Enhancing the Contribution of the Health Sector in the Prevention of Malnutrition: 

Review of Project Appraisals in Africa

Edited by

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TECHNICAL DEPARTMENT
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ENHANCING THE CONTRIBUTION OF THE HEALTH SECTOR IN THE PREVENTION
OF MALNUTRITION

Review of Project Appraisals in Africa

Edited by Tonia Marek

DIVISION OF HUMAN RESOURCES
TECHNICAL DEPARTMENT
AFRICA REGION
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This document was written for the benefit of project designers, implementors, and specialists in the nonindustrialized countries, and in development agencies.

Each chapter may be consulted independently for assistance in setting up a program or making decisions related to the experiences summarized here.

The author(s) of this document bear(s) exclusive responsibility for the observations, interpretations, and conclusions expressed here. They do not represent the views of the World Bank, its affiliated institutions, the members of the Board of (Executive) Directors, or the countries they represent.
Malnutrition in Africa has many causes, but most of them are linked to poverty. The World Bank, in its efforts to reduce poverty in Africa, has identified six intervention points:

1. Macroeconomic policies to ensure growth and improvement in income, better distribution of income to the poor, and more efficient allocation of resources.

2. Measures to ensure that the poor have access to food, and to improve their use of that food with a view toward improving their nutritional status.

3. Measures to ensure that the poor have access to physical and financial resources and social services and to improve the efficiency and effectiveness of these services.

4. Programs to shield the poor from the harmful effects of seasonal variations in income, drought, or macroeconomic shocks.

5. Programs aimed at increasing the participation of the poor, particularly women, in the socioeconomic choices that affect their lives.

6. Programs aimed at eliminating discrimination against certain groups, in particular women and the poor.

This document is aimed specifically at improving measures related to number three above.

It does not pretend to be an exhaustive study; therefore, certain topics, such as the nutritional status of refugees and displaced populations, are not addressed.

This document was first published in French under the title "Comment Améliorer la Contribution du Secteur de la Santé dans la Lutte Contre la Malnutrition: Revue d’Evaluations de Projets en Afrique". Copies in both languages can be requested.

SUMMARY

This document reviews many assessments of interventions in the health sector in the area of nutrition, principally in Africa.

It proposes to illustrate what may be this sector’s most effective contribution to the prevention of malnutrition. It is intended for those responsible for the design and implementation of projects, project directors, and national and international specialists.

This review of published and unpublished project appraisals underscores the health sector’s decisive role in the prevention of malnutrition, but it also emphasizes the necessity for rigorously defined interventions to avoid failure and wasted resources. As a result, this document recommends that the health sector (a) continue with the benefits it already provides: vaccinations, therapeutic treatments (for malaria, infections, dehydration), which also have a considerable impact on malnutrition; (b) undertake new and easily programmable services that require only a small supplementary investment of resources: promotion of breast-feeding and prevention of iron, vitamin A, and iodine deficiency; (c) take on more complex and/or demanding activities (for example, nutritional recuperation, the monitoring of growth, and food supplement programs) only through a more community-based approach and subject to the availability of all the necessary resources and a detailed program; if these conditions are not met, such activities should not be undertaken, and efforts instead should be focused on the first two types of benefits to increase coverage and improve its quality; (d) undertake work in the area of nutrition education only in conjunction with communications professionals and only when enough resources are available to train staff, along with other requirements.
This document was conceived, compiled, and edited by Tonia Marek, nutritionist, AFTHR. The chapter authors are as follows:

- **Dr. Bernard Maire**, researcher in nutrition at ORSTOM, Montpellier (France), recruited as a consultant by AFTHR to write the sections on preventing iron, vitamin A, and iodine deficiency, nutritional rehabilitation, the monitoring and promotion of growth, nutritional education, and food supplements.

- **Mrs. Margaret Kyenkya-Isabirye**, consultant on child feeding, UNICEF-New York (USA); **Mrs. Gabrielle Palmer**, consultant to UNICEF-New York; and **Mrs. Helen Armstrong**, training coordinator for the Baby Friendly Hospital Initiative, UNICEF-New York (USA), wrote the section on promotion of breast-feeding.

- **Dr. Ellen Piwoz**, consultant to the project "Support for Analysis and Research in Africa" (SARA), Academy for Educational Development, Washington (USA), wrote the section on dietary treatment of infection with support from the Africa Bureau (HHRAA Project) at USAID.

- The section on activities already undertaken by the health sector was taken from the document, "Malnutrition and Infection: A Review" (with the authorization of the ACC-SCN department of the United Nations), published by Andrew Tomkins and Fiona Wilson in October 1989.

**ACKNOWLEDGMENTS**

This report benefited greatly from the comments of numerous colleagues, including specifically **Dr. Mary Ann Anderson**, specialist in breast-feeding at USAID; **Dr. John Mason** at ACC-SCN; **Dr. Nicholas Cohen** at WHO; **Mr. Dick Heyward** at UNICEF; **Dr. Suzanne Prysor-Jones** of the SARA Project at the Academy for Educational Development; **Dr. Hope Sukin**, nutritionist in the Africa Bureau at USAID-Washington; **Drs. Jacques Baudouy**, **Yves Genevier**, **Jean-Louis Lamboray**, and **Maryse Pierre-Louis**, public health specialists at the World Bank; **Dr. Michèle Lioy**, IEC specialist at the World Bank; **Dr. Judith McGuire**, nutritionist at the World Bank; and **Mr. Timothy Stone**, independent expert on micronutrients.

The report was typed by Mr. Jim Shafer of the World Bank. Its presentation was designed by **Ms. Marit Hammond**, design consultant for the SARA Project, Academy for International Development, Washington (USA), with support from the Africa Bureau (HHRAA Project) at USAID.
I. INTRODUCTION

A Choice of intervention strategies

Before identifying any intervention strategy to prevent malnutrition, each program and project leader passes through the following decision stages, illustrated in the "Triple A" cycle popularized by UNICEF:

Figure 1. The "Triple A" cycle

- Once a malnutrition problem is identified as a result of studies and surveys that have evaluated the prevalence and extent of the problem (situation assessment), the intervention strategy is selected.

- Before deciding on an intervention strategy to prevent malnutrition, it is essential to ask questions about the underlying causes of the problem (analysis of the situation): is it a problem of household food insecurity more than anything else? Or is it a problem of access to health care? Or of lack of knowledge about how to raise a child? These three causes often coincide in Africa.

- What does one do to resolve these problems? Each sector (particularly agriculture, education, health, industry) can and should contribute to their solution (action).

This document deals essentially with actions relevant to the health sector, and defines its contribution to resolving these problems by reviewing lessons learned from health projects in Africa. However, this document does not address the means by which the fundamental causes of the malnutrition problem may be resolved, as identified in the conceptual framework developed by UNICEF (below); this conceptual framework depicts schematically the multiple factors that affect nutritional status and that are the domain of the project and program leaders (targeting, equity, and policy measures).

In Africa, the World Bank's health sector finances health and nutrition, food security and nutrition, and stand-alone nutrition projects. More of the projects could include nutrition, but due to the complexity of the problem's causes, some project and program leaders hesitate to get involved in prevention of malnutrition. This document should allow these decision makers to choose rationally the type of nutrition intervention that could be included in a health project or program.
Impact on operations design

When a health sector intervention in nutrition is designed, the desired goal is to provide an array of the most efficient services at each level of the health system while respecting a certain chronological order: first, it is imperative to provide the services that meet a demand—especially therapeutic care (for infections, malaria, dehydration) and vaccinations—before introducing services for which the demand is not as evident, such as nutrition or family planning.

The first three sections of the next chapter are closely related, and the interventions are classified according to the effort level and resources they require to be integrated in most health services. Benefits already provided by the health sector in nutrition are indicated in section A. If a health service would like to intensify its efforts, and if it has sufficient resources, it may undertake the activities indicated in section B. But to take on the activities described in section C, a service must fundamentally modify its current approach and be able to mobilize substantial resources. A
health service that is not in a position to meet these requirements should refrain from undertaking these activities, since the project appraisals show that they will have no impact. It would be more prudent to use additional available resources to extend the coverage of benefits listed in section A or to take on those described in section B.²

In sum:

SECTION A. Benefits already provided by the health sector, which have a positive effect on nutrition should continue to be provided: infection control, EPI, prevention of malaria, ORT, and family planning. For this type of benefit, efforts would be directed toward increasing coverage and quality.

SECTION B. Nutrition services that could easily be provided by the health sector, which require few supplementary resources: promotion of breast-feeding, dietary management of infection through changes in diet, micronutrients (iron, vitamin A, and iodine).

SECTION C. Nutrition services that could be provided by the health sector if a radical change in approach were adopted (moving from an approach based on a health center to a community-based approach but with the technical support of a health center), if the supplementary resources are available, and if the program is correctly planned. If not, such activities should not be undertaken (including monitoring and promoting growth); instead, resources should be concentrated on the first two types of benefits (sections A and B).

SECTION D. Nutrition education is included in most health benefits. It can be provided efficiently only if designed by communications professionals and if the necessary resources for its implementation are made available.

² As nutrition education (section D) is included in most benefits, we will consider it separately; its requirements, however, resemble those of the benefits mentioned in section C.
Benefits already provided by the health sector³

In Africa, the majority of health services already contribute to prevention of malnutrition by intervening directly to improve inadequate public health conditions, one of the immediate causes of malnutrition; these interventions and their impact on nutritional status are briefly described in the following paragraphs. It should be noted that preventive and therapeutic interventions modify mothers' behavior and make them more receptive to nutrition and family planning problems, as long as they are given some assurances about their children's health status.

In general, infections reduce food absorption or cause anorexia. The latter may be more or less pronounced, and its consequences are sometimes exacerbated by the feeding practices imposed by parents on a child with a fever and which vary considerably among cultures.

Furthermore, infections that are accompanied by fever increase a child's basic metabolic demands thereby increasing his calorie requirements; they may also lead to appetite loss or nutrient malabsorption. Gastrointestinal infections occur most frequently among infants; their principal symptom is diarrhea. Almost as common are childhood illnesses (particularly measles) and parasitic illnesses (such as malaria and intestinal parasites).

1. Prevention of diarrheal illnesses

Diarrhea is probably one of the leading causes of mortality in infants. For example (Tomkins and Watson, 1989), in an urban community in The Gambia, more than 35 percent of deaths among children between the ages of zero and three were attributed to diarrhea accompanied by malnutrition. Diarrhea in a well-nourished infant will not have the same impact as diarrhea in an infant who has practically no nutritional reserves. This is one of the reasons that diarrhea is responsible for more deaths in Africa than in the industrialized world.

Diarrhea also has a direct impact on nutrition since it affects intestinal absorption (see Tomkins, 1981 for a complete overview of this subject). While during diarrhea's acute phase the absorption of macronutrients remains at a high level (Molla et al., 1983), this level may well fall considerably in the case of chronic diarrhea. Dehydration in the case of acute diarrhea also leads to a drying out of the buccal mucous membranes, which makes absorption of solid food difficult.

The effort to prevent diarrheal illnesses should be continued and even intensified; the main elements of prevention are the following:

³ To a great extent this section is excerpted from A. Tomkins and F. Watson, October 1989.
Benefits already provided by the health sector

- maintaining breast-feeding for the first four to six months of life to decrease the risk of diarrhea;

- providing appropriate dietary treatment for diarrheal episodes (see our suggestions on this topic in Chapter II.B.5); one of the principal elements of dietary management is continuous breast-feeding during the diarrhea;

- maintaining breast-feeding beyond six months of age with the progressive introduction of weaning foods; and

- using oral rehydration measures to prevent dehydration, which may have a favorable impact on maintaining appetite.

2. Prevention of intestinal parasites

Some parasites are associated with a loss of appetite, malabsorption, nutrient loss, and anemia. Although improving sanitary conditions is the long-term solution, vermifugal treatment programs for vulnerable populations are used in the short term.

3. Prevention of malaria

The impact of malaria on nutritional status varies according to the age and immunity of the child as well as the degree of infection. It has a significant impact on newborns (low birth weight, iron and folic acid deficiency). The child’s suppressed immunity encourages the incidence of other infections, which may in turn lead to malnutrition.

4. Control of preventable childhood illnesses (Immunizations)

a) Vaccination against measles

A child who has been immunized against measles will have a smaller risk of malnutrition than a child who has had measles. The impact of this disease on nutritional status appears:

- In relation to the growth curve: significant weight loss has been noted in West Africa (Morley, 1969) in children who have had measles, and this disease has aggravated the rates of infection observed in Nigeria (Laditan and Reeds, 1976) in children suffering from wasting or kwashiorkor.

- In relation to dietary intake, greatly depressed in cases of anorexia, dehydration, fever, and buccal lesions, local practices in certain places prohibit the intake of certain foods in measles cases. It should be noted that the measles virus may inflict sufficient mucosal injury to the intestine to cause malabsorption and protein loss (Dosseter and Whittle, 1975).

- In relation to immunity, greatly lowered in measles cases, which opens the door to other infections, especially diarrheal and respiratory, and contributes to a deficient nutrition cycle linked to measles. This depressed immunity can persist for three or four months.

b) Vaccination Against Whooping Cough

In the same way, this vaccination contributes to improving children’s health by eliminating the symptoms associated with this disease (anorexia, fever, pain, vomiting, and diarrhea).
Nutrition services that could easily be provided be the health sector

1. Prevention of vitamin A deficiency

a) Findings and recommendations

- Awareness of the importance of vitamin A deficiency in Africa is recent. In 1964 only five countries were considered at risk; this number grew to 11 in 1974 and has now reached 18. Following the Harare conference in 1988, the African Council of Science, Nutrition, and Food included this concern in its guide to food and nutrition policy. Some countries have developed a national vitamin A policy, the first stage in the rational development of any sort of long-lasting system of treatment and prevention.

- Possible interventions are well codified and understood. The problem involves choosing among the different solutions available. The options may be revised in the near future based on trials now underway. The United Nations and several NGOs are particularly knowledgeable in vitamin A and may be useful advisors to governments making the choices. One must be attentive, however, to the sometimes excessive pressure brought to bear by some pharmaceutical companies; programs should undertake a preliminary systematic assessment of the situation to confirm the selection of proposed options (distribution of capsules or education).

- To ensure that a strategy covers the short-, medium-, and long term in a coordinated fashion, programs need to include all of the following: capsule distribution, infection prevention, vaccination at a high rate of coverage against measles, the enrichment of appropriate foods if they are available, improvement in the production of food rich in carotene, and nutrition education on an individual and community level.

i) Long-term solutions

- Programs based on increasing the production and consumption of foods rich in vitamin A are the only ones that have shown themselves to be viable. Vitamin A distribution programs (by capsule) will only have long-lasting effects in the case of the treatment of children at risk if they are integrated into other therapeutic care and MCH services, thereby making them routine and efficient.

ii) Short-term solutions

- Children at risk should be treated at all health centers; this implies sufficient staff training and the ongoing availability of vitamin A capsules. One solution that might facilitate this availability is to include vitamin A in the country’s list of essential medicines.

- The principal stumbling block to capsule distribution plans is the difficulty in obtaining good coverage, particularly in the countries of the Sahel where the scattered population and the level of training of community health staff and workers are significant constraints.

- One alternative is to link the distribution of vitamin A to the broad vaccination program with which it shares a certain number of characteristics: same target population, compatible time frame, a similar simple and quick procedure,
the necessity to provide the highest rate of coverage possible, and supplies from a central pharmacy.

- A published cost assessment is not available. The raw materials for treatment are relatively inexpensive: 4 cents per child treated per year with vitamin A capsules provided by UNICEF. The distribution cost, however, varies significantly depending on the strategy adopted (targeted or universal), and whether the distribution and education are conducted separately, in association with vaccinations, or within the normal functioning of the local health system.

b) VITAMIN A DEFICIENCY IN AFRICA

i) Consequences of vitamin A deficiency

Severe vitamin A deficiency in a young child leads to blindness and increased risk of death.

- Severe vitamin A deficiency and xerophthalmia: vitamin A acts as a visual pigment that absorbs light. A lack of vitamin A compromises the formation of rhodopsin, a mediating pigment of night vision. A method that is sensitive to detecting vitamin A deficiency consists, therefore, of measuring an individual’s ability to adapt to darkness (FAO/WHO, 1989). When the deficiency is ongoing, eye tissues will be affected to differing degrees, leading to xerophthalmia, and finally, if treatment is not provided quickly, blindness. WHO believes that vitamin A deficiency is a public health problem that may be severe, moderate, or mild according to the criteria in Table I.

Vitamin A is a fat-soluble vitamin that is stored in the liver; it is redistributed to peripheral tissues as needed through the bloodstream. As a result of its outstanding ability to stock the vitamin, the body may tolerate perfectly well prolonged periods of time without food intake containing vitamin A or its precursors. Depleted vitamin A reserves may also be restored through high doses given at intervals of several months (up to four to six months; after this period, the vitamin A status of children returns to its level before vitamin A supplements were given) (Stolzhus and Habicht, 1993). Vitamin A deficiency is generally attributed to insufficient consumption of the vitamin itself (retinol from the consumption of animal products: liver, milk, butter, cheese, eggs, fish, etc.) or of its precursors (carotenoids contained in certain fruits, vegetables, leafy greens, roots, and tubers). It may also be due to impaired intestinal absorption (diarrhea, parasites), impaired transit (protein-energy malnutrition), or to an increase in requirements (growth, infections).

- Vitamin A and morbidity: "Vitamin A deficiency leads to a heightened sensitivity to infection" (FAO/WHO, 1989). The impact on vision, albeit dramatic, is the last manifestation of the deficiency. Histological studies have shown that problems may first occur related to the increase in bony tissue; the development of immunity; or the development of epithelial formations in the respiratory, urinary, or gastrointestinal tract. Preventing morbidity has become a secondary goal after the prevention of blindness, the principal goal of programs to monitor vitamin A deficiency until recently. Vitamin A deficiency, even at a marginal level, may make an illness become more severe (diarrheal and acute respiratory illnesses in particular). At the same time infectious diseases lead to an increase in vitamin A consumption, and a deficiency may appear in the case of marginal status: measles, diarrheal illnesses, meningitis,
The health sector and nutrition interventions in Africa

Table I. Epidemiological criteria for evaluating the severity and extent of Vitamin A deficiency in a population

<table>
<thead>
<tr>
<th>Criteria (in children 1 to 6 years from a survey of 10,000 subjects):</th>
<th>Public health problems</th>
<th>Severe or moderate</th>
<th>Low or at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade XN: Night blindness (hemeralopia)</td>
<td></td>
<td>&gt; 1%</td>
<td></td>
</tr>
<tr>
<td>Xerophthalmia:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* grade X1B (Bitot spots)</td>
<td>&gt; 0.5%</td>
<td>one of these symptoms/ signs present in the community at lower rates, or in hospitalized subjects</td>
<td></td>
</tr>
<tr>
<td>* grades X2/X3A/X3B (corneal xerosis/ulceration/keratomalacia)</td>
<td>&gt; 0.01%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* grade XS (corneal scar)</td>
<td>&gt; 0.05%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate of plasmatic retinosis (&lt; 10 μg/dl)</td>
<td>&gt; 5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


malaria were cited (Inua et al., 1983; Sommer et al., 1987; Galan et al., 1990; ...). This is why children with measles, respiratory illnesses, and diarrhea are included in the risk groups.

