resourced. Some content issues arise, e.g., ensuring that youngest children and pregnant women are reached; food distribution, via ICDS as supplementary, or PDS, noon meals, etc., has not been evaluated for cost-effectiveness, and may not be optimal for nutrition.			
Pakistan			
Prime Minister's Program for Family Planning and Primary Health Care	Lady Health Workers (LHW) at village level, link with health, provide certain services including nutrition education	LHWs in 110 of 120 districts—mothers and children targeted	Supervision 1:33, ~ 1 LHW: 500 children
Health and Nutrition Development Society (HANDS)	Community-based, small-scale Social mobilization, improving women's status are components	50 villages, 35,000 children under 12	Not given Evaluations indicate significant impact
Overall, not many large-scale programs, perhaps building on the LHW program may be promising. A number of smaller-scale projects can provide positive (and negative) experiences that can be drawn on.			

continued

Table 2.1. Characteristics of selected current programs addressing general malnutrition (*continued*)

Project	Type, content	Coverage, target group	Resources/intensity
Cambodia			
Community Action for Social Development (CASD)	Supported by a range of agencies, especially UNICEF, thru Village Development Committees (VDCs); several hundred local programs; education, food, water, health, protection of women and children, credit, employment	400,000, especially women and children, 20%. 550 villages/2000 villages.	US\$4m/yr = US\$11/capita/yr
NGO programs	534 projects in all, in agriculture, capacity building, community organization, food security, health, water/sanitation; ADB supports some	All provinces covered, but targeted to central areas	Not given
Overall, many small-scale, often NGO-supported, activities are in place. Opportunity for increased resources and expanded coverage to have impact. Program content probably enlightened.			
Vietnam			
National Committee for Protection and Care of Children (CPCC)	Community-based with village collaborators (paid); no education, growth-monitoring, rehabilitation, referral	Children <5yr and pregnant women. 53 provinces; 2m children (15%) weighed in growth-monitoring	1 collaborator/450 children (1994); US\$0.8/child/yr
Pilot Community-based Child Nutrition Project	More intensive than CPCC, including antenatal care, links to microcredit, commune steering committees	14 communes (out of 500); 10,000 children covered	15–20 children/mobilizer; US\$2.6/child/yr
Control of diarrheal disease, acute respiratory infection, food security, family planning, health education, environmental sanitation, poverty and hunger alleviation, credit, and other such programs	Many such focused programs exist or are planned. All may benefit from increased resources and coordination		

continued

resources. In some cases, current policies and resulting programs would be widely effective if more resources were made available—this is the easiest situation to invest in—and increased coverage and resources per capita are what is needed. In many others, changes in program concept, or additional activities, as well as increased resources are required. This depends on policy change to allow effective investment.

The operation of health services is usually different from the programs described as community-based, but frequently the village workers are supervised by government employees who are often health workers.

In others (e.g., Pakistan) this is proposed as one of the ways to develop community-based programs in the future. Specific nutrition activities within the health services are considered later in this section.

In Bangladesh, the Ministry of Health and Family Welfare (MOHFW) has about one health worker per 5,000 population, and one Family Welfare Assistant per 7,000 (see table 2.1). The country study suggests, as one strategy, building on the MOHFW structure to support mobilizers in villages (1:500 population is proposed) with facilitators (1:10 mobilizers) [1, p. 73]. In the late 1990s, the Bangladesh Integrated Nutrition Project

Table 2.1. Characteristics of selected current programs addressing general malnutrition (*continued*)

Project	Type, content	Coverage, target group	Resources/intensity
Sri Lanka			
Thriposha	Supplementary food distribution, fortified, through health system	Pregnant women (2+3 trimester), 6–12mo, 12–48 mo children, meeting eligibility criteria; 32% covered	US\$2/capita/yr; 200 kcal/capita/day
Samurdhi	Income support program, with eligibility, country-wide; also includes some nutrition work, and could be basis for wider nutrition program	Poor households, from income criteria; Samurdhi workers are in all areas	Not given, but income support can be around US\$100/household/mo
Participatory Nutrition Improvement Project (PNIP)	Pilot community-based project, with local mobilizers and external facilitators (EFs); education, referral, community development	All households in pilot areas, with focus on preschoolers, pregnant and lactating women	1 EF per 300 children; 1 CF/30 children; evaluations needed to see cost-effectiveness
Overall, extensive health infrastructure (e.g., 95% of babies delivered in health facilities) and poverty alleviation (Samurdhi) system give opportunity for effective nutrition work, which is still much needed even with good services. Pilot exercises need evaluation lessons to be drawn for strengthened program design.			
Philippines			
BIDANI	Pilot: supplementary feeding, no education, village development	514 villages; households with emphasis on poor	~ US\$2/child/year
LAKASS	National nutrition/poverty program, community-based; policy top-down	Nutritionally depressed municipalities targeted	US\$0.4/child/year in targeted municipalities Baran gay nutrition scholars ~ 1:300 children
National Food Authority (NFA)	Rice subsidy with public distribution	Mainly covers (40%) capital and nearby regions, <5% of poor	US\$100m/yr, = ~ US\$7/capita/yr of those benefitting
Overall, supplementary feeding also quite extensive. Resource availability at local level, and support for village workers and activities, insufficient for impact. Structure exists that with more resources, and review and possible reorientation of activities in relation to causes, could have effect.			
China			
Information not available on current programs and gaps			

Sources: Country studies [1–8]. Additional information for Bangladesh from [19]; India [20]; Philippines, [22, p. 81, 91]. Some additional details are taken from [9] and [21].

(BINP) operated in a limited number of administrative areas (7% population coverage), with one Community Nutrition Promoter per 1,000 people (about 1:200 children). The cost was estimated at US\$18/capita/year, of which about half was supplementary food. This level of expenditure should be adequate for significant impact. Evaluations of BINP, if they actually measure net effects, would be extremely valuable for future planning. Overall the coverage of large programs reaching into communities was about 50% or less, synthesizing from the country report. Thus Bangladesh had substantial experience to build on, but required much greater resources; recently a National

Nutrition Program has begun which may bring the needed increased resources to bear on the problem.

In India the largest nutrition program in the world, the Integrated Child Development Services (ICDS), has operated for more than 20 years [3, 23]. Geographically some 70% of the administrative areas (blocks) are in the program. The program operates through Anganwadi centers, with an average of one Anganwadi nutrition worker (ANW) per 200 children. Supplementary food is an important aspect of the program to the extent that it is said that without the food the program would hardly exist. Another issue concerns selection of participants, especially inclusion of children under

3 years old; revisions to the services aim to reorient them in this way. The resources used are estimated at US\$2/participant/year, not including food costs. Training, support, and supervision of the ANWs are all under-resourced.

The Tamil Nadu Integrated Nutrition Project (TNIP), in some ways a forerunner of BINP in Bangladesh, has generated much useful experience relevant to other programs, including the ICDS. The Community Nutrition Worker looks after about 300 children, similar to ICDS, but then with selection into feeding based on growth-monitoring which increases the intensity. The cost 10 years ago was estimated as US\$9/participant/year (including all children, not just those being fed), plus an average of US\$3 for food. The level of resources for TNIP was in the range needed to get impact, and evaluations have indicated a decrease in underweight prevalence (<75% NCHS) of 1 to 2 percentage points (pp)/year (av. -1.4 pp/yr) in participating districts, compared with 0.3 to 1 pp/yr decrease (av. -0.7 pp/yr) in non-participating ones [20]. Which of the components caused the improvement has not been determined.

Other relevant programs in India include food distribution, such as the nationwide Public Distribution System and the Noonday Meals program; employment guarantee and poverty alleviation schemes are also highly relevant. Most analyses (e.g., [24]) have concluded that food distribution is not an effective way to protect nutrition, indeed ICDS was calculated to be at least twice as efficient in terms of food (kcal) transfer. A similar set of issues arises with most large-scale public food distribution systems, e.g., the National Food Authority in the Philippines. Arguments for reallocation of these extensive resources to nutrition activities are discussed in chapter 3.

Coverage of village level activities in Pakistan is low, and the country report proposes to build on the Lady Health Workers (LHW) who are the core of the Prime Minister's Program for Family Planning and Primary Health Care. At present there is one LHW per 500 children. A number of small-scale programs exist, which may yield useful experience (both positive and negative), such as the Health and Nutrition Development Society's ('HANDS') program. Assessing the program content and intensity of such pilot projects could be useful for future planning.

Cambodia relies presently on many NGOs for community-based activities. The Community Action for Social Development (CASD) is widespread, involving a range of agencies, operating through Village Development Committees (VDCs). Coverage is around 20% of the population, at about US\$11/capita/year. The activities are broad, and likely to be relevant. Over 500 other NGO-supported projects are reported. This appears to be a situation where infusion of additional resources at the local level, no doubt with need for coordination, would allow expansion of potentially

effective activities.

In Vietnam the Committee for the Protection and Care of Children (CPCC) is a large community-based program, with a reported population coverage of 15%, plus many others in different sectors. A pilot community-based program, like elsewhere, is more intensive than the national program.

Sri Lanka and China have extensive health infrastructures. In Sri Lanka for example 95% of deliveries are attended by a trained midwife, most in health facilities. Here the possibility of extending support to community-based programs is good, needing the policy decision to move on this, then resources for local action. In Sri Lanka the Participatory Nutrition Improvement Project (PNIP) is a potentially useful source of experience of community-based programs that could be applied more widely, when fully evaluated.

The Philippines has long supported national nutrition programs, however, at the same time the nutrition situation has improved only slowly [25]. The level of resources applied in the national livelihood and nutrition program (LAKASS) is estimated at only US\$0.4/capita/year; and even the pilot integrated development and nutrition program (BIDANI), which included supplementary feeding, is reported at US\$2/capita/year (see table 2.1). The program contents appear well designed; the issue seems more to be getting resources to flow to the periphery in a sustainable way, with enough coverage to make a significant dent in the problem. The National Food Authority subsidizes the price of rice, with a limited coverage, geographically and of the poor. The costs are extensive, around US\$100m/year [17, p. 91]. Although part of the argument for this expenditure is for nutrition, it probably does not reach many of the malnourished, in terms of coverage or targeting, nor does it address efficiently local causes of malnutrition. Like other public distribution schemes, it can be argued that the resources, which are committed in part for nutritional improvement, could be re-allocated for more effective impact on malnutrition.

A number of issues can be summarized. Even if the program content is appropriate, in most countries the coverage and outreach is not adequate to bring about long-term change. Coverage data (given in table 2.1) are displayed in figure 2.1. Only India reports coverage greater than 20%, and most countries only reach about 10% of the children. This fact alone explains part of the slow progress in reducing malnutrition; and increasing the coverage is essential for more rapid progress. The first recommendation is to massively increase support for local programs.

Moreover, programs are not usually positively targeted towards the most malnourished, except sometimes growth-faltering children are selected for special feeding. It is unclear whether the content of many

programs is best designed to address important causes of malnutrition. Related to this, the issue of using scarce resources for supplementary food versus other uses (e.g., behavioral change) remains unresolved—in practice often in favor of supplementary food.

The level of resources applied is strikingly low compared with that shown to produce impact. In terms of ratios of community workers to mothers and children, the level suggested for impact is 1:20. This comes from Thai experience, but is also seen in some small-scale projects, such as in Vietnam and Sri Lanka (approx. 1:30). The actual ratios (standardized as per child) reported are 1:200 (BINP and ICDS, INDIA), 1:500 (LHW, Pakistan), 1:450 (CPCC, Vietnam), and 1:600 in the Philippines. These are illustrated in figure 2.2. While it may be impractical to envisage 1:20 ratios everywhere—Thailand trained 1% of the population to be village health and nutrition workers in the 1980s—it seems certain that the ratios have to improve substantially in the areas already covered, let alone the 50% or more unserved, to accelerate improvement. The required ratios differ depending on whether they apply to part-time volunteers or to paid workers—but still the current levels are far from adequate.