It should be mentioned, however, that this issue is at the center of a debate among nutritionists because some studies (Rahmathulla et al., 1991, among others) did not demonstrate the effects of vitamin A supplements on morbidity.

In Africa Ghana's VAST study followed 1,500 children from age six to 59 months for one year. One group received a supplement every four months while another was given a placebo. The results demonstrated that supplementation had an impact on the severity of illness but not on its prevalence: medical visits were reduced by 12 percent and hospital admissions by 38 percent in the group receiving the vitamin A supplement.

- Vitamin A and mortality: Since 1983 A. Sommer has drawn attention to the potential for a more important-than-anticipated role for vitamin A deficiency based on results from Indonesia: the risk of death seemed to increase significantly at marginal and moderate deficiency levels (Sommer et al., 1983). A first supplementation trial with elevated doses aimed at reducing xerophthalmia and blindness unexpectedly reduced by almost 30 percent the mortality of young children. Since then, three additional trials of this sort have taken place. Two trials conducted in southern India (low weekly doses to approximate food intake adequate in vitamin A) and Nepal (high doses) have shown spectacular results in terms of the reduction of mortality rates due to the treatment—54 percent and 30 percent respectively, (Sommer et al., 1986; Vijayaraghavan et al., 1990; Rahmathullah et al., 1990; West et al., 1991). That the impact was specifically on mortality and not morbidity in most cases has yet to be explained; this may be linked to vitamin A's antioxidant nature, which enables it to avoid the harmful impact of an excess of free radicals resulting from infection.
The VAST study in Ghana (Fred Binka, Navrongo, to be published) recently showed a 20% decrease in mortality in children who received supplements, compared with those who did not. This result is probably explained in part by vitamin A's role in decreasing the severity of illness.

One should not lose sight of the fact that such a reduction in mortality may be meaningful only if one effectively reaches the highest risk individuals, which implies making an effort to provide almost complete coverage. It is likely that in the current state in which a number of health services operate, the impact would probably be nil (Costello, 1991). The association with EPI proposed by WHO would be an adequate solution at least initially in that this intervention in Africa as elsewhere currently achieves one of the best levels of coverage of the target population.

ii) Risk groups

- **Young children:** A child's needs are proportionally greater than those of an adult and vary radically as a function of his growth. Xerophthalmia is most prevalent generally around two to three years of age, at the weaning stage. This depends on the duration of breast-feeding and nutritional status. The deficiency may precede birth if the mother herself is also very deficient; in moderate deficiency cases, the child's needs during pregnancy and lactation are favored. The concentration in breast milk varies among countries and regions; on average, it is believed that breast milk can meet the needs of the nursing infant for six months. Children with measles, acute respiratory illness, and diarrhea have a heightened need for vitamin A (see above paragraph, "Vitamin A and morbidity").

- **Breast-feeding women:** WHO recommends that pregnant women not receive vitamin A supplements when massive supplementation at high doses occurs, since they may be teratogenetic early in pregnancy; it is recommended, however, that nursing mothers receive supplements, but no longer than one month after delivery (one month is the period during which it is known that the woman is not pregnant again).

iii) Treatment and prevention

The practical rules and modalities of treatment and prevention are abundantly discussed in various readily accessible recent works (WHO/UNICEF/IVACG, 1988; Amédée-Manesme et Demeyer, 1989; Storms and Quinley, 1988; etc.) There are five basic interventions in this area: urgent medical treatment, supplementation, fortifying food, increasing production of foods rich in vitamin A, and nutrition education.

Every child affected by xerophthalmia, regardless of how far it has progressed, should be systematically treated with vitamin A. It may be administered orally or through an intramuscular injection; these two methods were considered equally effective following a trial conducted in Indonesia, but the applicability of these results elsewhere, notably in Africa, is in dispute. Testing appropriate to each country or region is advised. Doses are well codified according to age and physical condition. A moderate deficiency in vitamin A is thought to be exacerbated by infectious diseases, including first and foremost measles, where elevated doses are strongly recommended to avoid serious eye complications, in particular in the case of associated malnutrition. The use of high doses during diarrheal episodes or pneumonia is less well established; toxicity is a risk, and the use of one dose is recommended.
Vitamin A deficiency disappeared over the course of time in the industrialized countries as a result of a natural trend toward varying dietary intake; it was definitively eradicated with the systematic supplementation of certain foods such as milk, margarine, and foods for special dietary use for children (Amédée-Manesme et Demaeyster, 1989). There are currently three ways to encourage this evolution in the nonindustrialized countries still facing this problem. A short-term approach would be for health services to administer periodically capsules containing high doses of vitamin A, the effect of which continues for several months due to the body’s ability to store it in the liver. In the medium term, certain foods that are widely consumed by populations at risk of vitamin A deficiency could be fortified. Only a program to develop production of foods rich in vitamin A and to educate all levels of society to encourage their consumption of these foods can resolve the problems associated with vitamin A deficiency in the long run.

iv) Distribution in Africa

"In Africa, most cases of blindness in young children are attributed to measles, but it is very likely that measles only precipitates an acute and severe xerophthalmia in children whose vitamin A intake is marginal. Countries in which a lack of vitamin A and xerophthalmia are considered a significant public health problem are found in the Sahel and sub-Sahel regions (Benin, Burkina Faso, Mali, Mauritania) and in eastern and southern Africa (Ethiopia, Kenya, Malawi, Sudan, Tanzania, Zambia, ...). Moreover, in a certain number of countries for which there is no direct evidence based on official observations, numerous indications suggest that the lack of vitamin A is a significant public health problem. In this category are the countries of Angola, Ghana (north), Mozambique, Niger, Nigeria (north), Uganda, and Chad" (FAO/WHO, 1989). It is clear that these countries are not all affected to the same degree in regional and seasonal terms (periods of drought) and that interventions should not necessarily be the same throughout the region. In Nigeria recent observations have suggested that vitamin A deficiency might be a problem not only in the Sudanese regions, the driest in the north, but also in the more humid regions in the south. Although palm oil, fruit, and vegetables are more abundant there, their consumption by young children, as in Asia, may be limited as a result of local cultural practices regarding weaning, in particular related to low-fat foods (Sight and Life, 1990).

Considering that the prevalence of cases of marginal, moderate, or severe deficiency affects on average about 15 percent of the target population of preschool-age children, the health services throughout the continent will handle approximately eight million children (Sight and Life Newsletter, 1990). Reliable data on the actual extent of vitamin A deficiency are still lacking in most African countries; there is a need for prevalence and simple monitoring surveys like those conducted in TANZANIA (Foster et al., 1986; Pepping et al., 1988).

c) LESSONS LEARNED FROM THE ASSESSMENTS

i) Programs set up in Africa

The first essential step is to make a concerted effort to resolve the problem for the long term, which means improving the production and consumption of foods rich in carotene and vitamin A, fortifying food, and incorporating distribution of vitamin A to groups at risk into therapeutic
Prevention of vitamin A deficiency

consultations. For the short term, vitamin A distribution programs may be considered.

Few program assessment results in Africa are available. Currently, results concerning the treatment of individuals with measles and the first treatment and prevention programs in Niger and Burkina Faso, which are representative of the Sahel countries, are available as are those from Malawi in eastern Africa.

Published cost-effectiveness studies are not yet available; the models evaluated in the Asian programs (Tielsch and West, 1990) have not yet been applied in Africa.

ii) Distribution of vitamin A capsules

This intervention has proven its effectiveness in good testing conditions. The capsules are mainly provided by UNICEF, at a cost of two cents per capsule. Generally, the intervention consists of a single high dose (200,000 units) distributed at an interval of several months according to three different or combined strategies.

The "universal" strategy is directed at the entire target population, generally children between the ages of one and five; it is implemented every three to six months by specific personnel (vertical programs) or by health center personnel (horizontal programs). The other strategy, known as the "target" strategy, consists of treating children systematically in zones or communities known to be particularly deficient; this method, which is less costly, enables one to reach specifically the individuals at highest risk. One could also target children at the most vulnerable ages (one to three years). Finally, the "medical" strategy consists of treating all children at risk (hemeralopia, measles, respiratory and diarrheal infections, protein-calorie malnutrition) when they come to a health center (hospitals and dispensaries). An alternative proposed by WHO is to associate the administration of vitamin A with the vaccination of young children and breast-feeding mothers (during one month following childbirth). It is essential to record carefully which individuals receive high-dose supplements to avoid giving them several doses close together as a result of the different programs or the combination of different strategies. With the help of recently perfected dose devices (atomizers), one can administer low doses orally on a regular basis; the distribution can then be carried out in the context of programs that provide more frequent contact with the children: growth monitoring, preventing diarrhea, nutrition education sessions. This strategy has also proven to be effective (Underwood, 1990). The problems posed by this approach concern coverage and continuance.

Assessing operations in a Sahel country: In Niger the program began in 1987 in four districts

Doses currently recommended by WHO (FAO/WHO, 1992) are the following:

<table>
<thead>
<tr>
<th>For prevention</th>
</tr>
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<tbody>
<tr>
<td>child 6 to 23 months:</td>
</tr>
<tr>
<td>child 2 to 6 years:</td>
</tr>
<tr>
<td>breast-feeding woman:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>child over one year with signs of deficiency or measles:</td>
</tr>
<tr>
<td>at diagnosis:</td>
</tr>
<tr>
<td>one day later:</td>
</tr>
<tr>
<td>4 weeks later:</td>
</tr>
</tbody>
</table>

for children under one year, decrease dosage by half
The health sector and nutrition interventions in Africa

of the Tahoua and Maradi departments with the aim of preventing nutrition-linked blindness and of treating xerophthalmia through the distribution of megadoses of vitamin A. It was launched in a coordinated effort by the health ministry, the national program for the prevention of blindness, and HKI (Helen Keller International). The first phase consisted of operational research to determine the best way to distribute the vitamin A capsules for treatment and prevention. The treatment consisted of distributing three capsules to children with signs of night blindness, xerophthalmia, measles, and severe malnutrition and one capsule to children with chronic diarrhea. Prevention consisted of distributing one capsule every six months to children under six years and to women who had just given birth (half a dose for children under one).

Two strategies were tested in two strictly comparable regions: treatment and prevention were provided by medical centers and rural dispensaries in one region (target population estimated at 64,000 people), and prevention was overseen by village health workers in the second region (target population of 54,000 people). The two strategies were then compared (Cohen, 1989; Helen Keller International, 1989).

For treatment, rates of coverage increased quickly and remained high throughout the first year of observation, between 50 percent and 100 percent. As for prevention, the rate of coverage fell in one year from 19.9 percent to 14.1 percent in children and from 20.2 percent to 17.8 percent in mothers in the regions covered by the health centers. It increased from 22.8 percent to 60.9 percent for children and from 27.7 percent to 55 percent in mothers in the region where the distribution was the responsibility of village health workers. The rate of coverage was not linked to the distance to the health centers nor to the size of the villages. The system set up routinely by the ministry of health at the health centers or taught to the village health workers to evaluate the number of capsules distributed proved effective. It was not possible to evaluate the impact on the prevalence of blindness or xerophthalmia since they were not measured at the beginning of the project.

Several problems were identified related to capsule distribution. The capsules are provided regularly to the clinic, and the registry of orders and deliveries is largely in order. Capsule delivery to health workers, however, was inconsistent (inadequate in 50 percent of the cases), and the records were incorrect. These workers must be supplied with capsules by the clinics rather than by those running the project. They also need more training in keeping records.

Professional health workers have a good level of knowledge after appropriate training, but their turnover is high and in the absence of periodic training, the level of trained individuals falls again quickly. The village workers are more stable, but their training is too theoretical, and it does not allow them to encounter all the practical problems with which they will be faced: they need shorter but more frequent sessions that meet their expectations.

This project also included a training component on the national level for health professionals, distribution of appropriate educational materials, and intense publicity to improve consumption of foods rich in vitamin A. Knowledge of vitamin A deficiency among the public improved considerably. Health workers did not relay the recommendations to improve production and consumption of foods rich in
vitamin A, however, and this risks reinforcing the notion of the necessity of medical intervention while downplaying the paramount importance of the role of food intake.

In the opinion of one of the evaluators (Cohen, personal communication), this project is a good example of the possible difficulties and success of a program to prevent vitamin A deficiency in a country in the Sahel region. The coverage attained by the village health workers is significant, but it represents the most that can currently be done given the constraints of the terrain and functioning of the health systems; in fact, coverage is still inadequate. It could be increased for women who have just given birth by having older women (traditional midwives) distribute the capsules. For the moment, however, extending the project nationally is still difficult to foresee; vitamin A is on the list of essential medicines in Niger, but bottlenecks appeared in the distribution system to which the individuals running the projects should be attentive. In fact, the project has often had to appeal to independent suppliers to function. Furthermore, this activity is poorly integrated into other activities in the health system, which makes its cost high (figures not available) and its viability uncertain over the long term. The alternative is to link distribution of capsules to the broader vaccination program in which coverage is advancing significantly.

- **Assessing impact in a Sahel country:** In Burkina Faso, HKI launched the largest pilot program in West Africa in 1988. Following a prevalence survey conducted in 1986 (in the Yatenga, Passore, and Sourouet Provinces) which indicated that vitamin A deficiency constituted a public health problem in these regions, training programs (1,800 trainers and health workers), distribution programs to provide capsules every four months (450,000 children and 240,000 nursing mothers), therapeutic treatment programs at health centers for the most high risk children, and educational programs in schools and preschools were set up.

Preliminary comparisons of the rates of xerophthalmia at the end of 18 months between the project zone and the zone that was not covered demonstrated a significant impact on xerophthalmia, which fell to a rate lower than the danger level defined by WHO. Night blindness reportedly fell from 2.22 percent in 1986 to 0.39 percent in 1989. Coverage rates for young children (between one and 10 years of age who had received one capsule during the previous six months) were on average 55.6 percent in the regions covered, which is considered satisfactory given local logistics and the difficulties encountered (Helen Keller International, Burkina Faso, 1989).

- **Assessing treatment in children with measles:** The association between measles and xerophthalmia has been described frequently. Measles increases vitamin A requirements, while the consumption, absorption, and transit of the vitamin is diminished. Measles may result in damage to the cornea. In general, the incidence of corneal damage following measles infection in Africa is estimated to reach 4 percent (editorial, Lancet, 1987). Foster and Sommer (1986) demonstrated with surveys conducted in schools in various African countries (Ethiopia, Malawi, Nigeria, and Tanzania) that half of blind children had measles shortly before they became blind. According to many clinicians, these cases were a direct result of measles, local treatment, or a concomitant herpes simplex infection; according to others, the process was linked to or exacerbated by a latent vitamin A deficiency (Inua and Ross, 1983; Markowitz et al., 1989).
iii) **Fortifying food**

This implies pinpointing with the appropriate survey the basic foods consumed by the entire population at risk. It is necessary to find one food among them that meets the following specifications: it may be fortified at a central location during the course of one stage in its processing; it must be possible to conserve vitamin A in a stable form in the food without changing its flavor or appearance; the enriched food must remain reasonably priced and be easily accessible to the poorest sectors of the population. The principal difficulty to date has been to find the proper medium: monosodium glutamate was used in Indonesia and sugar in Central America; tea was proposed in Pakistan, wheat in Bangladesh, and rice in the Philippines (Underwood, 1990). This type of intervention requires the collaboration of numerous agencies, and the benefits are evident only after several years. It should be supported by intensive nutritional education for populations at risk to popularize the consumption of the fortified foods. Although to a great extent the health sector has failed to grasp the process, health services should be involved from start to finish: identifying the problem and its importance, choosing this solution as it relates to other steps already taken or to be taken, participating in the choice of food to be enriched and the various fortification trials, and educating the population. It should be noted, however, that although this solution was used successfully in the industrialized countries, adopting it definitively and without interruption has not yet been possible in a country where vitamin A deficiency is currently significant. One of the best foods to be fortified is undoubtedly breast milk: if the nursing woman absorbs some vitamin A, it enters her milk and benefits the nursing infant.
Fortified foods in Africa: The list of foods commercially vitamin A fortified in various African countries is rather limited, as is their accessibility. An example is the "Maggi cube" by Nestlé (1400 IU/cube weighing 4 grams), manufactured in Abidjan and distributed throughout West Africa but mainly in the large cities; margarine manufactured by Unilever also in Abidjan; cookies manufactured by VAP in Zaire and Henry's in Morocco (Sight and Life, 1989). Information is lacking on the different foods used for weaning throughout the continent; in theory, there are recommended international standards (Codex Alimentarius, CAC/RS 72, 1976). Last, foods used by the World Food Program (WFP) were fortified with vitamin A (powdered milk, corn-soy-milk flour, cheese, and oil). The specific impact on vitamin A deficiency was not addressed by the studies.

iv) Improving the production of food rich in carotenoids and vitamin A

The availability of foods containing retinol is extremely poor in some African countries, particularly in the Sahel: about 180 micrograms (mcg) is available on average per person on a daily basis in Burkina Faso, while the minimum requirement is 250 mcg for a young child and more than 700 mcg for an adult (FAO food balance sheets, 1980). Livestock and fish are the principal sources of vitamin A, with agriculture and fruit harvests furnishing foods rich in beta-carotene. Although previously quite common along the banks of the Senegal river, vitamin A deficiency has decreased considerably as a result of a policy to plant mango trees and distribute mangoes to markets. The other step generally taken is to develop small gardening. The constraints are the same as those for all agricultural activity in the country: access to land and the availability of water. Most of the programs are not specifically oriented toward production of food rich in vitamin A but rather are part of agricultural development programs with broader goals. A recent table of the composition of African foods gives the vitamin A content of the most common of these (West et al., 1988).