The supervision ratios (mobilizers/facilitator) are also suggested as 1:20; this is in line with small-scale program experience, e.g., Vietnam. Since there are too few mobilizers, fewer facilitators will do for now, and these ratios are better, e.g., 1:20 in India. But if the mobilizer numbers expand, more facilitators will be needed in proportion.

The expenditure per participant is another measure of the resources available for programs. One factor that stands out is whether supplementary food is part of the program, which could about double the cost. Whether, when, and how supplementary food should be used is thus a crucial policy issue; it also uses human resources, and changes the nature of the program. For now, the non-food costs are considered (see fig. 2.3). The data from the reports tend to confirm the order of magnitude put forward earlier, that around US\$5 to \$15/participant/year appears to be associated with effective programs. In the Philippines, the figure was US\$0.4 to \$2/capita/year; in Cambodia US\$11/capita/year; TNIP was US\$9, BINP US\$14, and ICDS US\$2. It is reasonable to assume that the ICDS and Philippine programs are underfunded. Few evaluated programs (although not many are evaluated) have shown an impact at as little as US\$2/capita/year. An exception is that estimated start up costs of the *posyandu* (weighing post) system in Indonesia were US\$2 to \$4 per child, then less than US\$1/child/year recurrent costs in the 1980s [26]; here the nutrition impact was considered modest but worthwhile. The program activities faded away with increased emphasis on medical treatment, and plans are in hand to reactivate the system (Soekirman, personal communi-

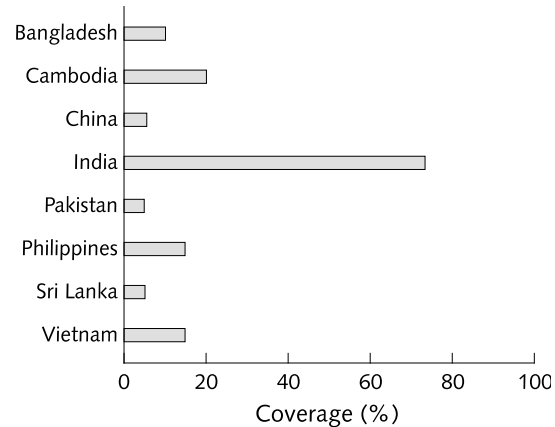


FIG. 2.1. Coverage of current community-based nutrition-oriented programs. Source: table 2.1

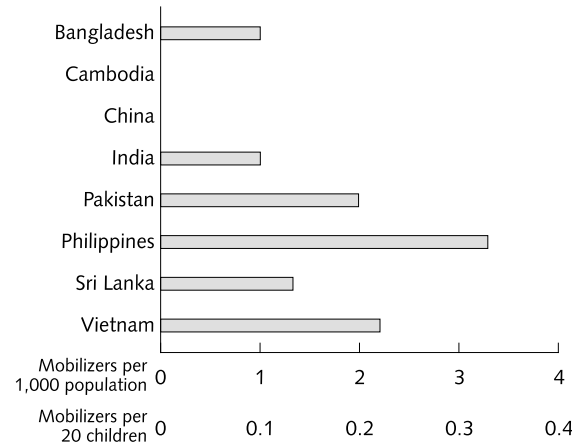


FIG. 2.2. Intensity of current community-based nutrition-oriented programs in terms of mobilizers/child ratios within programs. Source: table 2.1

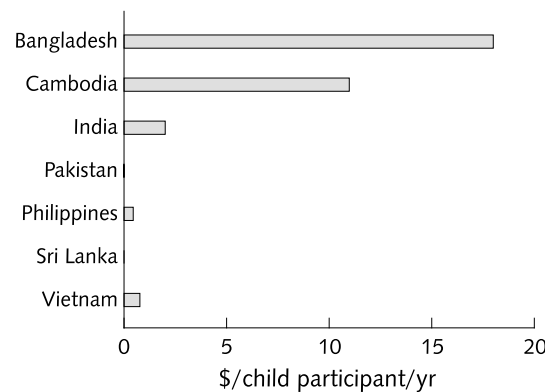


FIG. 2.3. Intensity of current community-based nutrition-oriented programs in terms of US\$/child/year within programs. Source: table 2.1

cation, 2001).

The concepts of coverage and intensity are linked and both can be adjusted, within resource availabilities. For example, when resources are inadequate to cover a certain population, the coverage can be lowered (e.g., by targeting) to concentrate resources per capita to the point where impact is achieved; this increases the intensity. Choice of who is covered is a targeting decision. The measures of coverage and intensity can be combined to assess overall adequacy of resources. If a benchmark level of intensity is assumed, then the population that can be covered at that intensity level can be calculated. The indicator is then the percent of the population potentially covered, with the existing resources, at the set intensity level; which gives a measure of resource adequacy.

This is done for the preceding data, as shown in figure 2.4. The resource calculated is the number of mobilizers (village workers), which may in fact be a better comparison across countries than funds, and also represents a critical factor. From figure 2.4 it can be seen that India has the highest reported potential resources in place, but only enough to adequately reach less than 10% of the child population. The other countries are much lower, around 1%, except Vietnam at 3%. Even if the ratios are too ambitious (i.e., fewer workers would do), these estimates are so low that it is clear that a massive expansion would be needed for a significant effect. Again, we do not need to look much further to understand the slow progress in reducing malnutrition.

Nutrition in health services

Nutrition activities form an integral part of the work of many health staff, and the opportunity often exists

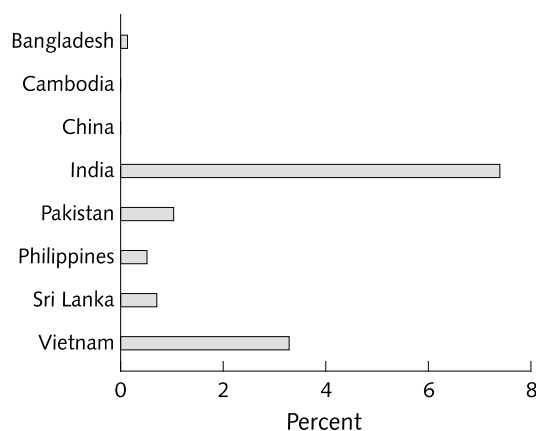


FIG. 2.4. Extent nationally of current community-based nutrition-oriented programs in terms of total numbers of mobilizers as % of that required at 1:20 children for the overall population. Source: calculated from data in table 2.1

for strengthening these. Much of this is of necessity facility-based, except where public health midwives or traditional birth attendants work in communities. Thus, for example, Sri Lanka has nearly complete coverage of midwives, with most deliveries in health facilities, who can be important in nutrition in strengthened programs, including administration of vitamin A capsules (VAC) to mothers shortly after delivery; and the Pakistan report sees linkage of future nutrition work with traditional birth attendants (TBA) locally known as *dais*.

A number of interventions regarded as essential for nutrition—antenatal care, safe delivery, immunization, disease management, and others—are by their nature normally part of the regular health services. They cannot be substituted readily by community-based programs, but the latter have an important role in ensuring high and timely coverage: facilitating mothers to bring their children for immunization, for example. Equally, health services are essential for community programs, especially for referral of sick children and cases of growth failure that do not improve at home. Deworming is an intermediate example that is feasible in the community or through the health services. Some nutrition activities within health services are being promoted and codified in the Integrated Management of Childhood Illness (IMCI) program. This emphasizes feeding practices, including breastfeeding, and thus reinforces behavioral change for good practices at least for those children who are brought in because they are sick. Feeding during diarrhea, especially chronic diarrhea, is very important in this context. Health services may cover different populations than community-based programs.

Community-based programs are different, and complementary, in several important respects. They are primarily aimed at *preventing* malnutrition, although they need to facilitate referral for those who become malnourished. They usually include some developmental activities, from infrastructure (water/sanitation, food storage, buildings) to income generation, safety nets, or credit. Community involvement and ownership is crucial, in contrast to the more vertical delivery of health care—part of which is necessary, like supplies, equipment, and trained personnel. The community within itself facilitates outreach. All this emphasizes that community programs and health services are complementary, and each needs the other for dealing with malnutrition (which in turn benefits health). Health services support community-based programs in most countries, as shown for a number of programs in table 2.1.

Another important connection between facility- and community-based work is that health (and other) services can provide supervision and support for community workers, who are often the crucial link with government and other more central resources.

This has been described in some detail elsewhere [11]. Therefore strengthening nutrition-relevant activities in the health services provides a key opportunity for addressing malnutrition. It does not substitute for community programs, but is synergistic with them. This must be emphasized, in part because the incremental nature of the costs of strengthening nutrition activities within the health services may make it an attractive option, but it will not work by itself.

In summary, the health services can directly benefit nutrition in at least the following ways:

- » Maternal health and nutrition can be enhanced through antenatal care to benefit fetal growth and development (although there is a need to lay out precisely which interventions are effective); certainly micronutrient supplementation can be achieved (see below), which may emerge as particularly effective; birth spacing benefits nutrition of the current and future child.
- » At delivery, the mother can be counselled on early initiation of breastfeeding, including colostrum, and on breastfeeding practices; vitamin A can be given as a single high dose.
- » During infancy and early childhood, growth-monitoring can give timely warning of health and nutrition problems; immunization contacts can be used for vitamin A supplementation and counselling on complementary feeding.
- » Periodic deworming may be carried out.
- » In management of disease, emphasis on the importance of continued feeding, including breastfeeding, on diet composition (energy density, micronutrient content), and administration of vitamin A in endemic deficiency areas.

Urban programs

Most thinking about nutrition-oriented programs defaults to considering rural areas, however, the population growth in Asia is mainly urban. On average urban areas tend to have lower prevalences of underweight children than rural areas, however, when urban slum prevalences are broken out these are actually higher than rural areas, see table 1.2 col B. Some country strategies (e.g., Bangladesh) stress the need for urban programs; and international agencies are beginning to focus on urban needs. Further research is urgently needed on the specific issues of supporting urban 'community' programs.

School programs

Although not a high priority focus of the country reports, the school system has some important comparative advantages in helping to overcome malnutri-

tion. Obviously this applies to those who attend school, but younger children and communities can benefit. It may be worth recalling the opportunities in general terms (as summarized elsewhere [9, p. 61]):

- » Incorporating nutrition and health teaching within the regular curriculum, so that the next generation has a better knowledge of child rearing; through child-to-child activities, children can also promote improved care of their younger siblings.
- » More effective nutrition interventions within the school population, e.g., micronutrients, school breakfasts, and snacks, to benefit the nutrition (and educability) of the current generation; promoting the development of school and community gardens, and related small-scale productive activities.
- » Monitoring nutrition through schools - many schools already measure height and weight of pupils, and such data if compiled (e.g., as a school nutrition census) provide uniquely valuable information for geographical and social targeting and long term monitoring.

Gaps

This review of country programs was intended, in part, to lead to an estimate of gaps in resources. This must be viewed in the light of whether potentially effective policies and consequent programs are in operation in the country, so investment to expand these is the way to go; or whether it is known what to do, but the policies and programs may need revision to be in line with potentially effective known actions; or whether what to do is not known, in which case more research, and policy and program analysis is essential. The program review here suggests that some of all of these apply. Some programs seem well-founded and should be expanded: the gap is the resource gap to do this. Others need some revision, which itself may take some effort, hence resources. In others still, the way forward is less clear and research must continue—a considerable part of this can be resolved by competent evaluation. With this in mind, a rough cut at the resource gaps may set some scale for the next planning stages.