Following establishment of a United Nations assistance plan for countries seeking to prevent vitamin A deficiency, the FAO has been particularly concerned with this problem. Until then, no such wide-ranging program had ever been set up in Africa. But Benin, Burkina Faso, Chad, Malawi, Mali, Mauritania, Niger, Tanzania, and Zambia have formulated projects of this sort since 1988, most of which started in 1991 (FAO activity report, 1991). We do not yet have an assessment of these projects. The FAO also tried to set up regional networks that grouped the responsible health and agriculture officials in East and West Africa along the lines of what was already developed in Asia.

Most of these projects involve an increase in production of fruits and vegetables rich in carotene in family, community, and school gardens and an increase in their consumption thanks to the education of school children and the public in nutrition matters. In Tanzania, faced with a high demand for palm oil (Kavishe, 1987, cited in West and Sommer, 1987), a specific project dealing with production and transformation of this oil was set up. It is still too early to assess the project's results.

In Niger (Ministry of Health/AED/HK 1992) a small social marketing project covering 26,000 people in the Tahoua department resulted in the design of six messages in the form of plays to improve consumption of food rich in vitamin A. These messages were targeted at different
segments of the public: pregnant and nursing women, their husbands, gardeners, community leaders, and development workers. The assessment demonstrated that about 90% of adults who had seen the plays consumed more liver, and 60% gave more liver to their children. Likewise, 89.6% indicated that they were eating more leafy greens, and 60% said they gave more of them to their children. (About half of the children under six years either do not eat leafy greens or eat them less than once a week; some parents think that a child between the ages of zero and 12 months is not yet old enough to eat them.) Coverage was better for men than women: 61% of men and 34% of women said they had seen at least one play.

v) Nutrition education

Every activity aimed at reducing vitamin A deficiency (or promoting the maintenance of a good level of vitamin A) should be accompanied by education appropriate to the target groups, either from within the community or through the media. The purpose is to teach families about the dangers of vitamin A deficiency, foods that may be consumed to prevent it, and the usefulness of monitoring in the mass capsule distribution campaigns. This education initiative should always be preceded or accompanied by adequate training for health personnel who are often still ignorant of the dangers of vitamin A deficiency. In the long run, it should make clear to all who work in development that health initiatives are only palliative and that the solution is to be found in the production and consumption of appropriate foods.

Integrated program assessment in eastern Africa: In Malawi, the Promotion of Nutrition in the Family and the Community project began in 1987 with the assistance of USAID in two regions, one in the center (32,000 inhabitants) and the other in the north (40,000 inhabitants). Distribution of capsules to children at risk and every six months to all village children with the highest rates of xerophthalmia was set up (six months-six years); mothers were not included in the project. Family educational activities via women's groups and school children and the establishment of family gardens were also initiated. The project was integrated into a community development project in the two regions.

Three years later the program was assessed (Save the Children, USA, 1990). The first problem was the absence of a precise formulation of the objectives and under what conditions they would be realized; this is what probably led to the uneven implementation of different parts of the project. It resulted in particular in confusion about who should be responsible for the project, who should be registered and how, and who should collect and analyze the data. The capsule distribution program was disappointing. Not enough capsules were provided, and in view of the low coverage, it would have been better to target the highest risk villages more. In this type of project, it is necessary to set up a well-identified supply network. It was not possible to provide the three doses in a rigorous fashion because different people were involved, and no appropriate form existed that could have allowed some follow-up. This was the case even though the registration was recorded each time on the growth form kept by the mothers and on a special form kept on site at the project. There was a high rate of participation in the family education activities conducted by the women's groups, but the content was focused more on home economics and vegetable gardens while neglecting topics such
as nutrition education itself, feeding a young child, identifying malnutrition, and using the health and nutrition rehabilitation centers. The women's groups achieved very encouraging results in the establishment of vegetable gardens, but evaluating them in quantitative terms was difficult because the number of gardens was not originally inventoried. A strategy to create a seed fund to encourage these gardens was short-lived due to the community's lack of involvement in the process. Although the school gardens worked, they ran into problems due to a lack of water and seed, and a significant part of the harvest was sold by the school teachers.

The project was successful at promoting production of agricultural products rich in vitamin A, particularly during the dry season, and some consumption; the goal is sustainability involving groups active in the community (women's groups, development assistants) and the broad coordination of different agricultural and health services, despite a lack of training, supervision, and follow through at the highest levels (district and national). A targeted educational campaign with incentives to consume foods rich in vitamin A directed toward the individuals with the highest risk—pre-school-age children and pregnant and nursing women—was lacking. Also, no cost assessment was performed in this study.

A program was implemented in another region of this country (IEF, lower Shire valley) that included the distribution of capsules every six months to children and their mothers. It was supported by women volunteers chosen by the community, each of whom was responsible for about 50 families; this program was at the halfway point in 1991. It has achieved coverage of 94 percent of children between six months and six years and 88 percent of mothers (during a two-month postnatal period). The project also provided for the training of medical ophthalmic assistants, health monitoring assistants, and village health workers in the vitamin A area. An extension to create vegetable gardens is underway (Vitamin A News Notes, spring 1991).

In Mali, in the context of an integrated health project with the participation of the SCF, a survey on the prevalence of vitamin A deficiency and the consumption of food containing this vitamin was conducted in 1990 (Kolondiéba circle). Twenty-four foods rich in vitamin A were identified, the market prices of which were compatible with household purchasing power. The risk of vitamin A deficiency, clearly identified locally, is linked to the late introduction of weaning foods. Following this survey, the "medical" strategy for children at risk (infectious disease, malnutrition) and training of health personnel to promote an adapted supplement earlier was proposed (Vitamin A News Notes, spring 1991). Training activities were also undertaken in the two other health projects administered by the NGOs (CARE and Africare) that incorporated a vitamin A component in Macina and Dioro. A social marketing strategy is being elaborated for food rich in vitamin A to stimulate community interest in the problem.

The results of the survey conducted within the framework of the Macina project (Vitamin A News Notes, winter 1990) demonstrate that in this region improving the consumption of foods rich in vitamin A is possible under the following conditions: sauces may easily be fortified in vitamin A by increasing the quantity of green leaves, liver, or squash used; it is necessary to see to it that children eat this sauce regularly. Although the results of education based on these principles have not yet been evaluated, it already seems that the level of acceptance is high, which was not the case with the medical measures that were initially stymied by the population's
skepticism about their effectiveness. Tests conducted on market days based on the purchase of food rich in vitamin A were designed to reinforce the practical application of nutrition education messages.

d) COSTS

According to Horton (1992, p. 28), the cost of fortifying sugar with vitamin A in Guatemala was 14 cents/person for one year of protection (U.S. 1987 dollars), while the distribution of capsules cost between five cents and 68 cents per person for a year of protection (in Bangladesh and Haiti).

The capsules purchased by UNICEF cost 2 cents per unit (1993).

2. Prevention of iron deficiency

a) FINDINGS AND RECOMMENDATIONS

- Although iron deficiency is a widespread health problem in Africa, preventive measures are rarely implemented on a national level. Most African countries provide pregnant women with iron supplements, but coverage of the population at risk is generally inadequate. In addition, measures to prevent malaria and parasitic diseases are rarely implemented.

- The first obstacle to setting up such programs is the decision makers' lack of information concerning the relationship between the expected benefit of a program and its relatively low cost. This problem affects many institutions, but few federative bodies are able to apply their accumulated experience to decision making.

- Whether a program is sustainable depends initially on resolving the problems of coverage of a target population and securing an adequate supply of iron tablets. Providing iron tablets should be made part of the national program to supply essential medicines and should be rigorously managed.

- Another problem that affects a program's effectiveness is patient compliance with the full treatment program. Providing health workers with information and communications training and broadly informing community leaders in this area should contribute to improving compliance.

- There is more than one solution to the problem of iron deficiency; a variety of resources should be used in combination to resolve the problem, beginning with providing iron supplements to risk groups, followed by preventing infections and parasites, educating people to increase their intake of iron-containing foods, and fortifying basic foods with iron or increasing iron's bio-availability to provide a definitive long-term solution to the problem.

- In the short term, countries should set up oral supplementation programs for pregnant women, the most important risk group; in most cases, a multietiological treatment program should be provided at the same time (including antimalarial and anthelminthic measures, folate supplementation, etc.).

- Success depends on providing personnel with a clear plan of action which includes treatment and prevention criteria, dosage levels, referral criteria, criteria for maintaining a good
Prevention of iron deficiency

A small-scale pilot test under local conditions is advised to ensure that the recommended measures are effective before applying them on a larger scale. The transition to a large-scale program, however, should be monitored closely, and its impact should be evaluated on a regular basis.

In the case of young children, when supplementation is planned only for regions where anemia is very prevalent, intervention will be limited elsewhere to encouraging breast-feeding for as long as possible and favoring the intake of ascorbic acid on a regular basis through the consumption of fresh fruits and vegetables, which promotes the absorption of iron. The problem of iron deficiency should be addressed in every educational program dealing with child feeding practices.

Iron deficiency is a structural problem given the type of food consumed in most African countries. While supplementing pregnant women with iron may be characterized as the most urgent step to be taken, solutions that address the core of the problem should also be sought, such as fortifying one or more foods and implementing anthelminthic programs. Given the benefits expected for children in terms of their intellectual development and adults in terms of their physical ability, these measures should be a priority in countries equipped for this type of intervention.

b) Iron deficiency in Africa

i) Consequences of iron deficiency

Iron is found in two areas of the body: in the blood and stored in the liver, spleen, and bone marrow. The body uses these sources only as a reserve to replace physiological losses.

ii) Iron absorption

The absorption of iron from food sources depends on the type of food and meals as well as reserve levels. Diets based on cereals or roots and tubers and that include a negligible amount of meat, fish, or foods rich in ascorbic acid have a high level of nonheminic iron, but with a low degree of bio-availability (absorption on the order of 5 percent or less) (FAO/WHO, 1989). In theory, the African diet overall is rich enough in iron to meet dietary requirements. In practice, the iron has a low level of bio-availability, since the diet is poor in foods of animal origin except for hunters, fishermen, or people who consume an abundant amount of vitamin C (Hercberg et al., 1987; Fleming, 1989). It is not unexpected, therefore, that iron deficiency is widespread.

The bio-availability of several food dishes was measured recently in Zaire, Benin, and Senegal (Galan et al., 1990; Galan et al., 1991; Guiro et al., 1991); it varied from 1.1 percent to 6.6 percent. The long cooking times usually destroy the ascorbic acid content. Adding ascorbic acid to the diet on a regular basis alone can increase iron absorption to about 10 percent.

Although the average iron content of breast milk is rather low, bio-availability is very high (50 percent); breast-feeding thus protects the nursing infant against developing an iron deficiency in the first four to six months of life (FAO/WHO, 1989). The bio-availability of iron in cow's milk is lower: it ranges from 10 percent to 20 percent.

In adults, iron deficiency leads to a diminished ability to work and lower productivity,
even when anemia is not present. The deficiency usually goes undetected, although the individual may feel a certain fatigue. Studies have demonstrated the impact of supplementation and its excellent results in terms of cost effectiveness (Scrimshaw, 1991). There are no references available for Africa in particular, and there is little data concerning the prevalence of iron deficiency in men (see Bénéfice et al., 1980, for data on anemia).

- In pregnant women, anemia is known to cause death or complications during delivery (prematurity, placenta hypertrophy) and to result in a higher incidence of low birth weight; its exact role in Africa, however, cannot be assessed. A pregnant woman may develop anemia during pregnancy even if she is not anemic at the beginning; conditions during labor and delivery may also have a significant impact on maternal anemia (postpartum hemorrhage) (Maire et al., Dakar, 1982). A premature newborn will become iron deficient more quickly. Although the newborn does not need iron for the first six months of life, there is a link between the mother’s iron reserves and those of the infant (Ajayi, 1988, for example), and an infant born to a deficient mother will need iron supplements before the age of six months. For this reason, pregnant women as a whole are considered a priority group. Young women who have not yet reached maturity who are giving birth for the first time are considered particularly at risk.

- In children: During the first year, a child triples his body weight and doubles his iron reserves. The reserves present at birth are thus completely mobilized for growth at 4-6 months. After six months, the child needs to increase his iron intake, but the cereal-based porridge provided at that age is rather low in bio-available iron. A number of studies have shown that iron deficiency at a young age results in changes in motor development, learning, and behavior (inattention, fatigue) in addition to anemia (see Scrimshaw, 1991).

iii) The prevalence of anemia and iron deficiency in Africa

The only data available from health centers concern the prevalence of clinical anemia (not very reliable) or laboratory-determined anemia (according to thresholds arbitrarily assigned by WHO). Etiological studies conducted to date have shown that anemia frequently has multiple causes in Africa, among them malaria, bilharzia or ancylostomiasis, iron and/or folate deficiency, a hereditary hemoglobin production anomaly (drepanocytemia or thalassemia), protein-energy malnutrition, and — even more recently — AIDS (Hercberg et al., 1987; Fleming, 1989).

Published data were reviewed by DeMaeyer and Adiels-Tegman (1985), Hercberg et al. (1987), and WHO (1989): in 1980 in Africa, approximately 165 million people of a population of 405 million could be considered anemic. Prevalence varied from 3 percent to 100 percent, depending on the region, age, and sex, with averages on the order of 27 percent to 60 percent. The data should not be considered representative, and the actual prevalence of iron deficiency, which is generally based on the prevalence of anemia, is certainly underestimated.

Representatives of 10 countries met in September 1989 at an African regional meeting to discuss the prevalence and causes of anemia in Africa and to propose a course of action, particularly for pregnant women (WHO, 1989), with the express purpose of "eliminating severe
Table II. Epidemiological criteria for evaluating the severity of anemia in a population

Prevalence in the population by percentage such that the problem is considered:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Severe</th>
<th>Moderate</th>
<th>Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate anemia* or hematocrit &lt;33%</td>
<td>&gt;40%</td>
<td>10-39%</td>
<td>1-9%</td>
</tr>
<tr>
<td>Severe anemia (Hb &lt;7 g/dl)</td>
<td>&gt;10%</td>
<td>1-9%</td>
<td>0.1-0.9%</td>
</tr>
<tr>
<td>Serum ferritin (mcg/l)</td>
<td>&lt;12</td>
<td>&lt;12</td>
<td></td>
</tr>
</tbody>
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a. Hb <11 g/dl pregnant woman
   11 g/dl young child
   12 g/dl school-age child or adult woman
   13 g/dl man


Anemia by the year 2000 and reducing the prevalence of moderate anemia." Their report illustrates the extent to which data are lacking for the continent; Fleming believes that in addition to the numbers resulting from isolated measures, which vary a great deal, the prevalence of anemia is probably on the order of 50 percent to 60 percent for pregnant women as a whole. Most African countries provide an iron supplement to pregnant women, but coverage of the population at risk is generally low; additional measures to prevent malaria and parasitic diseases are not always implemented. No assessment of the current programs is available.

c) LESSONS LEARNED FROM THE ASSESSMENTS

i) Trials on emergency treatment

In cases of emergency (i.e., pregnant women who schedule prenatal visits late in their pregnancy, who demonstrate a lack of compliance with oral treatment programs, or who are severely anemic), treatment by injection may be initiated; this step should be limited to hospital-type institutions. Several teams have shown that an intramuscular injection given once or in several doses (Ogunbode et al. in Nigeria, 1980; Kaisi in Tanzania in 623 pregnant women, cited in WHO, 1989) is completely effective and well tolerated. Jenkinson in Zambia (1984) compared giving a single injection of iron dextran at the beginning of pregnancy (133 women) to giving iron sulfate supplements orally (142 controls): hemoglobin was elevated in 84 percent of the cases in the first group compared to 56 percent in the control group. Due to the risk of AIDS, however, the tendency is to limit injections in areas where cost considerations make guaranteeing the usage of disposable syringes difficult (DeMaeyer et al., 1989).

ii) Trials on supplementation effectiveness

Direct iron supplementation through medication has the benefit of leading to a very rapid correction in iron deficiency, and it may be used easily to target risk groups. It is also administered in a very systematic fashion: via
ferrous sulfate tablets (possibly in conjunction with folic acid) given to pregnant women, older children, and adult men (or a dextran iron injection in the most severe cases) and a liquid preparation for very young children (DeMaeyer et al., 1989; WHO, 1989; ACC/SCN, 1990).

In pregnant women: A number of controlled trials were conducted in Africa to verify the effectiveness of various proposed treatments:

In Liberia, Jackson and Latham (1982) provided oral iron supplements of varying dosage levels to 621 pregnant women during their third trimesters (for 12 weeks) (1 x 60 mg or 3 x 60 mg per day). In every case, the treatment moderately increased hemoglobin levels and decreased the prevalence of anemia from 78 percent to 45 percent. In Nigeria, Ogunbode et al. (1980) also showed that a 40 mg dose of iron (200 mg of ferrous sulfate) given orally on a daily basis seemed to be sufficient to prevent iron deficiency during pregnancy. Higher doses do not provoke a more rapid hematological response and may lead to gastrointestinal problems. Fleming (1987) believes, however, that it is advisable to double or triple these doses if one wants to replenish substantially iron reserve levels, as in the case of northern Nigeria, for example.

Hercberg (personal communication) recently supervised a supplementation trial of pregnant women (in their sixth month) in Niger in accordance with international guidelines. The number of women with anemia and with insufficient iron reserves fell. The improvement was still detectable three months after delivery in this group when compared with a control group receiving no supplementation. The newborns in both groups, however, had identical iron reserve and hemoglobin levels. Brunengo et al. (1988) in Niger measured the iron reserve levels of pregnant and nursing women before and after they were treated with supplements of moderate levels of iron given orally (400 mg of fumarate per day) for one month. The level of iron deficiency in the group went from 22 percent to 8 percent, but only half the women agreed to participate in the study through its completion. These results illustrate the extent of iron deficiency among the population of the Sahel and the need for a systematic treatment program. They also underscore the difficulty of successfully implementing such a program.

In northern Nigeria, Fleming et al. (1986) compared the respective effects of different programs that included iron and/or folate antimalarial treatments with a group receiving no treatment. They concluded that pregnant women in the Sudan and Sahel regions should be systematically treated with antimalarial drugs and an iron-folate mixture to reduce the risk of anemia during pregnancy, preterm delivery, and low iron and folate stores in the nursing infant. Approximately 70 percent of pregnant women with anemia responded to a combined treatment program of iron and folate supplements and antimalarial drugs in Nigeria (Fleming, 1989). According to Fleming, as a result of resistance problems in a number of African countries, the appropriate preventive measure is to use proguanil.