Around US\$1.4 billion per year is the estimated cost of effective programs for the approximately 273 million children in the eight countries (see table 2.2). This resource level could reduce the underweight prevalence by an additional 1.5 to 2 percentage points per year (pp/yr), thus broadly halving the prevalence on average over 10 years—see table 1.1 for the required rates. This figure is derived from standardized costs per child; in chapter 5 these are compared with estimates from the proposed strategies in the country reports, which turn out to be comparable overall. Existing resources should in principle be deducted to estimate

TABLE 2.2. Estimates of requirements for nutrition-oriented programs aimed at general malnutrition

Country	Population, 1999 (millions)		GNP per capita (US\$)	Government health and education budget, US\$/capita/yr (1995–96)	Requirement for nutrition-oriented expenditure			
	Total	Child			US\$/year (millions)	US\$/ population	as % GNP	as % government health and education budget
Bangladesh	126.9	15.1	370	15.2	76	0.6	0.16	3.9
India	998.1	115.0	450	18.5	575	0.6	0.15	3.1
Pakistan	152.3	23.8	470	17.9	119	0.8	0.17	4.4
Cambodia	10.9	1.6	260	9.4	8	0.7	0.28	7.8
Vietnam	78.7	8.5	370	13.7	43	0.5	0.14	3.9
Sri Lanka	18.6	1.6	820	39.4	8	0.4	0.05	1.1
Philippines	74.5	9.8	1,020	40.8	49	0.7	0.07	1.6
China	1,267	97.8	780	29.6	489	0.4	0.05	1.3
Total	2,727	273.2			1,367			

Sources: Population and gross national product (GNP), [27, p. 78–81, 94–7]; Government health and education budgets, and GNP percentages from [28, p. 188–90]. Requirements for nutrition expenditure are calculated as US\$5/child/year.

the gap, but these are not readily available. However, the present coverage and intensity of programs, as illustrated in figure 2.4, indicates that less than 10% of the required resources are currently being applied, so much of the estimated needs in fact represents the gap. These financial results are calculated from estimates of community-based programs. Micronutrient deficiency control programs are not yet included.

These figures are in line with other existing estimates. For example, the World Bank committed US\$1 billion to child nutrition in Bangladesh over a 10 year period (about 15 million children at US\$5 over 10 years gives US\$750 million). For India, an alternative estimate for child nutrition program needs was an additional US\$300 million per year [23, p. 45], roughly doubling the current resources. By country, these calculations give the requirements shown in table 2.2, ranging from US\$8 million for Cambodia to US\$575 million for India. These figures were calculated based on population, without allowing for malnutrition prevalences or targeting. Targeting would in theory bring them down, but in practice it is rare that targeting increases the focus on the malnourished by more than a factor of about 10% (estimated as the ratio of the prevalence in the participant group to the population prevalence [29, p.153–5]).

The estimates are also shown in relation to gross national product (GNP), and as a percentage of governments' health and education budgets, in table 2.2. The sums required are a small fraction of the GNP (and as discussed in chapter 5 would prevent considerable greater economic losses due to malnutrition), and are significant but still a relatively minor part—generally less than 5%—of the social sector budget represented by health and education. From these viewpoints the sums needed should be affordable.

Another calculation of resources can be based on the

expected numbers of community workers (mobilizers) required. It was seen earlier that the present ratios of community-based or other village- or peripheral-level workers needs to reach about 1:20 children for impact: in practice one-tenth of this, about 1:200, was the best reported in the country studies. We might conservatively calculate the needs at a lower ratio of 1:50 for the purpose of this estimation. Thus about four times the present level is needed when the ratio is 1:200 or more. In round figures, this implies that nearly 5 million mobilizers are needed in Bangladesh, India, and Pakistan, with 250,000 facilitators (at 1:20); nearly 2 million mobilizers in Cambodia, Vietnam, Sri Lanka, and Philippines, with 100,000 facilitators; and 8.5 million mobilizers in China, with 400,000 facilitators. An effort of sufficient magnitude to halve the prevalence of malnutrition in the next 10 years would involve a massive recruitment and training exercise. However, in the 1980s Thailand trained about 1% of the population [10, 15]—it can be done.

So, in rough terms, accelerating nutrition improvement by the 1.5 to 2 pp/year needed to halve the prevalence of underweight children in 10 years will require about US\$1.4 billion per year, and some 15 million people trained as community workers, with 750,000 facilitators to support them. This is a probably a realistic estimate in order of magnitude terms, conservative if anything.

Micronutrient deficiency control programs

Micronutrient deficiencies affect more people than does overall food deficiency (see chapter 1), and as many or more children are likely to be micronutrient deficient than underweight, by similar arguments. In

fact, the extent to which micronutrient deficiencies may contribute to growth failure has tended to be overlooked. They affect all stages of the life cycle. Fetal growth and development is affected, as is maternal health and indeed survival, by several deficiencies, including vitamin A, iodine, and iron. Many micronutrient deficiencies cause anorexia, and the poor appetite usually associated with childhood illness may be worsened by incipient nutrient deficiencies. The repeated cycle of growth failure with frequent infection followed by catch-up, which is the typical growth pattern in Asian countries, means that children may get depleted in a wide range of nutrients, as tissues waste, so that micronutrient intake could easily become limiting for rapid replacement of tissue [30, 31].

Effective interventions applicable in all the Asian countries are available for deficiencies of iodine and vitamin A. Iron is more of a problem, but must be addressed. The realization of how common and debilitating these deficiencies are, yet with inexpensive remedies available, has begun an extraordinary process that is leading to rapid progress in micronutrient deficiency control [32]. This must offer a major opportunity for investment in nutrition.

The interventions that are proven effective for vitamin A and iodine deficiencies are high and infrequent supplementary doses, coupled with fortification. The emphasis is more on fortification for iodine, and supplementation for vitamin A. Both also apply to iron, but the problem here is that supplements are not effective unless frequent—daily or possibly weekly—and problems of logistics and compliance have prevented large-scale program effectiveness in most Asian populations. Dietary modification is theoretically applicable. In practice, very few attempts to improve micronutrient status by such means have been demonstrated to be effective. The underlying trend of improvement in vitamin A deficiency (VAD) is likely to be due in part to improving diets—but this is a result of socioeconomic progress rather than from deliberate

efforts aimed at dietary change. Public health measures are also relevant to improving micronutrient status; but these too will probably proceed from their own imperatives. Breastfeeding is crucial for all forms of nutritional well-being, and breastfeeding promotion and protection should be supported for this and other important reasons—bearing in mind that it is the mother's nutrition that counts.

Micronutrient deficiency control programs have vertical and horizontal elements. The top-down structure, usually controlled within one set of organizational linkages, is advantageous for this type of technical intervention. Nonetheless, creation of awareness and demand is important. Micronutrient supplementation needs to be supported by, indeed be a key part of, community-based programs and health services. For fortification, especially for iodine, monitoring of salt quality at the local level would be feasible and might be effective in overcoming the main constraint now in many places, which is the extreme variation in iodization levels of salt as sold.

The state of micronutrient deficiency control programs in the eight countries is briefly reviewed here. Data are given in table 2.3. Gaps and opportunities for investment are then summarized.

Control of vitamin A deficiency

The major intervention for reducing vitamin A deficiency (VAD) in young children is administration of high dose vitamin A capsules (VAC, usually 200,000 IU vitamin A in oil solution) twice yearly. In India the dose is given as the vitamin A solution directly by dispenser. Several means of delivery have been tried. Universal coverage with door-to-door delivery was used for some time in Bangladesh, but coverage was never adequate. Alternatives now applied include distribution directly through the health system (e.g., India, with growth monitoring); with National Immunization Days (e.g., Bangladesh, Cambodia, Philip-

TABLE 2.3. Characteristics of selected current programs addressing micronutrient malnutrition

Project	Type, content	Coverage, target groups	Resources
Bangladesh			
VAD: Nutritional Blindness Prevention Program	VAC distribution with National Immunization Day and EPI; home gardens; education	85% coverage of children with VAC; postpartum supplementation also, coverage not known	US\$0.8m/yr for VAC for children
IDA: with antenatal care	Iron-folate given at antenatal care visits; no fortification yet	Antenatal care coverage 20% rural, 50% urban; compliance not known	Not reported
IDD: Control of IDD program (CIDD)	Salt legislation enacted 1995; mass communication; iodized oil injections phased out	Highly variable iodine content in salt; 265 refineries	Monitoring and quality control is issue

continued

TABLE 2.3. Characteristics of selected current programs addressing micronutrient malnutrition (*continued*)

Project	Type, content	Coverage, target groups	Resources
India			
VAD: massive dose; fortification	Vitamin A in oil dispensed; vegetable oil fortified but limited outreach	68% of 6–12 mo, 25% of 12–60 mo reported covered; fortified oil reported not to reach poor	Not reported
IDA: National Nutritional Anemia Control Program	Iron-folate supplements; diet promotion; rehabilitation	Pregnant and lactating women targeted; supplements low coverage and variable supply	Not reported
IDD: Universal Salt Iodization Program (USI)	650 salt iodization plants established; mobile labs; quality still highly variable	In principle all areas should have access, but remote areas vulnerable	Quality control major issue
Pakistan			
VAD	No national program		
IDA	No national program; iron presumably in ANC		
IDD: National Program	Social marketing to create demand; support to producers (600+); Iodized salt support facility	70% of producers iodizing (1996), 50% households with iodized salt; Endemic IDD areas in north targeted	~ US\$1.5m/yr; US\$0.04/beneficiary
Cambodia			
VAD control: HKI and UNICEF	VAC with National Immunization Day, changing to with EPI	99% of target children reported, survey shows 47%	Not reported
IDA	No national program; iron-folate available in health centers, use probably low		
IDD: control programs	Salt iodization programs beginning; salt production is mainly in one area; iodized capsules in interim, in badly affected areas; well water iodization also tried	Coverage low now; programs starting	US\$0.50/capita/yr
Vietnam			
VAD: National VAD Control Program	VAC distribution, nutrition education, dietary improvement, VAC postpartum	VAC 6–60 mo. 98.5% coverage reported; mothers 53%	878 commune workers, 940 district, 106 province; US\$0.08/capita/yr
IDA: National IDA control program	Iron tablets, deworming, fortification planned, diet diversity	Pregnant women, children <2yr, girls >15 yr; 425,000 pregnant women reached with tablets in 1995 (20%), now <25%; impact reported	200 commune workers (1/10,000) women; US\$0.55/capita/yr
IDD: National IDD control program	Salt iodization	Households using iodized salt: 40-90% by area (1996); 86% salt produced iodized	US\$0.05/capita/yr

continued

piners, Vietnam) and in National Vitamin A Weeks (Bangladesh); and with the Expanded Programme of Immunization (EPI), usually starting with the measles immunization contact at nine months of age. High levels of coverage are reported, which are in line with a massive increase in supply of capsules, notably by

UNICEF, in the last few years [32, p.52, 95].

Supplementation with high doses of vitamin A during pregnancy is not recommended because of concern for possible resulting birth defects. Low dose supplementation during pregnancy (daily or weekly) is safe and highly recommended. The practice of giving

TABLE 2.3. Characteristics of selected current programs addressing micronutrient malnutrition (*continued*)

Project	Type, content	Coverage, target groups	Resources
Sri Lanka			
VAD	No policy, but recent survey demonstrated problem; VAC postpartum to start; supplementary food for poor mothers and children (Thriposha) fortified with VA and range of micronutrients.		
IDA: in ANC	Iron-folate given with ANC which has high participation; fortification of wheat flour being considered	ANC covers most pregnant women; wheat flour mainly in urban areas	Not reported
IDD: salt iodization	Law enacted in 1995. Quality highly variable, only 30% adequately iodized	National program	Not reported
Philippines			
VAD control program (ASAP)	VAC with National Immunization Day; several foods fortified with VA	Preschoolers, 100% reported, 80% on survey	VAC US\$0.40/capita/yr including program costs
IDD control	Iodized oil capsules, with VAC (ASAP); salt iodization	Capsules target selected groups; salt: whole population	Iodine capsules: US\$0.1/capita/yr Iodized salt: US\$0.3/capita/yr
China			
Information not available on current programs and gaps; 76.3% coverage of iodized salt reported for 1995			

VAD = vitamin A deficiency; VAC = vitamin A capsules; EPI = expanded program of immunization; IDA = iron-deficiency anemia;

ANC = antenatal care; IDD = iodine-deficiency disorders, HKI = Helen Keller International.