Women’s compliance with long-term treatment is an essential component of the success of a treatment and prevention program: 55 percent of women in the study of Brunengo et al. (1988) and 64 percent in the study of Fleming et al. (1986), for example, agreed to continue with the treatment until it was completed. Nyazema in Zimbabwe (1984) demonstrated that this is
fundamental to most long-term medical treatments: patients need to know something about their illness, why and how they are being treated, what to do if treatment is momentarily interrupted, etc. It is essential that health workers intervene to advise them throughout the treatment process.

- **In young children:** Few iron supplementation trials have been conducted in young children in Africa. Smith et al. (1989a) treated anemic young children in Gambia in 13 villages during the rainy season when malaria transmission is at its highest rate. The mothers were asked to give 3–6 mg/kg of iron per day to each child in the form of syrup or tablets dissolved in fruit juice. Community health workers supplied the weekly doses to each mother and advised them about storage and avoiding overdoses. The group was supplemented for 12 weeks while a control group received a placebo. Anemia in the control group worsened, but the complete blood profile and iron reserve levels of the group receiving treatment improved. This study demonstrates the effectiveness of treating young children with oral supplements and the possibility of having the mothers themselves administer the treatment under the supervision of community workers.

- **In school-age children:** Older children no longer constitute a risk group. Children in school, however, are a captive population that is easy to give supplements to with teacher participation. WHO recommends this course of action. A study of the impact of this type of supplementation in children in primary school in Kenya (Latham et al., 1990) is available. Supplements were administered for 32 weeks on a daily basis (excluding weekends and holidays), and the presence of bilharziasis was carefully ruled out. Although the number of children involved was small (29 received supplements, and 26 were controls), there was a significant increase in hemoglobin levels and improvement in growth in terms of height and weight, thereby confirming results obtained elsewhere. A shorter study (four weeks) was conducted in Benin (Preziosi, 1990) in which 347 infants in the COTONOU district received an elemental iron supplement of 50 mg five days/week. The impact on hemoglobin and iron levels was relatively limited. It is possible that the dosages were too low, the study too short, or that infections that are prevalent during the rainy season interfere with iron levels; additional studies suitable for each environment are necessary. A second study was conducted in Benin the aim of which was to increase vitamin C intake to promote iron absorption; participants consumed one orange daily for a period of two
months. There was no dramatic impact on hemoglobin levels, although ferritin levels were significantly higher at the end of treatment (Hercberg, personal communication). In this age group, an intervention to prevent intestinal parasites may be very effective in decreasing the prevalence of iron deficiency in communities that have been greatly affected (Bundy, 1991) and consequently in reducing the incidence of anemia.

iii) Analysis of the effectiveness of routine supplementation

The effectiveness of routine supplementation provided along with prenatal care in Africa is rarely evaluated. Okafor et al. in Nigeria (1985) examined the bone marrow of 31 pregnant women who delivered children at the same time in a community in which anemia due to iron deficiency is common and where iron and folate supplements are given orally on a systematic basis at the beginning of pregnancy. Ninety seven percent of the patients were still iron deficient, and thirty five percent demonstrated megaloblastic changes in their marrow despite the treatment. According to the authors, although many explanations are theoretically possible (absorption inhibitors in the diet, additional food sources low in iron and folate, dosage levels that were too low), it seems clear that noncompliance is the issue. Even if pilot supplementation trials have largely demonstrated the effectiveness of this type of intervention, the effectiveness of making it part of programs on a routine basis should be carefully analyzed. This is the case even when target group coverage is satisfactory.

In reference to the above, Gove et al. in 1987 in Somalia (cited by Morrow, 1990) cited the following factors: stomach problems and the bad taste or lack of the tablets’ availability; most important, a large number of women mentioned voluntarily restricting their intake out of fear of having an oversized baby. A much broader educational approach to nutrition problems linked to pregnancy is necessary in such cases. This lack of compliance is partly a function of the dosage: low doses are better tolerated. To offset the discomfort caused by the supplements, tablets with slow gastric release (gastric delivery system or HBS; hydrodynamically balanced system; ACC/SCN, 1990) were marketed; there are no studies available on this topic in Africa.

A lack of compliance was noted even for the placebo group; however, noncompliance is not related to the discomfort linked to the iron tablets alone. This goes back to the more general studies that were conducted on this issue (Morrow, 1990; Galloway, 1990). Logistical problems are one factor regularly mentioned in every program in almost every region of the world, including a shortage of tablets and the distance to the health center. But Taylor and Mutambu (1987) in Zimbabwe showed that compliance with the entire treatment did not exceed 52 percent in a malaria prevention program, which was otherwise very well executed by a trained and motivated staff. The other difficulty is to convince an individual who no longer feels very weak to continue with treatment for several months; only repeated explanations of the necessity to do so will counter noncompliance in this area. Elegbé et al. in Nigeria (1984) demonstrated that listening carefully to women in the program, in conjunction with an effective and clearly explained treatment program designed to respond to the mothers’ initial perceptions, can contribute to changing participants’ attitudes. Gove observed that the distribution of iron tablets by trusted traditional midwives improved compliance. Greenwood
Prevention of iron deficiency

(1989) made the same observation for a malaria prevention program.

According to the 1989 WHO report, among the constraints on running effective programs is the training of personnel (Benin, Gambia), the lack of supervision (Congo), and most important, an inadequate supply of medicines (particularly iron and folate) (Benin, Gambia, Tanzania, Zambia), whether due to the lack of available financing (Tanzania) or logistical problems (Gambia). Infrastructure problems do not seem to be an issue, although there are frequent staff shortages. Coverage constraints seem to be surmountable as far as the target group of pregnant women is concerned, although coverage is still inadequate in areas where a plan of action has not been vigorously implemented; it has gone from 22 percent to 90 percent in the JNSP (Joint Nutrition and Supplementation Program) in Mozambique, to 90 percent in Gambia, and to 85 percent in Tanzania. Coordination as alluded to above is a key problem: in Tanzania, numerous pilot trials and research efforts are carried out in a disorganized fashion, due to the numbers of institutions involved and the lack of centralization of efforts and results. Nigeria, confronted with the difficult task of coordinating prevention efforts in a variety of areas, set up a specific committee on the federal level to combat noninfectious diseases, including anemia (WHO, 1989).

- **The costs of supplementation**: The cost of iron tablets (60 mg) and folate tablets (250 mcg) supplied by UNICEF in 1989 was $1 for a package of 1,000 tablets originating in Copenhagen. The cost on the open market for doses of 60–100 mg of iron was $4 to $10 per 1,000 tablets (in Zimbabwe, the cost was $Z 7.3 per 1,000). With a basic course of treatment consisting of about 250 tablets, the total cost of the tablets is between $0.25 and $5 per person. Tablets with slow gastric release, which are more effective, are also more expensive (between two and 10 times more depending on their origin). At a tablet cost that is twice as high, the treatment cost remains the same, since it requires half as many tablets. No data are available on the costs of a large-scale program in Africa. Providing pregnant women with supplements at the time of their prenatal visits, which are already scheduled, certainly does not involve any additional operating costs aside from the purchase of the medication.

- **Cost-effectiveness**: Based on data collected in 1980, Levin (1986) calculated that an increase of 10 percent in hemoglobin levels in a population following the consumption of the appropriate foodstuffs fortified with iron in Kenya could lead to a theoretical gain of $43 of additional annual revenue per person; an increase in hemoglobin levels of 25 percent following an oral supplementation program would lead to a gain of $107, also according to Levin. These numbers are based on productivity gains in agricultural workers during experimental studies available and are a theoretical view of the problem. No actual data exists.

iv) **Fortifying food**

- **Increasing energy intake** whenever it is inadequate is the simplest way to augment available iron intake; augmenting food intake alone will lead to an increase in iron intake. Even if the iron is not very bio-available, when a large quantity is absorbed, it may serve to meet requirements. The shortest-term intervention is to guarantee sufficient energy intake. In most cases, however, simply fortifying a basic food is an essential step. Young children are at highest risk during the weaning stage, between six and 18 months. Commercially prepared weaning foods
are often enriched with iron and ascorbic acid; the majority of the population, however, does not have access to such foods, and they are also relatively expensive. The CSM (Corn, Soya, Milk), a weaning food that is widely used in USAID and CRS (Catholic Relief Services) supplementation programs in Africa, is enriched in ferrous fumarate.

- **Increasing bio-availability** is another way to increase the amount of iron that children absorb from food. It may be achieved through malting or fermentation (DeMaeyer, 1989), both of which result in an increase in vitamin C content and a lowering of tannin and phytate content. Svanberg and Sandberg (1989) have shown in Tanzania that in a sorghum-based diet, with a low level of bio-availability, procedures like soaking, germination, or fermentation activate phytase to such a point that a moderate to high degree of bio-availability is achieved (an effect similar to adding meat or a large amount of ascorbic acid to the diet).

- **The cost of fortifying food** is initially lower than that of supplementation: recurrent costs are also low. Therefore, it is certainly the most cost-effective measure (DeMaeyer et al., 1989). In countries with widespread iron deficiency, the cost of supplementing a large segment of the population would be a significant health care expense, which would be unjustifiable in terms of other priorities; as such, only food enrichment is currently possible. Trials to fortify salt with iron and iodine were conducted in Asia with encouraging results.

v) **Other prevention methods**

- **Prevention of parasites through improved hygiene**: Preventing infection of any kind (anthelminthic measures, wearing shoes, control of diarrheal illnesses) represents a possibility to limit iron loss, especially in young children. The problem with preventing helminthiasis (bilharziasis, ancylostomiasis, trichocephaliasis, etc.) is that anthelminthic medicines are expensive and their effectiveness is short-lived if steps are not taken to eliminate the sources of infestation elsewhere. Even if parasites are not eliminated, iron supplements are more effective than anthelminthic treatment alone in increasing hemoglobin levels. Few studies conducted in Africa are available, particularly for school-age children (see Stephenson, 1987).

- **Nutrition education**: Taboos about food may have a significant impact on iron levels; Jackson and Jackson (1987) noted that while food rich in folate is widely consumed by pregnant women in Liberia, there are still restrictions on consumption of game and food rich in ascorbic acid. Ojofeitimi et al. in Nigeria (1982) conducted research on the extent to which nutrition education was able to modify harmful eating habits during pregnancy, particularly the tendency to reduce energy intake because of the fear of delivering an oversized baby. They showed that it was possible to change this practice with appropriate education aimed at countering these fears.

- As for young children, the simplest plan of action involves maintaining breast milk intake for as long as possible (iron that is highly bio-available) and incorporating vegetables or fruits rich in vitamin C on a regular basis. Achieving a good level of compliance with these recommendations again involves health workers who provide repeated explanations and encouragement. These recommendations may be integrated easily into nutrition education programs.
designed for mothers and their young children; setting up special programs is not necessary.

- **Family planning:** Delaying the first pregnancy until a prospective mother is physically mature, and spacing children to allow iron reserves to be replenished, are logical and effective steps that justify linking family planning to the prevention of iron deficiency. However, no studies have demonstrated the real effect of such measures for a given population in Africa.

3. Prevention of iodine deficiency

a) **Findings and recommendations**

Iodine deficiency is currently "the most avoidable cause of delayed intellectual development globally" (Stanbury, ref. idem Hetzel, 1988: 116-119). Of the deficiency diseases, it is certainly among those that could be eliminated relatively quickly.

- Science and improved technique have produced all the answers needed to provide for the effective control of this deficiency disease inexpensively, at no risk to health, and based on simple techniques that are easy to implement. It is mostly a question of political will. The obstacles encountered to date include, first, a lack of understanding of the problem by political leaders who consider it more of an aesthetic issue (goiter) than a serious public health problem, although even a marginal iodine deficiency has an impact on intellectual capacity. Second, iodized salt programs have had problems that discouraged health officials who were not managing them well. The lack of trained personnel capable of addressing the issues of laboratory supervision, salt iodizing techniques, etc., constitutes another obstacle to countering this disorder. Most important, the task of informing the public has been neglected. Informing populations at risk is a priority; this is the only way to maintain the persistent pressure on authorities that will lead to implementing and maintaining preventive measures over time (and thus is the only way to ensure their success).

- The following six stages were outlined based on an analysis of the difficulties encountered in programs conducted to date throughout the world. They are summarized by Hetzel (Hetzel, 1988) from the development of a prevention program for Iodine Deficiency Disorders (IDD):

1. **Choice of strategy based on the extent of the problem:** In general, when local conditions include disorders caused by marginal to moderate iodine deficiency, iodizing salt or other foodstuffs as quickly as possible should be recommended; in cases of severe deficiency, treatment with iodized oil should be initiated.

One must estimate first the exact extent and severity of the iodine deficiency in the country. At the very least, a representative survey (on the district level) should be conducted of a reference group, such as children between the ages of 10-15 years, including the collection of reliable epidemiological data accompanied by water, urine, and, if possible, circulating thyroid hormone (T4 level) analyses. Laboratory facilities are useful for preparing and tracking the program; they are not absolutely necessary to initiate it, however. Expensive equipment may be purchased together for use on a regional level ($30,000 worth of investment for automatic dosages of urinary iodine) (WHO/UNICEF/ICCIDD, 1989).

It is also necessary to study the salt production and distribution situation in the country and
to identify the best iodizing method to be able to compare the possible benefits linked to each type of intervention and their respective costs. For countries that import most of their salt, it is very important to ask the government to take the necessary legal steps so that all imported salt is iodized and to ensure that the laws are obeyed.

2. These results should then be incorporated into a large publicity campaign aimed at health workers and the public.

3. A national action plan should be developed involving all sectors after discussion of the different possible alternatives and cost considerations that takes into account possible aid from specialized international agencies. A national committee to prevent iodine deficiency disorders should be established and invested with the authority necessary to fulfill its mission before any broader programs are implemented. The health sector should push for its establishment, and the committee should include all sectors so as to involve the maximum number of potential actors in the program to be established.

4. Effective political support should be sought at the highest levels to guarantee that the program’s leaders have the necessary authority.

5. Steps to organize staff training programs, necessary resources, and program implementation should be taken.

6. Upon completion, the program should be appropriately assessed.

Too often, some steps are not followed, which makes it difficult to complete a program efficiently and successfully. One of the determining elements underscored in most programs is the presence of one or more individuals who are charismatic, very dedicated, and able to inspire and sustain enthusiasm during the entire course of the project.

- It is particularly important not to establish a vertical program to avoid artificially prolonging these programs. In fact, integrating a program into the expanded program of immunization (EPI), food inspection services, or other programs in existence avoids the problem of vested interests that may arise when, for example, the capsule distribution program must be reduced because salt is currently iodized.

- Programs that work best from the beginning have a solid central organization; one should still aim to integrate them into existing structures to minimize costs and guarantee their durability. The integration of the iodized oil distribution program into the vaccination program with which it shares some characteristics is possible; nevertheless, the target group is not the same and the treatment should be limited to risk zones, unlike the vaccination program. One must also make sure to avoid the simultaneous distribution of vitamin A and iodized oil (given orally) because there may be some incompatibility: a massive iodine dose is capable of destroying vitamin A’s double bonds.

- The medical solution is of interest because it does not require one to wait for decisions from other sectors, which often involves a significant delay; it may be implemented quickly. Although the only long-term solution to the problem of iodine deficiency is fortifying salt or another foodstuff with iodine, the medical professional should not ignore the problem simply because it cannot resolve it fully.

- The distribution of iodized oil by mouth has proven to be a good solution; it provides only
Prevention of iodine deficiency

one year of coverage but does not require highly specialized staff; as such, it may be integrated into a treatment and prevention program by community health workers or within the community (schools). It is less expensive than intramuscular injections if staff not hired for that specific purpose are used; if not, the number of visits necessary makes this a more costly solution.

From the beginning of the process, the projects should consider all of the treatment "chapters" and solicit appropriate funds: iodizing salt, megadoses, training, supervision, communication, and research. Standard plans were prepared by an appropriate institution, which is able to furnish high-level technical advice (ICCIDD).

b) CONSEQUENCES OF IODINE DEFICIENCY

Hypothyroidism that results from an iodine deficiency is manifested in adults by apathy and a decrease in mental functioning; this may be corrected with iodine supplements. In children, from the moment of conception, iodine deficiency may result at the very least in a decrease in IQ in addition to a variety of forms of cretinism linked to a permanent change in the brain, which is characterized by spastic diplegia, mental retardation, and deafness alone or in conjunction with muteness. This deficiency is often more prevalent among women, probably for hormonal reasons. An iodine deficiency in a pregnant woman may lead to the death of her fetus or newborn or to a congenital deformity. Postneonatal mortality is also elevated in zones where the deficiency is common.