Sources: ref. 1–8, 33.

the mother a high dose within a month after delivery (when she cannot become pregnant) has spread rapidly, and been adopted as policy in Bangladesh, Cambodia, Vietnam, and Philippines. This method covers the breastfed infant against deficiency at least to six months of age; the child should then get a further dose at nine months of age, through EPI, if not earlier through the health system.

Until recently Sri Lanka did not consider VAD a problem, and is beginning to develop programs. Pakistan has not regarded VAD as a priority problem, although surveys have shown that the deficiency is as prevalent as in neighboring countries.

As summarized in table 2.3 (from the country reports), coverage of vitamin A supplementation is extensive where there are programs—85% in Bangladesh, 68% in India, 50% or more in Cambodia, nearly 100% in Vietnam and Philippines. These data are displayed in figure 2.5. Now that sub-clinical deficiency is considered to increase health and mortality risks, with a prevalence of around 10 to 20% in the Asian countries, even incomplete coverage is likely to have a benefit. It used to be held that less than 90% coverage would miss most of those at risk; while the worst-off are often the most difficult to reach, this new perspective reinforces the value of supplementation, even though outreach and high coverage remain important.

These coverage figures refer to children, and recent

evidence shows that maternal mortality may be greatly reduced by supplementing women [34]. More attention to supplementation of women, with more frequent low doses, will be appropriate in the future. As a new priority, this may be another suitable area for investing in nutrition.

The costs reported for VAC distribution programs are less than US\$1/child/year—the VAC themselves are less than US\$0.10. Probably around US\$0.50/child/year is a reasonable estimate.

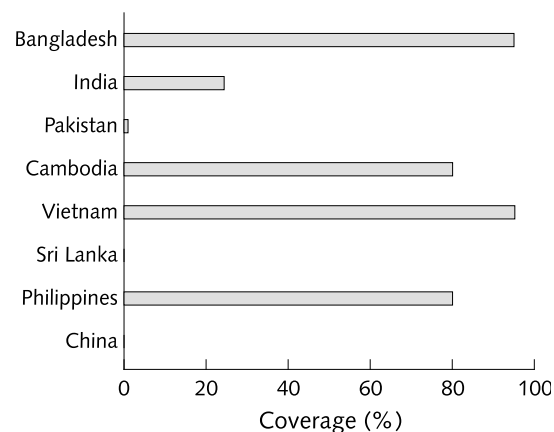


FIG. 2.5. Coverage of vitamin A supplementation programs. Source: table 2.2

Fortification of suitable foods with vitamin A has been important in virtually eliminating VAD in industrialized countries, and is likely to be a main part of the long-term solution in Asia. Fortification is progressing in several of the countries—dairy and vegetable fat are fortified in India, China, and Pakistan and sugar is being investigated in Bangladesh and Philippines. Promoting operational research and implementation of fortification is another opportunity for investment in nutrition.

Control of iron deficiency

Most countries attempt to provide iron or iron-folate tablets as part of antenatal care (see table 2.3). With logistic and compliance problems [35], it seems unlikely that this approach will soon make a lasting impact on the widespread problem of iron deficiency. Recent research has suggested that weekly supplementation may be adequate, but even that would have problems. It looks as though supplementation is feasible when oral doses are needed every six months or so (like for iodine and VAD), but other ways have to be found for those nutrients needing daily intakes.

Of these, fortification is the most promising. Part of the difficulty is that iron is needed in milligram quantities, its absorption in low and easily inhibited, and it can be readily oxidized. Thus it may discolor or otherwise change the food used as a vehicle. Fortification of wheat flour is common in industrialized countries and is being explored in Sri Lanka. Rice is the staple food for most of the people in the eight countries, moreover it is used as a grain rather than a flour. Rice is more difficult to fortify satisfactorily, in part because the iron fortificant tends to wash out during cooking.

Controlling iron deficiency is an example of where the most effective policy is not yet clear, and vigorous research—much of it of a highly operational nature, like how to fortify which foods—needs to be pursued. Here a priority for investment is to support this research since controlling iron deficiency and the related anemia would have a big economic payoff, as well as improving health, especially for women. It is not as if a great deal of expensive research has been undertaken and failed; it is now time to ensure that the necessary research is done, with a reasonable assurance of success, because fortification does work in some countries—with wheat (and many other manufactured products, like breakfast cereals) but unfortunately not yet with rice.

Control of iodine-deficiency disorders (IDDs)

Efforts in Asia to promote IDD control (supplementation and fortification) received major stimulus from the international level in the early 1990s. From the

World Summit for Children and the International Conference on Nutrition ambitious goals were agreed, in this case with clearly feasible interventions that might meet them: iodize the world's salt supply. With UNICEF pushing, and following a technical conference on 'Ending Hidden Hunger' in 1991 where many national programs and opportunities were discussed, a worldwide effort began [36]. In 1994 around 30 developing countries had salt iodization programs in place; this rose to around 80 in 1997. Time series data on IDD indicate a rapid fall in goiter prevalences as the salt supply becomes iodized (but not otherwise) [32, p. 23–26; 37, p. 9–27].

All eight of the countries have salt iodization programs in operation, as shown in table 2.3. The percentage of households with adequately iodized salt (>15 ppm) by country is shown in figure 2.6. One important issue is the quality control of the iodization levels in salt as available to households. Surveys in which the salt iodine content is assayed in the household have shown extreme variability. For example, recently in Bangladesh nationally less than half the households, and in Sri Lanka only about a third, were actually getting adequately iodized salt, although a majority were intentionally buying salt labelled as containing iodine. Surveys at the factory and retail level have shown similar variation, so the problem starts at the manufacturing level, although poor storage adds to the problem.