When the deficiency is marginal, it may go undetected. It may alter the growth of children in the community, however, thereby reinforcing the impact of malnutrition on growth. The mental ability of apparently normal children living in zones of iodine deficiency may also be diminished. From this perspective, the prevention of iodine deficiency in pregnant women is vital.

c) ETIOLOGY

The principal cause is an iodine deficit in the environment, which results in a low level of iodine in drinking water and locally produced food. Some vegetables also contain goitrogenic elements (corn, sweet potato, cabbage, and some types of cassava that are rich in linamarine, whose main metabolite is thiocyanate, the goitrogenic effect of which has been widely shown in the north of Zaire [Delange and Abluwalia, 1983]). But if iodine intake is adequate, the thyroid can adapt to an overloading of thiocyanate without developing hypothyroidism or goiter (Cliff et al., 1986 in Mozambique), and in most cases iodine supplementation corrects the disorder. The presence of goitrogenic foods is one more reason to insist on a high level of iodization in salt.

d) PREVALENCE IN AFRICA

Almost all African countries (41, according to Hetzel, 1989) have zones that are known to have a high prevalence of goiter. A broad region of iodine deficiency varying in severity extends across the entire center of the continent, from Nigeria to Senegal in the west and from Ethiopia, Tanzania, and Kenya in the east; the entire southern plateau is an area of moderate deficiency, including vast zones in Zimbabwe, Botswana, Mozambique, and Madagascar. In 1987, Tanzania, Kenya, Ethiopia, Sudan, Zambia, and Zimbabwe were the only countries that had data on a national level (Ekpechi, 1987). There is still little data available on the Sahel region or other countries in eastern Africa, except for the centers of severe deficiency that have been recognized for some time and that persist despite
The health sector and nutrition interventions in Africa

Table III. Epidemiological criteria for evaluating the severity of iodine deficiency in a population

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Severe</th>
<th>Moderate</th>
<th>Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Incidence of goiter (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(in school-age children, 6 to 12 years):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (grades 1 to 3) (total goiter)</td>
<td>&gt;50</td>
<td>20-49</td>
<td>10-19</td>
</tr>
<tr>
<td>Visible (grades 2 to 3) (visible goiter)</td>
<td>&gt;10</td>
<td>5-9</td>
<td>1-5</td>
</tr>
<tr>
<td>B. Urinary iodine (median, mg/l)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;20</td>
<td>20-49</td>
<td>50-99</td>
</tr>
<tr>
<td>C. Thyroid stimulating hormone (TSH): % &gt; 5 mcg/l</td>
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<td></td>
<td></td>
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<tr>
<td>(adults or infants, not neonatal)</td>
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<tr>
<td>D. Prevalence of cretinism (%)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;1</td>
<td>&lt;1</td>
<td>0</td>
</tr>
</tbody>
</table>


sporadic or isolated interventions (Brown et al., 1990, Zaire).

c) PREVENTION AND TREATMENT

There are two main methods of preventing iodine deficiency; they have amply proven their effectiveness. In the short term, for either emergency situations or isolated communities that cannot easily reach sources of fortified food, iodized oil is administered. In the longer run, the solution is to fortify foods that are broadly and regularly consumed, which usually means salt. The strategy officially adopted by the regional WHO bureau for Africa is to fortify salt with iodine wherever possible, while providing zones that are prevalent in iodine deficiency with iodized oil treatment programs. To date, the lack of political will needed to ensure that the programs run well has been an obstacle, resulting particularly in a lack of essential coordination among various sectors. An important step was taken with the creation of a task force for the prevention of iodine deficiency in Africa, comprising three subgroups: West Africa (Pr Ekpechi, Nigeria), Central Africa (Pr Lantum, Cameroon), and East and Southern Africa (Pr Kavisbe, Tanzania). A regional strategy and action plan was established at the same time (WHO, 1986).

i) Distribution of iodized salt

Salt is the only foodstuff that is consumed in a more or less constant amount throughout the year by all members of society regardless of social class. Production sites for salt are among the most centrally located, compared to those for other foods. Finally, salt is one of the rare foods that reaches even the most remote regions.

In practical terms, the problem is in making this product available to populations isolated in mountainous or semidesert areas. Other constraints include preserving the iodine content of salt, especially in humid climates (regular inspection is essential), and verifying treatment effectiveness.
Although these issues are outside the technical domain of the health sector, their consideration should underlie decisions made concerning the implementation of a distribution program. The health sector should encourage efforts to coordinate the various sectors to implement the distribution program successfully, inform and educate consumers, verify that the program is working, and measure the health advances achieved.

The cost of iodizing salt at a salt treatment center that has already been set up involves in general a surcharge of $5 to $12/ton, that is, about $0.024 to $0.06 annually per person. Local market prices, however, may differ: in Congo, iodized salt sold in the endemic zone is about 20 percent more expensive (African Task Force, 1990).

ii) Administering iodized oil by mouth

A capsule is given by mouth once every 12 months. For this method, staff do not need as much training as in the case of injections. In addition, the risk of viral transmission linked to injections may be avoided. Currently, to avoid the possible toxic effects of administration by mouth, using small quantities (0.1 to 0.25 ml for nursing infants and 0.5 ml for all others), which provide about one year of protection, is recommended. Tests conducted in Kirotshe, Zaire were conclusive (WHO/UNICEF/ICCIDD, 1989) and are being carried out on a larger scale.

A recent alternative, which is even less expensive than iodized oil capsules (by 20 percent), is administering vaporized iodized oil by mouth (ORIODOL, Guerbet Laboratories). This technology is relatively recent and has not yet been implemented on a large scale.

iii) Administering iodized oil individually by injection

A single intramuscular injection is given, which prevents deficiency for three years (one injection of 0.5 ml for children under one year of age and 1.0 ml for those over one year). The target group comprises all females from birth to age 40 and all males from birth to age 20 in communities affected by the deficiency. Dosage amounts vary with age; after age 40, injections are not given to avoid possible thyrotoxicity. Aside from the immediate discomfort, there are no notable secondary effects. The only problem is that injections must be given at a health center, which contributes to their higher cost. An increasing number of health center officials are concerned, however, about the heightened risk of the transmission of viruses, such as the AIDS virus, and for this reason, there is renewed interest in oral supplements.

In central Africa, the cost of oil, syringes, and needles represents 41 percent of the total cost (equipment and distribution). Administering capsules by mouth is clearly less costly than intramuscular injections; but since this method provides a shorter period of protection, especially at low doses, the annual cost per person may be as high.

iv) Other methods

Other possible approaches are modifying and diversifying eating habits by incorporating foods originating in zones that are not deficient in iodine, for example, or new foods; supplementing food and water (Lugol’s solution) consumed by people in the iodine-deficient zone; providing medication that is made from products rich in iodine (iodine tablets, which should be available to pregnant women in dispensaries in endemic zones); providing iodine treatment of agricultural
lands and cattle. Aside from salt, many other foodstuffs are fortified, among them a variety of condiments, sauces, flours, bread, milk, etc. Fortifying weaning foods has also been proposed, as has supplementing food aid, which is the case for vitamin A and powdered milk. Ongoing supplementation trials of bottled water were conducted, particularly for wells and water exploration sites in Mali. There have been no complaints about the water's appearance or taste; no cases of hyperthyroidism have been reported; and the impact was rapid. The cost of the diffusers used to iodize a well serving 800 people is about $150 per year; the cost of educating village residents so that they accept and use this method must also be included. As for goitrogenic foods, if their consumption cannot be eliminated, various procedures to detoxify them may be applied, such as soaking and retting some types of bitter cassava root in central Africa.

v) Target groups

Married women of childbearing age: This is the target group, since protecting the fetus as early as possible is desired, which means involving women even before they become pregnant. It is not always easy, however, to reach this group without a vertical program. If this is not possible, one should try to target pregnant women.

Pregnant and nursing women: It is relatively easy to reach this group through the health system if it provides good prenatal coverage. Iodine deficiency in the mother has an impact on the various stages of development of the fetus; it may lead to neurological cretinism in the second trimester (or perhaps even in the first trimester) and to myxedematous cretinism in the third trimester. For this reason, experts agree that pregnant women should be treated in highly endemic regions. One should be aware, however, that providing iodine supplements to a woman who is far along in her pregnancy risks causing neonatal hypothyroidism, which is transitory in most cases; for this reason, low doses of 0.5 ml per patient are advised.

Children zero to five years of age: If the mother is nursing and she is receiving iodine, her breast milk will contain it. Giving iodized oil to children beginning at six months of age is recommended to avoid developmental problems resulting from iodine deficiency.

Children from six to 15 years of age: This group is not a priority, but it may be targeted through schools. Studies have shown that supplementing this group may enhance learning ability.

The risk of thyrotoxicity has been demonstrated in individuals who are over 45 years of age, iodine deficient, and have consumed iodine-rich foods. For this reason, it is recommended that individuals over 45 not be included in iodization programs.

Current recommended doses are the following (FAO/WHO, 1992):

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Recommended Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child of 6 to 12 months:</td>
<td>200 mg orally (1 capsule) per year or 240 mg via injection (0.5 ml of Lipiodol) every 2 years</td>
</tr>
<tr>
<td>Between 1 and 45 years of age:</td>
<td>400 mg orally (2 capsules) per year or via injection (1.0 ml of Lipiodol) every 3 years</td>
</tr>
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</table>

f) Assessing Programs Conducted in Africa

Of the 32 countries classified as having iodine deficiency problems, only seven have established significant treatment and prevention programs.
Following a scientific meeting specifically on iodine deficiency, held under the aegis of the OAU in Addis Ababa in 1980, several governments made an effort to initiate programs to iodize salt, but without much success. In the opinion of Ekpechi (1987), the main reasons for the small number of programs implemented to date in this area are (a) an acute lack of information on the exact situation (out-dated surveys, inadequate modalities), and (b) a lack of political will, since decision makers have not yet realized how serious the problem of this endemic disease and its consequences are.

Since 1987, a number of national projects were initiated, but mostly in anglophone East Africa (WHO/UNICEF/ICCIDD, 1987).

i) Assessing iodized oil injection programs

Zaire: The first treatment trials in Africa analyzed were held in Zaire about 15 years ago in isolated mountain areas where the prevalence of endemic goiter had reached a very high level (Thilly et al., 1977).

Given the delays required to develop a salt iodization program in Zaire (legislative, economic, logistical, and administrative problems), launching a medical program using iodized oil injections was judged more appropriate. The program began with a pilot trial involving 30,000 people on the island of Idjwi in the eastern part of the country in 1970 (Thilly et al., 1977). In view of the dramatic results obtained, an eradication program was implemented in the Ubangi Mongala region in the northwest for a population of 1.5 million inhabitants. The program was carried out using teams and a logistical plan that had already proven effective for a vaccination program. Three mobile teams were set up, each consisting of three nurses, a secretary, and a driver, with the theoretical capacity to distribute 500 doses per day. The goal was to treat the entire population over five years (500 doses x 200 days/year x 3 teams x 5 years = 1,500,000 people treated) for a cost of $0.35 per treated individual or $0.07 per person per year of protection ($150,000 for oil, $60,000 for supplies, $125,000 for coordination and analysis, $172,500 for the three mobile teams, totaling an estimated $507,500 for the entire program in 1977) (Thilly et al., 1977).

Despite the delay in putting together the teams, 360,000 people were treated by two teams during the first four years in an area of 1,200 square kilometers, and more than one million people were treated between 1977 and 1984 (Hatzel, 1988). The program was gradually transferred to routine local health services, while a coordination and evaluation committee led by an epidemiologist at a central agency followed the evolution of the program closely (Thilly et al., 1977). Beginning in the second year of the program, teams that were not part of the program treated 42,000 people with a level of coverage estimated at more than 70 percent (Thilly, 1981). This program was accompanied by an educational campaign, specifically on retting cassava and the value of continuous breast-feeding since thiocyanate is not concentrated in breast milk. One of the most dramatic effects of the program, aside from the decrease in the prevalence of goiter, was the decrease by half of perinatal mortality and the increase of an average of 200 grams in birth weight for children born to first-time mothers, compared with children born to mothers receiving a placebo.

Zaire currently has one of the world’s highest rates of endemic goiter. In 1987, out of a general population of 33 million inhabitants, it was estimated that 13 million lived in iodine-deficient zones, with five to 10 million living in areas with
The health sector and nutrition interventions in Africa

high levels of endemic goiter, while approximately 1.2 million showed various signs of cretinism (IDD Newsletter, 1988; Hetzel, 1989). Fortified by previous successes, the country launched a six-year treatment and prevention program in 1988 through the existing health care system for 50 percent of the population in risk zones. In terms of priorities, pregnant women and newborns are targeted first, followed by school children, and finally adult men with goiter. This program includes all the components of an integrated program: training of personnel, laboratory facilities, complementory epidemiological studies, and salt iodization trials. Application methods vary according to regional conditions; the program as a whole is directed by a national committee. A final evaluation will be conducted in 1993. The estimated cost per person treated is $1.00, including administrative fees (the oil costs about $0.40); this amounts to a total cost of $1.2 million (IDD Newsletter, 1988). These numbers should be evaluated carefully, given changes in the value of Zaire's currency.

One of the difficulties in a program of this scope is knowing to what extent it may be decentralized. Experience has shown that the choice of the population to be treated, the organization of the program's schedule, the supply of iodized oil doses, and the ongoing analysis of epidemiological data and statistics should be done by a central agency. The pilot trial's success is what led to the crucial support of the authorities throughout the program's implementation.

The easiest way to ensure the continuity of a program over many years is to integrate it into the expanded program of immunization insofar as these programs achieve a significant level of coverage. Coverage at the level of the 85 percent obtained in Zaire, however, is still insufficient; it is likely that the population that is most at risk is not reached. Specific targeting of these zones is required, which clearly increases the cost of a true eradication program.

Ideally, injections should be administered with one sterile syringe and a disposable needle. This poses two problems: the risk that soiled needles are passed around and high costs. In many cases, health services don't have the means to meet these conditions, and they reuse the equipment after boiling it, which is not ideal.

Tanzania: Tanzania carried out a single intramuscular injection pilot program (480 mg) in a region with a high level of goiter, and the results were analyzed after three years. The program had a positive effect, but an interval of three years was judged to be too long for children whose needs are greater than those of adults (Wächter et al., 1986). According to the researchers, the interval between the two injections should be reduced to two years. Pregnant women had a satisfactory level of thyroid function, as did their children who were breast feeding; on the other hand, as soon as breast-feeding ceases, it is necessary to provide treatment for the children. There were no toxic effects noted, in contrast to some previous studies.

In MALAWI, between 1984 and 1986, 63,000 people received an injection of iodized oil, of a population at risk totaling between 150,000 and 350,000 (IDD Newsletter, 1987). A program to import iodized salt has not yet been instituted.

ii) Assessing programs to administer iodized oil orally

Algeria: The first trials of iodized oil given orally in Africa were conducted in Algeria.
According to Ben Miloud (WHO/UNICEF/ICCIDD, 1987), the procedure provides effective protection for two to three years. More recently, after pilot trials, doses of 0.5 ml (240 mg) were judged adequate for 18-24 months of protection; 30,000 women and children were successfully treated; there were few secondary effects, no toxic effects on the fetus in pregnant women, and only one case of exophthal-mic goiter. This simple technique, which is easy to integrate into primary health care services, has been extended to the target population at large throughout the risk zone since 1987.

Sudan: In the Darfour region, the possibility of using iodized salt seemed unlikely, given transportation difficulties, the distance to the Red Sea, and the preference of the population for local salt; iodized oil injection trials were thus conducted on an experimental basis in 270 school children. The satisfactory results showed that an injection every four years could be an acceptable strategy. A controlled trial was then conducted to compare the effects of administering by mouth two doses, at one-year intervals, of 400 mg of iodine with those of a single injection over two years of 1 ml (475 mg of iodine) in 2,316 school children. The reduction in the prevalence of goiter and the normalization of biological indicators was similar in both groups (Eltom et al., 1985).

Zaire: In 23 villages in the eastern part of Zaire (Phillips et al., 1988), Phillips compared the effects of administering iodized oil by mouth (2 ml) with a placebo and with the injection of iodized oil (2 ml). Eight months later, the prevalence of goiter was still unchanged, but biological indicators were normal in individuals who had received the iodized oil by either route. Another analysis conducted at the end of two years showed that the results obtained by the two routes of administering iodized oil were still similar (decrease in the prevalence of goiter and normal biological indicators). The quantity of iodine in breast milk was increased satisfactorily during a period of at least 30 months (Phillips et al., 1988; Phillips & Osmond, 1989).


iii) Assessing iodide tablet distribution programs

An attempt was made to distribute potassium iodide tablets in schools in Sudan (in the Darfour region); after supply and distribution irregularities, however, the program was suspended (Abdel Wahab et al., 1984). Phillips et al. (1988) in Zaire compared the administration by mouth of various dose levels of potassium iodide (0.5 g, 1.0 g, 2.0 g) to the administration by mouth of iodized oil. There were no long-term effects (eight months) for any of the potassium iodide dose levels in contrast to the iodized oil. The daily dose thus produces a prophylactic effect; although very easy to implement on a community level, it quickly runs into supply problems on a larger scale. It should be available to pregnant women in dispensaries in endemic zones, however, when no other alternatives are available.

iv) Analysis of iodine fortification of salt

Lesotho: In Lesotho, the presence of visible goiter in adults fell from 15-20 percent to about 5 percent between 1950 and 1977. This decline is attributed to the importation of iodized salt from South Africa (IDD Newsletter, 1987), although neither the content of the salt nor its distribution was really subject to supervision. It is not known
how much time is required to achieve this result; this is a concrete example, nevertheless, of the long-term effectiveness of the importation of iodized salt.

Algeria: The first iodization trials of industrial salt produced locally were conducted in Algeria in 1967 (WHO/UNICEF/ICCIDD, 1987); the program was limited by a number of constraints: insufficient production; an iodine content that was too low for the consumer; a higher price than ordinary salt, although it was produced primarily for low-income consumers; and a lack of supervision. It was necessary to substitute a distribution program of iodized oil by mouth.

Kenya: A salt iodization program set up in 1970 did not lead to an appreciable decrease in the prevalence of goiter due to the availability of other sources of salt in the country, and the program was not continued (Van den Haar & Kavishe, 1986). In fact, setting up an iodization program should be preceded by an analysis of all salt suppliers, their distribution networks, and the iodine content of their salt. In 1987, Kenya finally strengthened its legislation concerning the importation of iodized salt and the minimal iodine content required, and it instituted strict inspection procedures (Alnwick, 1988).

Ethiopia: Ethiopia, with about 12 million cases of goiter (which rules out only distributing iodized oil), opted for distributing iodized salt. The government set up iodization centers in Assab and Massawe in 1987. The country quickly increased its production levels, and it could become an exporter in time. Political leaders are still not sufficiently aware of the need for ongoing programs in this area (Madinger, 1988). Fortification levels are often still too low; experience has shown that the level should be at least 100 mg/kg to account for the losses that usually occur before distribution. Packaging poses a problem: preparing small packets enclosed in a good-quality envelope preserves the iodine content but increases the price. Machines exist that can handle the packaging of small quantities and can be adapted for use almost anywhere. With these machines, treatment could be limited to zones with a low number of endemic cases, but experience in this area is still lacking. The principal problem to date is that the program is not economically feasible.

Zambia: A treatment center that was established in 1982 had to close after three years (Mannar, 1989) after excessive corrosion and a lack of spare parts; it is this sort of program limitation that requires a degree of political and economic commitment on the part of the government in the long run.

Regional Programs: For countries that do not produce their own salt and are thus obliged to import it, the most effective step is to verify through legal mechanisms that imported salt is iodized; laws in this area are often not applied, however, even when they are on the books. The national committee to prevent disorders related to iodine deficiency is responsible for making sure that the law is applied and that analyses are conducted on a regular basis. Not all countries have passed laws of this type yet.

In fact, analysis of production on a continent-wide level (see WHO/UNICEF/ICCIDD, 1989, for example) shows that some countries supply their own neighbors with salt. For example, Senegal supplies salt to about 20 countries in West and Central Africa. The production site at Kaolack is private. After almost 20 years of
ignoring the problem, the head of this operation has just agreed to negotiate the possibility of iodizing salt. Cameroon has a large salt treatment center in Douala that supplies a good part of the country's needs as well as those of the Central African Republic, Chad, Gabon, and Equatorial Guinea. The salt could be iodized at a low cost; the price would be $0.02 annually per person (Mannar, 1989). GHANA exports salt to about 12 countries in West Africa.

Following renewed interest in the issue, Kenya and Tanzania have become exporters of iodized salt and are able to satisfy the needs of surrounding countries (Uganda, Rwanda, Burundi, Eastern Zaire, Zambia, and Malawi). Malawi and Tanzania are in the process of establishing additional production sites (Mannar, 1988). Botswana also possesses a large salt production site; negotiations have been underway for several years to begin iodizing salt produced there. It could then be exported to neighboring countries (African Task Force, 1990).

At this stage, a concerted regional strategy is essential to keep the pressure on producers so that they make necessary changes and to guarantee them a market so that they will accept the changes. It will then be possible to bring the iodine deficiency problem under control quickly in a large part of the continent.

v) Fortifying water

Mali: This solution was adopted because of the number of entry points for salt originating in the Sahara, making it impossible to iodize all salt supplies. Thanks to support from the Rhône Poulenc Foundation, a silicon polymer-based iodine diffuser, which captures sodium iodide and releases it in small quantities into the water over the course of one year, was developed. This technology was tested successfully in the northwest part of Mali in four villages (about 1,000 people) in a highly endemic zone (the prevalence of goiter surpassed 50 percent). The prevalence of goiter fell rapidly, and biological indicators gradually normalized. A study of the population's acceptance of this program was also conducted by a sociologist. The company is capable of producing large quantities of diffusers quickly (100,000 in 1993!), which would permit large-scale tests. As long as the cost of the diffusers is not too high, this solution certainly has a bright future in cases where the sources of the water supply are not too spread out (an ideal solution for "well-water exploration sites"). The predicted cost is estimated to be $.10–$.15 annually per person. The interesting aspect of this technique is that it allows one to iodize livestock and lands under cultivation and could be adapted for other nutrients, like vitamin A or iron, for example, or even for the distribution of larvicide and bactericide. The project is currently being extended to the entire district of Kita with support from the World Bank (see WHO/UNICEF/ICCIDD, 1987; WHO/UNICEF/ICCIDD, 1989; African Task Force, 1990). One of the problems to be resolved for a large-scale program is that of changing the diffuser annually when the pump is serviced.

vi) Information/education/communication

According to Martin, a questionnaire distributed to country representatives attending the Dar-es-Salaam conference in March 1990 demonstrated that practically nothing had been done in this area (African Task Force, 1990). This program element is clearly neglected. If making a vaccination program work depends on being able to convince the mother to bring in her child, and if the success of an ORS program depends on the ability to teach her a new technique, the success of a program to prevent iodine deficiency implies that all levels of a
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population have been informed and participate since prevention is based on changing common behavior (avoiding or treating goitrogenic foods, using different salt). All significant means of communication should be brought into play, such as radio, meetings, etc. This aspect, which is often neglected, is essential, but it frequently poses difficult problems. In Nigeria, 70 percent of inhabitants are believed to be isolated from access to the media (Hetzel, 1989). A campaign of this sort would not appear to be necessary if iodized salt is not competing with other salts on the market available to the population.

In Zimbabwe, the consumer association refused to approve legislation concerning the importation of iodized salt because it did not provide the consumer with enough choice; information about disorders related to iodine deficiency in the country and the fact that using iodized salt does not pose any risks is important in countering such opposition (IDD Newsletter, 1987).

UNICEF made videos in East Africa to provide the public with information; this format has proven itself to be very useful in promoting the acceptance of programs and public participation. Only films that have been made locally have an appeal to people, however; they are not interested in those made elsewhere.

Educating political leaders at all levels is essential, since the vital step of setting up a national committee to prevent iodine deficiency begins with their awareness of the problem; the absence of political will until recently is a result of this lack of information. Playing this role should be a priority of the health sector.

In terms of training, there is a clear lack of brochures and pedagogical materials available, especially in countries in West Africa. Health workers are obviously poorly trained, and for this reason cannot actively support the programs in place. On a national level, there is a lack of information exchange among countries; active regional groups should be established.

vii) An integrated program

Tanzania: Since 1983, Tanzania has implemented a comprehensive program, after establishing a national committee to prevent iodine deficiency. The program comprises a public outreach component through the radio and newspaper, a training component for health workers in the zones at risk, studies and laboratory analyses, and iodized oil injections in zones where the prevalence of goiter exceeds 60 percent. Twenty thousand injections were given as a result, while a distribution program of 700,000 capsules (by mouth) has been underway since 1987, specifically in the context of the JNSP in Iringa. A salt iodization pilot program was finally set up in a district; the percentage of school children with goiter decreased from 60.9 percent to 30.4 percent in six months, and to 6.0 percent in 12 months. Several iodization centers were established to provide supplementation throughout the country (Van den Haar & Kavishe, 1986).

Two problems delayed the program in its first phase: the first was the initial lack of information on the extent of the problem, and the second was the coordination of various aspects involved in the program. Since 1986, almost 20 districts have been integrated into the iodized oil distribution program; the level of coverage is 50 percent (African Task Force, 1990). Doctors in the district were made responsible for the distribution, but each district organized the distribution independently through health centers and
dispensaries, primary schools, NGOs, mobile teams, or even political leaders in the villages. The principal current problem is supplying the capsules, which makes targeting distribution necessary in the first phase.

The Tanzanian example has been an indisputable success; the program included the important component of raising awareness about the problem and education. The circumstances are rather unusual in Tanzania: it has a national language, literacy rates that reach 85 percent, universal primary school attendance; and an omnipresent and active political party structure. During the initial study, discussions with professors and students were held in schools; students also served as information agents for the population at large. The results of the study were discussed with political leaders in each district and village. Radio shows based on interviews of women with goiter were broadcast and meetings were held with local journalists to encourage them to pass on the information.

4. Promoting breastfeeding

a) Findings and Recommendations

i) Recommendations

- In a traditional society, where breastfeeding is very prevalent, a coordinated policy backed by regulations to protect this practice produces results. The tendency to decrease breastfeeding may be reversed, which helps to protect it, as is the case in Papua New Guinea. But the recent advent of cable and satellite television advertising threatens these efforts and poses a problem that may only be resolved on an international level. To maintain policies to protect breastfeeding practices, it is necessary to initiate campaigns to promote breastfeeding and to ensure that regulations in this area are enforced.

- Improving breastfeeding practices in maternity hospitals associated with the Baby Friendly Hospital initiative leads to a notable improvement in children’s health. This sort of initiative may be implemented only by sensitizing decision makers and training physicians and paramedical workers in the correct way to manage breastfeeding.

- Community initiatives may increase the prevalence of breastfeeding, and they have a positive impact when they are coordinated on a national level by a multidisciplinary team.

- Highly motivated individuals should coordinate the projects, and the government should take a stand on the issue in support of these efforts.

- As soon as an initiative gets underway, a data base should be created; compilation and rigorous evaluation of the data is necessary throughout the project. WHO/UNICEF indicators should be used (WHO, 1991).

- Since breastfeeding improves the outcome of other interventions in the health sector, budgets for these interventions should protect, promote, and support breastfeeding. For example, since breastfeeding improves the effectiveness of immunization, it should be encouraged by immunization programs. A "withdrawal" from an EPI budget could be used for a national campaign to promote breastfeeding. A water decontamination and quality improvement project could set aside part of its budget to protect breastfeeding to have the greatest impact. Family planning budgets should include something for
protecting breastfeeding. The team responsible for encouraging breastfeeding should have enough financing and not be dependent on external sources of funds, but it is also in the interest of people running the EPI, decontamination, and family planning programs to make a contribution.

ii) Background

That promotion, protection, and support of breastfeeding is essential to attain the global health and nutrition goals for children during the 1990s is no longer in dispute. The challenge is to identify, then implement specific actions that will result in increased prevalence of exclusive breastfeeding through a minimum of four months and that of complemented breastfeeding through two years or beyond, as illustrated in Table IV. This pattern of feeding is known as OPTIMAL BREASTFEEDING.

The best and most concise review of the global situation regarding breastfeeding is presented in a 1990 WHO/UNICEF report entitled, BREASTFEEDING IN THE 1990s: Review and implications for a global strategy (WHO, 1990). The report presents the results of a three-year systematic assessment and analysis of the status of breastfeeding, constraints to practicing what is recommended, how these constraints have been overcome over the last three decades, and recommendations for future actions.

The above report was presented to a WHO/UNICEF meeting of high-level government policymakers from industrialized and developing countries, and 10 UN and bilateral agencies, held in July 1990 in Italy. After reviewing the report, the meeting produced the Innocenti Declaration on Protection, Promotion, and Support of Breastfeeding (1990), which is now policy for WHO and UNICEF. The principles are also embodied in USAID's 1990 policy and strategy for breastfeeding promotion. Participating governments and agencies committed themselves to specific actions and targets to attain optimal breastfeeding.

iii) Practices in Africa

Figure 3 illustrates the extent of the problem in some African countries: in Mali, for example, only 10 percent of children 0-4 months of age are breastfed exclusively, which is the ideal feeding method. In Ghana, more than half of children under four months of age are given a bottle, which senselessly exposes them to the dangers of diarrhea.

Moreover, among children who are six months and older, many are undernourished, as in the case of Mali, for example, where 55 percent of children are given only breast milk and other liquids (Figure 4).

iv) Breastfeeding: impact on morbidity and mortality

The optimal feeding pattern described above has become rare. Even where frequent and prolonged breastfeeding is customary, early use of

<table>
<thead>
<tr>
<th>Age in months</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>100 percent of infants should be exclusively breast-fed</td>
</tr>
<tr>
<td>4-6</td>
<td>Two-month transitional period</td>
</tr>
<tr>
<td>6-24</td>
<td>All infants should be receiving complementary food</td>
</tr>
</tbody>
</table>

Figure 3. Infants 0—4 months who are exclusively breastfed and those who are supplemented with a bottle in Sub-Saharan Africa, DHS 1986–1991

Notes: 1. The information on feeding practices is based on the 24 hours preceding the survey.
2. WHO recommends that all children receive only breast milk until 4—6 months of age.


Promoting breastfeeding

water, commercial baby milks and foods, or homemade porridges or cows’ milk is common practice (Dimond and Ashworth, 1989). The situation will continue to deteriorate unless time, money, and skills are invested in repromotion of the optimal feeding pattern at global and country levels, and within families. The consequences of this deterioration are reflected in increased costs of health care because of increased prevalence and severity of common infant and child illnesses, in particular diarrhea and respiratory infections, and higher mortality and morbidity rates in developing countries. The harm that early supplementation can and does inflict on infants’ nutrition status and physiological development is fully explained in WHO’s publication, The Physiological Basis for Infant Feeding (Akre, 1989). Figure 5 illustrates the dramatic increases in mortality and morbidity due to diarrhea and respiratory infections directly related to suboptimal breastfeeding (Victora, et al., 1987). The consequences also translate in more births and increased demand for family planning services. Table V illustrates this impact.

Breastfeeding also protects against allergy; diabetes; necrotizing enterocolitis; and parasitic,
-exclusive breastfeeding is the only human activity that fulfills—up to the first six months of life—the three necessary conditions for good nutrition: food, health, care. Breastfeeding significantly enhances almost all other health interventions. Its diminution or absence may even cancel out the benefits of other interventions. For example, in Malaysia, a decline in breastfeeding offset the impact of water and sanitation improvements (DaVanzo et al., 1985).

v) Breastfeeding myths

Myths, fallacies, and misinformation about infant feeding have helped to create an artificial feeding culture. Women are no longer confident of the capability of their own bodies to be the sole source of nourishment for their young. In the developing world, where custom facilitates breastfeeding, rejection of colostrum, prelacteal feeds, and inappropriate supplementation are now evident in many regions (Dimond and Ashworth, 1987). Medical training textbooks are devoid of any information on the process of lactation, and how to manage it and breastfeeding. In turn health workers have misguided parents and mismanaged breastfeeding so badly that "not enough milk," the most common reason for supplementing breastfeeding in the early weeks, is now considered an iatrogenic disorder (Proceedings of UNICEF/WHO workshop at the International Pediatricians Congress, Rio de Janeiro, September 1992). It is only through extensive and intensive retraining of these health workers that countries have managed to improve their knowledge, attitudes, and practices and, subsequently, breastfeeding practices. One of the most concise general publications answering questions or common myths and practices was

dfungal, and urinary tract infection. Breastfeeding and the accompanying amenorrhea protects women from breast, ovarian and epithelial cancers (Cunningham, Jelliffe, and Jelliffe, 1992). Those concerned with health in developing countries may see protection only in terms of infectious diseases, but it is important to be aware that the less common conditions cited above may also occur in poor settings where health services and families can ill afford to be overburdened with "Western" as well as the familiar diseases. WHO's CDR programme has estimated that about 1.5 million infants die every year from diarrhea and acute respiratory infection (ARI) caused by inadequate or no breastfeeding.
There is an important difference between full, exclusive breastfeeding and the wide range of feeding practices that include some breastfeeding or breast milk. Figure 6 elaborates on these differences. Exclusive breastfeeding means nothing should enter the infant's mouth except the breast.

Early evidence of the advantages of breastfeeding has been sullied by poor study design: for example, the definition of breastfeeding is an important step that was omitted from many studies. In too many studies, any breastfeeding pattern from exclusive to mainly artificial with a few restricted breastfeeds was counted as breastfeeding for the purposes of comparison with exclusive artificial feeding. This and other methodological flaws compromise much data, particularly from industrialized countries. Consequently, cohorts of truly breastfed babies, which can match in other variables cohorts of artificially fed babies, have been hard to find. Many studies claiming to compare exclusive breastfeeding with other feeding patterns ignore or discount the use of water and "non-nutritive" fluids (Traore in Hill, 1990).

b) **Experiments in the Promotion of Breastfeeding**

Few assessments in this area are available for Africa; therefore, most examples are taken from other continents.
Table V. Contraceptive Prevalence Required to Maintain Current Fertility Rates If Duration of Breastfeeding Were to Decline

<table>
<thead>
<tr>
<th>Country</th>
<th>Contraceptive Prevalence</th>
<th>Contraceptive Prevalence Needed with 25% Decline</th>
<th>Contraceptive Prevalence Needed with 50% Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana (1988)</td>
<td>13%</td>
<td>24%</td>
<td>34%</td>
</tr>
<tr>
<td>Senegal (1986)</td>
<td>11%</td>
<td>23%</td>
<td>35%</td>
</tr>
<tr>
<td>Morocco (1987)</td>
<td>36%</td>
<td>41%</td>
<td>47%</td>
</tr>
</tbody>
</table>


i) Awareness campaigns

Some tried methods of breastfeeding protection, promotion, and support are described below. A comprehensive review of breastfeeding promotion programs in more than 25 developing and industrialized countries (Green, 1989) concludes that breastfeeding campaigns have often been geared toward "motivating" mothers to breastfeed by working on their perceptions and attitudes—but have often overlooked other factors that in the end may make breastfeeding difficult, however motivated the mother is.

General messages about the benefits of breastfeeding are ineffective if they do not address the major impediments to optimal breastfeeding practice. Media campaigns and other advocacy strategies must therefore be an integral part of a broader program.

Green describes small-scale (booklets and posters) and wide mass media (TV, radio, newspapers) initiatives. She states that the most successful have the following common qualities:

- An overall communication strategy based on an in-depth analysis of the main impediments to optimal breastfeeding.

- A plan for ensuring long-term sustainability of breastfeeding promotion campaigns.

- A well-designed media plan with messages and media appropriate to the target audience(s).

- Interpersonal support systems such as health workers and counselors,

- Sound administrative and financial management of such campaigns.

These principles could well apply to any health intervention program, but breastfeeding is particularly dependent on a fully integrated approach.

These programs use different methods ranging from a simple outpatient card in the Dominican Republic to an imaginative multimedia campaign in Brazil. Campaigns are most effective if carefully targeted, and pretesting of material and messages is invaluable. What works for one society may be disastrous in another. For
Figure 6. Percentage of infants 0—4 months in selected African countries according to the type of breastfeeding

![Graph showing the percentage of infants in selected African countries for breastfeeding and water]

- Exclusive breastfeeding
- Breastfeeding and weaning
- Breastfeeding and complementary feeding

**Source:** Demographic Health Surveys 1986-1991.

example, media advocacy from a Brazilian soccer star was successful, yet a plan to use well-known footballers was rejected in Honduras because the pretest group pointed out their reputation as womanizers and lack of credibility.

iii) *Baby Friendly Initiative Hospitals*

Among the best documented of this type of intervention is Dr. Natividad Relucio-Clavano's pioneer reform program at Baguio General Hospital in the Philippines in the 1970s (Relucio-Clavano, 1981 in Jelliffe and Jelliffe, 1988). The effort focused on reeducating hospital staff who took bottlefeeding, mother-child separation, and baby food industry influence within the hospital for granted. Rooming-in was introduced, bottlefeeds were phased out, and mothers were provided with support and information. The results were a virtual elimination of diarrhea and a 95 percent fall in mortality. No cases of lactation failure have occurred since the start of the program. Helping staff to breastfeed their own infants was an integral part of the program.

The WHO/UNICEF Baby Friendly Initiative launched in June 1991 is aimed at accelerating changes in hospital practices. The Initiative promotes retraining of health workers in breastfeeding management; transformation of hospitals and health care facilities to implement a set of WHO/UNICEF guidelines to support women initiate and sustain exclusive breastfeeding; and elimination of hospital practices that undermine breastfeeding, promote artificial feeding, and perpetuate misinformation among health workers. Included in the last category is the practice of receiving and using free and low-cost supplies of breastmilk substitutes.

This initiative has accelerated country-level action to promote and protect breastfeeding. Within 18 months of its being launched more than 100 governments had committed to taking some action in this area and in particular to prohibiting distribution of free and low-cost supplies of breastmilk substitutes in health care facilities.

The criteria for becoming a baby friendly hospital are based on the following Ten Steps to Successful Breastfeeding:

- Have a written breastfeeding policy that is routinely communicated to all health care staff.
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- Train all health care staff in skills necessary to implement this policy.

- Inform all pregnant women about the benefits and management of breastfeeding.

- Help mothers initiate breastfeeding within a half-hour of birth.

- Show mothers how to breastfeed and how to maintain lactation, even if they should be separated from their infants.

- Give newborn infants no food or drink other than breastmilk, unless medically indicated.

- Practice rooming-in—allow mothers and infants to remain together—24 hours a day.

- Encourage breastfeeding on demand from the child.

- Give no artificial teats or pacifiers to breastfeeding infants.