Iodine intake during pregnancy is of particular importance, given the vulnerability to irreversible effects *in utero*. Supplementation—which is safe and used to be widely used, the oral dose lasting for six months or so—may need to be considered when iodine from salt cannot be guaranteed, and is included in multiple micronutrient supplements designed for wide use during pregnancy. At the same time every effort is needed to ensure the quality of the salt supply. These

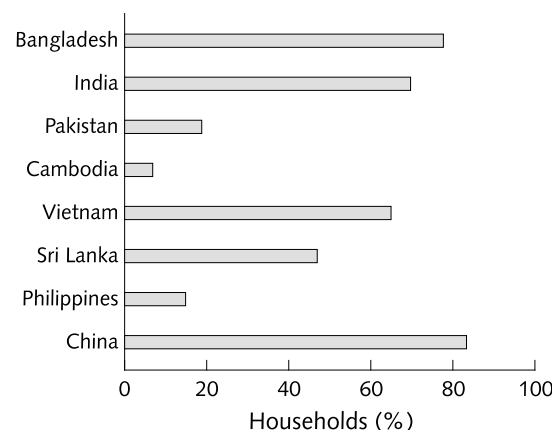


FIG. 2.6. Coverage (% households) with adequate iodized salt. Source: table 2.2

two thrusts do not necessarily compete. Stopping a gap with supplements while fortification is developed is a familiar approach for other micronutrients.

One prospect that would link the vertical fortification process with community action might be to have community programs participate in testing salt in their own households and shops. The test kit is inexpensive and easy to use. This participatory approach to quality control seems worth a try.

A major opportunity for investment in improving nutrition would thus seem to be to support the distribution of adequately iodized salt, through quality monitoring and control. Methods are well established, legislation and/or government programs are in place in most of the countries. At the same time, some innovative ways of increasing iodine intake, such as iodizing well water, may repay research.

Gaps

The estimates in table 2.4A are based on standard costs per population [38, p. 65; 39, p. 23–4] which are summarized in table 2.4B. The overall costs for different interventions—supplementation targeted to children and/or pregnant women, and fortification which is usually not targeted—are shown by country in table 2.4A.

Successful programs are expanding for both vitamin A and iodine. The well-established interventions of vitamin A capsule distribution and salt iodization require around US\$140 million and US\$270 million annually; for Bangladesh, Pakistan, Cambodia, Vietnam, and Sri Lanka these figures are US\$25 million

and US\$39 million, respectively. However, part of this need is already being met. The current gaps, or unmet needs, can be estimated using available information on coverage (in table 2.3, and from [39, p. 34; 41, p. 90–1]). These are shown in table 2.5, amounting, for the group of Bangladesh, Pakistan, Cambodia, Vietnam, and Sri Lanka, to about US\$16 million/year for vitamin A and US\$20 million for iodized salt.

Sustaining these relatively new programs will be an issue, so estimating gaps alone could be risky. Investment will be needed for maintenance of momentum, establishing permanent mechanisms, and so forth. The per capita costs of micronutrient programs are low—for any one micronutrient much less than US\$1 per capita (of total population) per year. Even adding fortification to supplementation costs, as would make sense until fortification is effective enough to cover all vulnerable groups, amounts to about US\$0.64/capita/year. The estimate for multiple fortification (e.g., with a pre-mix) is less overall, around US\$0.34/capita/year. Taking the figure of US\$0.50/capita/year, this amounts to US\$1,364 million per year. This figure applies to the overall population that would benefit from fortification. (The estimate is thus not directly comparable to the similar figure for community-based programs aimed at improving the nutrition of the child population). Moreover, the promotion and monitoring of fortification, and delivery of supplements, would depend in part on local programs, so the figure for micronutrients should not be seen in isolation from other programs.

The likely cost of around US\$0.50 /capita/year for interventions with the prospect of having profound

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TABLE 2.4A. Estimates of annual requirements for programs aimed at micronutrient malnutrition

	Population (1999)		Vitamin A		Iodine		Iron		Multiple	
	Total	Child	Capsules to children <5 yr	Fortification	Fortification	Fortification	Supplement in pregnancy	Fortification	Supplement in pregnancy	Fortification
Bangladesh	126.9	15.1	7.6	25.4	12.7	10.2	25.4	5.1	43.1	
India	998.1	115.0	57.5	199.6	99.8	79.8	199.6	39.9	339.4	
Pakistan	152.3	23.8	11.9	30.4	15.2	12.1	30.4	6.1	51.8	
Cambodia	10.9	1.6	0.8	2.2	1.1	0.9	2.2	0.4	3.7	
Vietnam	78.7	8.5	4.3	15.7	7.9	6.3	15.7	3.1	26.8	
Sri Lanka	18.6	1.6	0.8	3.7	1.9	1.5	3.7	0.7	6.3	
Philippines	74.5	9.8	4.9	14.9	7.4	6.0	14.9	3.0	25.3	
China	1,266.8	97.8	48.9	253.4	126.7	101.3	253.4	50.7	430.7	
Total	2,726.8	273.2	136.7	545.3	272.7	218.1	545.3	109.0	927.1	

Note: based on data in table 2.4B

TABLE 2.4B. Annual costs of micronutrient programs

	Population		Vitamin A		Iodine		Iron		Multiple	
	All	Child/woman	Capsules to children <5 yr	Fortification	Fortification	Supplement in pregnancy	Fortification	Supplement in pregnancy	Fortification	
										US\$
Costs per person in population (total, or child/woman) per year	(0.06)	0.20	(0.06)	0.20	0.10	(0.08)	0.20	(0.04)	0.34	
Cost per million people per year	57,000	200,000	57,000	200,000	100,000	80,000	200,000	40,000	340,000	

Sources and notes. Vitamin A capsule distribution per child, and fortification for entire population [38, p. 65]. Iodine fortification of salt [38, p. 65]. Iron, supplementation for pregnant women [38, p. 65]. Iron, fortification of salt or sugar for entire population: US\$0.12/capita/year [39, p. 23]; US\$0.2/capita/year [38, p. 65], higher value taken. Multiple micronutrients: supplementation in pregnancy, US\$/pregnancy, fortification (cost of fortificants) for entire population [40, p. 87]. Estimates per pregnancy taken as 4% of women per year. Values in parentheses are calculated as average per total population.

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