- Foster establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

In Indonesia the Sanglah Hospital project provided facilities for staff to breastfeed, so they could serve as community models. Formula industry personnel and promotional materials were banned from health facilities. Rooming-in was established, as well as lay volunteer support of mothers. Mortality from infection dropped from 21.4 per 1000 to 8 per 1000 within six months of rooming-in. Mortality rates due to infection dropped, particularly for acute otitis media (which fell from 106.9 per 1000 to 8.4 per 1000). Formula purchase fell from 105.6 to 25.6 tins a month. Average hospital stay decreased from 3.2 to 1.8 days. These data cover a one-year period from 1984 to 1985 (Wellstart, 1983).

In 1986, in a satellite town of Brazilia, Taguatinga Hospital, which serves a population of poor worker families, set the following policy: human milk only, exclusive breastfeeding starting at birth, and rooming-in. All contact with formula companies was proscribed. The neonatal mortality rate fell from 25 per 1,000 to 9 per 1,000 in four years and there has been no diarrhea since the policy began (De Oliveira, 1990). These maternity facility reforms have become the backbone of broader initiatives and wherever the plan has been repeated, not only are morbidity and mortality reductions dramatic, but the hospital shows significant cost-savings. What is remarkable is that despite irrefutable and consistent evidence of dramatic improvements in health and cost-saving outcome, it has proven so difficult to alter practices.

An evaluation of the impact of the BFHI in its first two years was planned for 1993.
iii) Training of health workers

Most health workers have received training in infant bottle feeding management that damages their capacity to help mothers to breastfeed.

Health workers often have greater difficulty than other groups in learning about breastfeeding after their training, and the revelation that they might have been doing harm to those in their care can be a painful one. It seems appropriate that health workers should be the best-informed about the benefits of breastfeeding, yet this knowledge alone may have little effect on practices. A study from Nigeria (Ojofeitimi, 1982) showed that although nurses were more knowledgeable than teachers about the benefits of breastfeeding, they breastfed their own infants for significantly shorter duration than the teachers.

So, just as with media campaigns, training must not be viewed as merely another passing on of the "breast is best" nostrum, but as a handing over to health workers the tools with which to do their job effectively. This training demands more than just passing on of information; it demands an interactive process whereby the health worker gains the confidence and skills to help mothers. An example of innovative and effective training comes from the University of Western Australia, where training of medical students routinely includes breastfeeding mothers in the classroom (Hartmann, 1990). Western Australia now has higher than national average breastfeeding rates with more than 90 percent leaving the hospital breastfeeding (Hitchcock et al., 1984).

One pool of training experience comes from IBFAN Africa. The lessons learned have been succinctly documented by Helen Armstrong (in Labbok and McDonald, 1990). Armstrong addresses the course content and the practicalities, and stresses the value of one- to two-week full-time courses. There is a clear distinction between training sessions and information dissemination seminars that do not impart skills. The latter cannot be expected to result in concrete changes in practices. In Phillips, Feacham, and Mills (1987) an assumption is made that to educate hospital staff, all that is needed is a week to prepare a pediatrician, who will then run a seminar at which each nurse spends half a day! This is a serious underestimate of what is needed to "detrain" the pediatrician, then impart some new knowledge and demonstrate some of the skills essential to supporting breastfeeding mothers. To assume that a doctor will be equipped to train others after only a week of exposure to this new information, and prior to putting it in practice and experiencing its impact is very risky, and a formula for failed training efforts.

The Phillips model assumes hospital-based training. Even then, more time and resources are needed (UNICEF BFHI Programme guidelines, 1992).

The IBFAN approach is to organize training sessions as described above, adapt the training forum to the circumstances in each country (or region), and have a training team that includes local and outside experts. Teams of health professionals are trained at the USAID-sponsored programme, Wellstart in San Diego, California. During 1992 a similar service was established by the Institute of Child Health in London. The Lusophone countries plan to use the Santos Lactation Centre in Brazil.

Training of trainers is an integral part of the process. Among Wellstart, IBFAN Africa, and now Institute of Child Health, an important group
of experts (master trainers) in this subject now exists in Africa. This justifies an investment in rapid capacity-building within the region. Within each country there should be a Lactation Training and Resource Centre. The master trainers should be seconded or recruited to work full-time with these centers. When this is accomplished, progress in the whole area of breastfeeding is accelerated. Training curricula for these courses, for all levels, are being distributed by UNICEF and WHO as part of the Baby Friendly Hospital Initiative.

The necessity for a prolonged course lies as much with the emotional content as with the quantity of information to be absorbed. Armstrong identifies four phases of a course: "ennui," when people question the need for the course at all; "resistance," when challenge to current practices arouses strong negative feelings; "absorption," when the content engages the participants and they warm to each other; and "looking forward," when the inspiration of the course motivates participants to seek and plan of ways to change. This necessary group dynamic cannot be achieved in a short course or in a course of weekly seminars.

Training health workers as part of breastfeeding intervention programs will be necessary and difficult as long as bad basic training persists in medical and health schools and textbooks, and that incorrect information materials, sometimes funded by baby food companies, continue to be readily available. Currently, no integrated program can function without prioritizing the retraining of health workers. It is of note that in Sweden, where basic training and breastfeeding practices are relatively good, the government still deems it necessary to provide lactation support staff in health institutions to reeducate the existing health workers (Armningsjälpen, 1990).

iv) "Mother-to-mother" networks

Training of lay counselors is a sensitive area because care needs to be taken to ensure that the lay counselor and health worker feel a sense of complementarity and mutual support. This is not always the case, especially if informational support to the mother is contradictory. One of their most important contributions is in the use of counseling techniques in breastfeeding support. In Belize lay counselors played a key part in the successful national breastfeeding campaign (at four months breastfeeding rates rose from 18 percent in 1983 to 49 percent in 1989). Of 230 counselors trained, 67 percent were community women and the remainder nurses, community health workers, and TBAs. Despite volunteer status, the retention rate was 62 percent. Average work load was about eight hours a month, helping an average of nine women. Counselors met three to six times a year for training and support (Huffman and Steel, 1992).

Kyenkya-Isabirye and Magalhaes (in Labbok and MacDonald, 1989) describe the historical development of mother-to-mother support and the groups involved in its provision, and propose its adaptation to health care services.

In many societies, female relatives and TBAs have given the support, encouragement, and advice. In industrialized societies the role of the lay counselor emerged from the mother support groups founded by breastfeeding women in the 1950s, '60s, and '70s. Their influence has been important. The turnabout in breastfeeding trends
Promoting breastfeeding

in industrialized countries has been attributed to
t heir influence more than to medical edict
(Morley, 1980; Helsing in Jelliffe and Jelliffe,
1988). La Leche League in the United States,
Amningsjihilpen in Sweden (and kindred groups in
the other Scandinavian countries), The Nursing
Mothers of Australia, the National Childbirth
Trust in the U.K. and many more have provided
a pool of information and support. A key
characteristic of these groups is their dynamic
approach to new information and their ongoing
learning from mothers and babies.

v) Monitoring advertising for breast milk
substitutes

The International Code of Marketing of Breast
milk Substitutes (WHO, 1981) remains the basic
and minimum standard to guide countries in
regulating the way infant feeding products (infant
formula, breast milk substitutes, and feeding
utensils) are marketed. The code contains articles
on how products should be labeled, displayed,
sold, and stored. The code also specifies what
health workers and manufacturers and distributors
of products under the scope of the code should
and should not do. The code is a recommendation
to member states to take action to implement it.

One key point regarding the code: its main
goal is protecting breastfeeding, but its attendant
goal is protecting infants who must be fed
artificially. It is in the best interests of the infant
and his caretakers that the choice of feeding
method and product is impartial. The current
HIV epidemic is leading to an increase in children
who are not being breastfed, either because of
orphanshood (and no readily available wet nurse),
decision not to breastfeed, or inability of the
mother to care for her child (including
breastfeeding) because of illness. These and
similar disaster situations trigger commercial
exploitation. It is therefore imperative to view
situations where artificial feeding is taking place
as in need of extra vigilance in terms of
implementing marketing regulations.

In Africa, programs to improve infant feeding
practices need to include efforts to promote
breastfeeding through development and
enforcement of national marketing regulations
(IBFAN Africa, personal communication). IBFAN
has the expertise and commitment to assist
governments in this effort, and UNICEF and
WHO are mandated to work in this area.
Establishing sustainable monitoring and
enforcement mechanisms is essential and has not
been successfully pursued. There with skills do
not have adequate financing to act. One exception
is Mauritius, where an independent organization
has taken on this task over the last seven years,
and the process continues to benefit breastfeeding.

Papua New Guinea took measures to protect
breastfeeding before the concept of an
international code had ever been publicly
discussed. Between 1962 and 1972 breastfeeding
rates in the capital city, Port Moresby, declined
from 94 percent to 78 percent and hospital
admissions and deaths due to diarrhea doubled. A
1976 survey found a significant difference in
malnutrition rates (35 percent and 26 percent
between bottlefed and breastfed children. The
government, the health professions, and a mother
support group (Susu Mamas) mounted a campaign
targeting health workers, the community, and
schoolchildren. There was widespread media
coverage. Traders were asked to voluntarily
restrict the sale of feeding bottles but did not
comply. Legislation was passed to control the
sale and distribution of breast milk substitutes and
to require a prescription for the sale of feeding
bottles and teats. Health workers were required to ensure that conditions were appropriate before writing a prescription. Advertising of all these products was banned. By 1979 breastfeeding in Port Moresby had increased and malnutrition rates fallen dramatically.

The Papua New Guinea experience has shown how a simple set of initiatives can protect breastfeeding and reverse a trend. Key factors appear to be coordination between different sectors, political will for implementation of the law, and good behavior on the part of the baby food companies. In contrast to many other countries, there were no entrenched vested interests and the companies had no established market to lose (Biddulph in Jelliffe, 1988). Also, the emphasis of restriction focused on feeding bottles, teats, and pacifiers rather than on infant milk products.

Recent events show that breastfeeding protection should be continuous, as long as there is money to be made through the sale of substitutes. A 1989 report showed a reversal of the successful trend, with a 60 percent increase in artificial feeding in the Port Moresby sample. Flouting of the legislation has occurred mainly because of a lack of monitoring. Employed mothers find insufficient time allowed for breastfeeding. Pacifiers are on sale and external TV advertising cannot be controlled (Minei, 1992). This erosion of effectiveness indicates the need for vigilance and strengthening of existing measures. The problem of external advertising can only be addressed at the international level.

Despite 11 years since the code's adoption, there are very few countries where it is implemented in its entirety even though it was adopted as a minimum standard. The few countries that have achieved more or less full implementation have shown good results. Sweden and Norway have more or less effective voluntary codes; breastfeeding rates have risen since code adoption but in the context of a multifaceted strategy. The Code Documentation Centre, based in Penang, Malaysia, specializes in training government officials in code analysis, development, enforcement, and monitoring. The center has multilingual staff and has provided support and technical assistance to a number of governments preparing national marketing regulations. Recent examples include India, Nepal, Brazil, Swaziland, and Bangladesh.

Other countries that have established effective codes are Brazil, Guatemala, and Kenya. All three have made code legislation and implementation part of a coordinated national breastfeeding campaign and all have shown improvements in breastfeeding trends. All countries suffer from external pressures. Guatemala is particularly vulnerable to TV advertising from neighboring countries.

The United States has the most aggressive marketing. There is public (including TV) advertising of baby milks, free offers and samples are sent directly to pregnant women, and "discharge packs" are common. After Carnation (Nestlé) and Gerber launched TV advertising campaigns, there was a 15 percent increase in overall sales of artificial baby milk and a 15 percent fall in breastfeeding rates (Lawrence, 1991). There have been various breastfeeding promotion campaigns in the United States (Green, 1989) but the trend is diminishing. Reports from the Brazilian campaign emphasize that
promotional messages can only work if industry promotion is controlled (Rea, 1990).

vi) Rights of mothers

Measures exist to provide entitlements for employed mothers. Van Esterick's *Women, Work and Breastfeeding* (1992) provides a current review and analysis of this aspect of the subject. What scarce evidence there is reveals that where breastfeeding is valued, it is accommodated. Van Esterick cites data from Mali showing a society where it is taken for granted that babies accompany their mothers everywhere—to the office, the fields, or on a train.

There is great regional variation in national legislation on maternity protection. The Clearing House on Infant Feeding and Maternal Nutrition (APHA, 1989) reports on the current status of regulations country by country but does not give a picture of implementation. It is often difficult for women to claim their rights. Unions are too concerned with job protection and fair pay to deal with something seen as a minor issue. Brazil has some of the best legislation; however, enforcement is a problem. As with infant products marketing regulations, mechanisms to enforce maternity entitlements are essential.

The ILO Conventions (Nos. 3 and 103) which lay down standards for maternity protection (including the right to two paid nursing breaks a day), are ratified by only 25 countries and are not promoted. In Honduras enterprises employing more than 20 women must provide a suitable place for breastfeeding and in Uruguay public sector workers can work half-time for six months. Most poor women work in the informal sector where there is little control over their working conditions and rights. Even in the formal sector there is planned discrimination against mothers, employment conditional on sterilization, or long-term contraceptive injections (Mitter, 1986). Claiming the right to breastfeed at work is impossible for most women unless their request is backed by government support.

There is no evidence that breastfeeding in the workplace has ever disrupted production; there is even evidence that when breastfeeding is facilitated, workers return to their jobs early (Ketcher and Lanese, 1985). Van Esterick lists advantages for the employer, including earlier return, less absenteeism, fewer training costs, less employee turnover, and better productivity due to lower worker anxiety.

Provision of crèches alone is *not* the answer to enabling women to combine work and breastfeeding.

A comparison of two factories in Mozambique found that one, a cotton factory, had a pleasant-looking crèche where babies were bottlefed. Mothers were forbidden to leave their posts to breastfeed and high rates of infant malnutrition and diarrhea resulted. At a cashew factory, with less attractive facilities, mothers were allowed to organize their work to breastfeed and their children stayed healthy. Mothers worked in pairs so as not to disrupt the machine management if one needed to feed her baby (Zinkin, 1983). A similar situation was encountered by one of the authors in Mauritius in 1985.

At Campinas University in Brazil all female employees were entitled to free day-care as long as they were breastfeeding, which positively increased duration. It is pertinent that the dean was fully committed to this project (Hardy, 1990).
In Ethiopia, at a fruit-growing cooperative, women left their children at a day-care center administered by a Children's Affairs Committee of the coop. An innovative feature of the program has been to provide work credits to women for time off to breastfeed. This, together with other aspects of the day-care center, have been linked with a reduction in disease-related deaths (Hargot, 1989). Crèches are one of the most practical ways of facilitating continued exclusive breastfeeding. In a study in a large health institution in Nigeria, half the women interviewed said they would have breastfed longer if there had been a crèche (Bamisaiye and Oyediran, 1983).

A practical and immediate action for program managers is to routinely review how any proposed program or project is affecting or will affect participating women's capacity to breastfeed and to care for their young infants. Such a review should address the short- and long-term effects of the possible infant feeding options available to the women participating in the program. The review should lead to adjustments in the program to make exclusive breastfeeding for zero to four-to-six months and continued through two years the easiest and most practical option.

This should apply to any program or project whose objectives are to improve health and the status of women, to generate income for families and individuals, to improve education, etc. Cost analysis of the above option should go beyond the economic interests of the government, and employer and include those of the families and communities as well as the total well-being of mother and child.

Including breastmilk in the list of foods produced in the country is likely to start a process of assigning a (money) value to this valuable food resource. When the cost of its replacement is calculated, countries that have to import infant feeding products are likely to choose to institute means to ensure breast milk's continued production, including adequate maternity entitlements and resources.

vii) Integrating breastfeeding promotion into other health programs

Promotion of breastfeeding should be part of very important measures aimed at preventing diarrhea and reducing the infant mortality rate.

Examples and experiences of how breastfeeding promotion and support can and have been integrated into other health programs were shared at a UNICEF workshop in 1988. The proceedings are documented in a UNICEF publication edited by Baumslaug and distributed by UNICEF headquarters. Programs include immunization, control of diarrhea diseases, family planning, safe motherhood, and growth promotion/monitoring.

c) Costs

There is little information on the cost of breastfeeding. Phillips et al. (1987), however, estimated the cost of a "package of breastfeeding promotional activities," which includes: i) changing hospital routines; ii) individualized instruction; iii) a media promotion campaign; and iv) legislation to limit the commercialization of breastmilk substitutes at between $1 and $10 per mother exposed to this "package of activities."
5. Dietary management of infection

a) Background

Illness adversely affects children's nutritional well-being through increased nutrient requirements and losses, and child-driven reductions in dietary intake (anorexia). In Africa, the effect of illness on nutrition is exacerbated by children's poor nutritional status, due to large deficits in their nutrient intakes during convalescence and post-recovery, and mothers' reluctance to encourage their children actively to eat.

Mothers' reluctance to take an active role in child feeding stems from a traditional view that learning how to eat the family's staple food is part of a child's socialization process. It is generally believed that the purpose of eating is to fill the stomach, and that a child knows best when he is hungry and when he is full. Providing too much guidance may spoil a child and cause him to be greedy for foods that are not available to everyone. When children are ill, however, African mothers are usually willing to prepare special foods and more actively encourage their children to eat.

Therefore, periods of illness and convalescence are seen as opportune times to provide information and to encourage African mothers to adopt new feeding behaviors.

b) Conclusions and Recommendations

- The programs reviewed in this document all included intensive community-based (formative) research prior to the design of interventions to improve feeding practices during and following child illness. The formative research included ethnographic studies, nutritional assessments, and household trials of new behaviors and food recipes. The resulting interventions focused on providing mothers with specific "guidelines on feeding frequency, food quantities, and recipe preparations. This information was intended to build mothers' self-confidence and it was used to encourage mothers to take an active role in child-feeding interactions.

Results of household trials indicated that mothers were willing to change their feeding practices if they perceived positive benefits for their children and themselves. The most frequently accepted behavior changes involved small modifications of existing practices, such as enriching a traditional weaning porridge, or increasing the quantity and/or frequency of feeding other solid foods. However, when new foods or practices were adopted they often replaced rather than complemented the traditional diet. Obstacles to trying new behaviors included perceived time and other resource constraints. Mothers' continuation of the new practices was usually determined by their children's reactions to them.

Therefore, future interventions should stress the benefits to mothers and children of adopting improved feeding practices, and provide mothers with alternative methods for overcoming their children's resistances to new foods and behaviors. Recommended behavior changes should build on existing practices. The importance of breastfeeding and continuing traditional, beneficial practices should also be stressed.

- Once programs moved from formative research (i.e., household trials) to implementation (i.e., community-based education) their
results have been less encouraging. For example, mothers in Cameroon had improved knowledge but there were few measurable improvements in feeding practices after less than one year of program implementation. Within two months of being trained, more than 50 percent of mothers in Nigeria knew how to prepare *eko ilera*, but less than 20 percent indicated that they would prepare and feed it on a continuous basis.

The failure of programs to live up to the promise suggested by the household trials, and to result in changes in feeding practices, is believed to be due to a combination of factors. Mothers were willing to adopt new practices during the trials because of the individualized care and attention provided by the field-workers, and because they were active participants in the process of deciding what behavior changes to adopt.

During implementation, however, the intensity and personalized nature of these interactions were not sustained. Mothers who received individual counselling were more likely to have improved feeding knowledge, yet this knowledge may not have resulted in the adoption of new practices without mothers' active participation in deciding what those practices should be.

In addition to the above explanation, it is generally believed that changing behavior in a population is a long-term process. Whereas some members may adopt a new practice immediately after it is introduced, there are others who will accept it only after it is already well-established in the community. The programs examined may not have produced measurable changes in feeding practices because evaluation designs did not examine changes in behavior over the appropriate (long-term) time intervals.

Therefore, programs should incorporate the methods employed during the household trials (of individualized care, decision-making, and negotiation) into their strategies to change mothers' feeding practices. Program evaluations should be designed, and adequate resources allocated, to measure changes in feeding practices and nutritional status over time.

- Developing effective programs to improve feeding practices during illness and convalescence requires knowledge of health providers', mothers', and other caretakers' beliefs and practices, available and acceptable foods, and the nutritional quality of the local diet. Research should also determine feasible feeding changes, how mothers can be motivated to adopt them, and how they can overcome resistances from their children to pursue them. During this research, it is important to understand the health personnel's attitude towards nutrition education, as well as to gather information to improve their group and interpersonal counselling skills.

Therefore, involving health providers, mothers, and children in the intervention design process, through careful formative research, is feasible in Africa. The goals of this research are two strategies: one for improving mothers' feeding practices and another for enhancing health providers' nutrition education skills.

- To date, nutrition programs have not focused on improving mothers' feeding practices and children's dietary intake during periods of convalescence — when appetite returns and compensatory (catch-up) growth is possible — or
on developing sustainable strategies for engaging mothers in pro-active child feeding practices. These two areas merit further attention.

Therefore, as a starting point, future nutrition programs should encourage mothers to improve child diet during convalescence. Such efforts should take advantage of mothers’ concerns about child feeding during illness, as well as their willingness to take special measures to increase their children’s dietary intake during this time.

Health services could easily implement measures on dietary management of infections, but also on dietary prevention of infection as illustrated by Table VI (adapted from Gillespie and Mason, 1991).

c) OVERVIEW OF THE PROBLEM

i) The nutritional consequences of infection

The relationship between nutrition and infection has been described as synergistic: frequent infections reduce the nutritional well-being and growth rate of young children, while malnutrition suppresses host resistance and results in more severe infections.

- Common childhood illnesses such as diarrhea, respiratory infections, malaria, and other parasitic infections adversely affect nutrition through increased metabolic demands and nutrient requirements, decreased nutrient absorption, and/or decreased dietary intake due to anorexia (depressed appetite).

- Fever is common during episode 3 of diarrhea, respiratory infection, and malaria. It increases the body’s energy requirements by 10-15 percent per 1°C rise in body temperature due to increases in basal metabolic rate and requirements for immune cell production (Akre, 1989). At the same time, nutrients are lost during the sweating caused by fever.

- Diarrhea has reported average incidence rates of 4- to 8 episodes per year in African children under 5 years of age. Incidence is highest (up to 10 episodes per year) in the first two years of life (PRITECH, 1989; 1993). Diarrhea results in decreased nutrient absorption (mainly carbohydrate and fat) due to mucosal injury, reductions in the concentrations of bile salts and digestive enzymes, and increased gastrointestinal transit times.

- Measles: in Sub-Saharan Africa it is estimated that less than 60 percent of infants have been immunized (ACC/SCN, 1992). Measles causes mucosal injury, impaired nutrient absorption, immunosuppression, and often results in severe diarrhea, with its attendant nutritional costs.

- Intestinal parasites, including hookworms, schistosomes, ascaris, and whipworms infect millions of African children and adults. They affect nutrition by competing for their host’s nutrients while producing fever, diarrhea, vomiting and anorexia, altering nutrient synthesis and transport, impairing the absorption of fat, protein, and vitamin A, and causing blood loss and iron deficiency anemia (Stephenson, 1987).

- Although infrequently documented and rarely quantified, perhaps the greatest nutritional consequence of childhood illness occurs as a result of reductions in dietary intake that accompany and follow the frequent infections described above (Bentley et al, 1993). The reductions may occur when mothers deliberately refrain from feeding a
### Table VI. Examples of actions that can be implemented by health services and of those necessitating additional resources

<table>
<thead>
<tr>
<th>Dietary management of infections</th>
<th>Actions that can easily be implemented by health services</th>
<th>Actions that require additional resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Promote exclusive breastfeeding during illness;</td>
<td>- Provide supplementary feeding;</td>
</tr>
<tr>
<td></td>
<td>- Maintain sufficient food intake during illness;</td>
<td>- Control intestinal parasites.</td>
</tr>
<tr>
<td></td>
<td>- Give vitamin A during measles, acute respiratory</td>
<td></td>
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<tr>
<td></td>
<td>infections, and persistent diarrhea;</td>
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</tr>
<tr>
<td></td>
<td>- Provide Oral Rehydration Therapy;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Maintain adequate food intake during chronic illness;</td>
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</tr>
<tr>
<td></td>
<td>- Give iron and anti-malaria drugs during malaria</td>
<td></td>
</tr>
<tr>
<td></td>
<td>episodes;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Provide Growth monitoring and promotion.</td>
<td></td>
</tr>
<tr>
<td>Dietary prevention of infections</td>
<td>- Give colostrum to the baby;</td>
<td>- Give supplementary feeding to the child</td>
</tr>
<tr>
<td></td>
<td>- Exclusively breastfeed for 3 to 4 months;</td>
<td>and the mother;</td>
</tr>
<tr>
<td></td>
<td>- Continue breastfeeding for two years;</td>
<td>- Establish community programs for growth</td>
</tr>
<tr>
<td></td>
<td>- Provide growth monitoring and promotion;</td>
<td>monitoring and promotion.</td>
</tr>
<tr>
<td></td>
<td>- Provide pre- and post-natal monitoring of mothers;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Give vitamin A as a preventive measure in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>highly deficient areas;</td>
<td></td>
</tr>
</tbody>
</table>


The health sector and nutrition interventions in Africa

Child who is vomiting, or when they refrain from encouraging an anorectic child to eat when he or she is not interested in doing so. The nutritional consequences of these reductions are especially great in parts of Africa where children’s usual intakes during healthy days are well below their estimated requirements (e.g., 60 to 70 percent in Dickin et al, 1991), and thus no opportunities to replace nutrient losses or attain catch-up growth are possible.

- The relative importance of mothers’ reluctance to encourage their children to eat — and the influence it has on children’s nutritional well-being — is suggested in numerous anthropological studies throughout Africa. In general, becoming accustomed to food and learning to eat the family diet is an important aspect of childhood socialization in Africa. Mothers may initiate feeding when their children exhibit cues of hunger (e.g., looking at or reaching for food), but children are usually assumed to know when they are full and thus when eating should stop.

In times of illness as well as health, children in the diverse populations of Cameroon (CARE et al, 1989), The Gambia (Samba and Gittelsohn, 1991), Ghana (Ministry of Health, 1989a), Niger (Keith, 1991a), Mali (Toure, 1991; Dettwyler, 1989), and Swaziland (National Nutrition
Cultural beliefs and practices often influence dietary intake and feeding behaviors. Mothers and other caregivers are encouraged to feed their children regularly, but this advice may not always be followed. In-depth studies in Senegal (Sene, 1991), Niger (Youssouf, 1992), and Burkina Faso (Roison et al., 1990) have shown that many mothers forcefeed young children who are unwilling to eat (Oni et al., 1990). These studies have also found that health providers' advice is generally vague and non-specific.

In Mauritania, a survey of health facility personnel in charge of diarrheal disease control and counselling (N = 243) found that only 62 and 49 percent of CDD workers knew program messages about feeding during and following diarrhea, respectively. During 91 clinic observations, 76 percent of the CDD workers gave “advice to mothers on feeding following diarrhea, but only 33 percent (N = 30) verified that mothers understood what they had said” (Coulibaly, 1989). In-depth studies of the nutrition messages given to mothers found that providers’ advice was usually vague and non-specific. Results of similar studies in Senegal (Sene, 1991), Niger (Youssouf, 1992), and Burkina Faso (Roison et al., 1990) were comparable.

ii) The quality of health education and individual counselling

- Evaluations of programs to improve child feeding practices during and following illnesses in Africa have underscored the need to improve health providers’ knowledge concerning proper nutritional management of illnesses as well as their interactive counselling skills.

In Uganda, for example, 80 percent of health workers surveyed (N=35) believed that solid foods (e.g., sorghum, millet, potatoes) and fluids (e.g., fermented drinks) should be withheld from children with diarrhea (Konde-Lule et al., 1992). These beliefs were contrary to the nation’s Control of Diarrheal Diseases (CDD) policy that feeding should continue as usual during diarrheal episodes.

In Mauritania, a survey of health facility personnel in charge of diarrheal disease control and counselling (N = 243) found that only 62 and 49 percent of CDD workers knew program messages about feeding during and following diarrhea, respectively. During 91 clinic observations, 76 percent of the CDD workers gave “advice to mothers on feeding following diarrhea, but only 33 percent (N =30) verified that mothers understood what they had said” (Coulibaly, 1989). In-depth studies of the nutrition messages given to mothers found that providers’ advice was usually vague and non-specific. Results of similar studies in Senegal (Sene, 1991), Niger (Youssouf, 1992), and Burkina Faso (Roison et al., 1990) were comparable.

- Qualitative assessments of nutrition communications skills in several countries, including Burkina Faso (Duran-Bordier, 1992) and Cameroon (CARE et al., 1989), found that health workers have difficulty using educational materials and visual aids during group discussions. In addition, health promoters were found to require practical training in how to listen, develop solutions, and provide tailored feedback to mothers, especially in areas where these types of exchanges are uncommon. When this was done in Mali, the results were impressive: mothers residing in villages where health promoters were specifically trained in interactive counselling skills had better feeding practices and fewer underweight children than mothers residing in villages where health workers were not similarly trained (Rohde et al., 1993).

iii) Conclusions

- Thus, programs to improve feeding practices during and following childhood illness must develop strategies to improve the dietary intake of children with depressed appetites. Effective educational messages can only be developed with an understanding of local feeding practices and diet, as well as mothers’ motivations and resistances to changing their feeding style and behavior. Health providers’ knowledge, beliefs, and nutrition education practices must also be studied in order to identify training needs and improve their community education and interpersonal counselling skills.
This chapter describes the design and impact of programs that have attempted to address these needs in Africa.

iv) The traditional dietary management of the sick and anorectic child in Africa

Programs to study and improve the dietary management of the sick child have found that while African mothers may hold specific beliefs about foods to avoid during specific illnesses (e.g., Konde-Lule et al., 1992; Odebiyi, 1989), they do not generally stop all solid-feeding, or refrain from providing most liquids and breastmilk during childhood illnesses (Bentley et al., 1991; Keith, 1991a; Sene, 1991; Spain, 1991; Toure, 1991; Dettwyler, 1 985). As noted above, it is usually the child who regulates his or her intake.

In Nigeria, where energy intakes during periods of health, diarrhea, and convalescence were compared, 5-28 month old children consumed less solid food but similar quantities of breastmilk and liquid paps during diarrhea compared to days of health. Total energy intake, particularly from solid foods were not increased during convalescence (Dickin et al., 1991), as is currently recommended by WHO (1992).

Likewise, no concepts of convalescent feeding — i.e., the need to increase intake following illness — or catch-up growth were reported by mothers in Senegal (Sene et al., 1992), The Gambia (Samba and Gittelsohn, 1991), Mali (Toure, 1991), Niger (Keith, 1991a), Ghana (Ministry of Health, 1989d), Cameroon (CARE et al., 1989), and Swaziland (National Nutrition Council, 1988) where feeding practices during and following childhood diarrhea were studied. In The Gambia, however, children consumed up to 120 kcal/kg per day after recovery from prolonged diarrhea, compared to average daily intakes of 70 kcal/kg during their illness (Tomkins, 1 983).

Episodes of illness are reported to cause great concern among African mothers, and mothers who are normally passive feeders may take on a more active feeding style when their children are sick. In Mali, for example, 80 percent of mothers reported that they would encourage a sick child to eat, compared to only 45 percent who said they would similarly encourage a healthy child (Toure, 1991). On the other extreme, Yoruba-speaking mothers in Nigeria were observed force-feeding (a fermented pap) during 71 percent of days when children were ill with diarrhea, compared with 50 percent of days during convalescence and 33 percent of days during post-recovery (Brown et al., 1988).

Mothers in several African countries have also reported that they prepare special foods for their children when they are sick. In the Arua and Kabale districts of Uganda, for example, mothers prepared a fermented cassava, millet, or sorghum-based food for children with diarrhea. These foods’ distinctive taste was believed to help restore the appetite and thirst of anorectic children (Sserunjogi and Tomkins, 1990). Fermented millet and sorghum porridges are also specifically fed to sick children in Rwanda and the Sudan (Ashworth and Draper, 1992).

One of the greatest obstacles to reducing the nutritional consequences of childhood illness in Africa is the fact that the reductions in intake that occur with infection are small in comparison to the deficits observed on healthy days relative to age-specific dietary requirements. In Nigeria, for example, children’s average daily energy intake
Dietary management of infection

During diarrhea was 85 kcal/kg, an 11 percent reduction from their average intake of 96 kcal/kg on healthy days. Consumption on healthy days, however, was less than 70 percent of the children's estimated daily energy requirements (Dickin et al., 1991).

When this situation occurs it is generally believed that the ideal approach to reducing the nutritional consequences of infection is first to focus attention on improving children's usual diets and mothers' day-to-day feeding practices (Behrens et al., 1990). By improving intake on a daily basis, children's overall nutritional status should be enhanced and the severity and nutritional impact of subsequent infections reduced.

Encouraging African mothers to take a more active role in child feeding on a daily basis may be difficult, however, given financial, time, and food availability constraints. In addition, and as noted above, the process of learning to eat the family food is considered to be an important part of children's socialization -- the time when they learn to become independent and satisfied with the food that is available (Keith, 1991a; Toure, 1991; National Nutrition Council and The Manoff Group, Inc., 1992).

Although many African mothers may be reluctant to modify their daily feeding practices in fear that their children will become selfish or greedy, most appear willing to take special steps to ensure that their children eat when they are ill. Thus, programs to improve children's diet may therefore find it beneficial to use times of illness and recuperation as opportunities for providing mothers and other caretakers with knowledge and skills to improve child diet and feeding practices.

v) Programs to improve dietary intake and feeding practices in Africa

As noted earlier, efforts to reduce the nutritional consequences of childhood illnesses must be based on an understanding of local beliefs and practices, as well as individuals' motivations and resistances to changing behavior. Projects included in the review were selected because they studied these conditions prior to developing specific interventions.

Although the projects were carried out by a variety of institutions ranging from university research centers to government ministries to private non-governmental organizations, each project employed a combination of qualitative and quantitative research techniques in roughly five stages:

- A review of pre-existing information on feeding practices, diet, and illness beliefs, practices, and epidemiology.

- A brief (6-8 week) or in-depth (up to 1 year) ethnographic study of health providers', community members', and mothers' health, illness, and nutrition beliefs and practices, and their sources of information on the same.

- A nutritional assessment of existing diets and practices, their potential for enrichment or improvement, and possible resistances or obstacles to improving diet quality and feeding practices.

- Individual and group trials of new feeding practices, foods, and recipes to determine the most feasible alternatives for improving dietary intake and peoples' reactions to new products (e.g., foods and recipes) and behaviors.
Development of an overall strategy for improving child feeding in the population, based on the findings from these "formative research" activities.

All of the projects described below were carried out by multidisciplinary teams that included social scientists, health professionals, nutritionists, and community members. Projects focused on improving the feeding and diets of healthy as well as sick children. Many of the projects are still in progress and information on their nutritional impact is not yet available.

 Cameroon

DESIGN: This project was carried out from 1985 to 1989 in 37 villages of the Extreme North Province by CARE/Cameroon, in collaboration with the Center for Nutrition (IMRMP), the Ministries of Health and Agriculture, and USAID. Technical assistance was provided by the Manoff Group, Inc. and the Educational Development Center (EDC) under The Weaning Project.

The methodology described above resulted in the development of an education and training program designed to improve feeding practices of children less than 36 months of age, using locally available resources. Emphasis was also placed on improving the communications skills of CARE's community health workers (animateurs).

Educational messages, targeted at parents and advising them on the appropriate diet, feeding frequency, and meal composition for healthy and sick children of different ages (0-3, 4-9, 10-15, and 16-36 months), were developed. Educational materials included picture cards for use in groups discussions, counselling cards for use during growth monitoring sessions with copies to take home, and general information posters for community viewing.

Animateurs visited each project village monthly to lead a discussion group and, with the assistance of local midwives and mothers, to carry out a cooking demonstration on how to prepare the traditional weaning pap enriched with either milk, egg, or peanut butter. During a second visit the animateurs held growth monitoring sessions with individual-level nutrition counselling. Home visits were also scheduled for children who were moderately malnourished (low weight-for-age).

RESULTS: A post-intervention AP survey was carried out by Tulane University in 23 intervention and control villages after six months to one year of program implementation. The evaluation found increased coverage and mothers' participation in nutrition-related activities and improvements in mothers' nutrition knowledge in intervention communities. Knowledge scores were highest among mothers who received individual counselling. A significant increase in the percent of mothers feeding enriched porridge to their children (from 44 percent to 50 percent) was also observed in some villages (p < 0.02).

Specific knowledge and attitude gains related to the dietary management of the sick child included an increase in the number of mothers who 1) knew to feed more following illness, from 39 percent at baseline to 55 percent at follow-up (p < 0.0001), 2) knew to continue feeding a child with diarrhea, from 86 percent to 93 percent (p < 0.0001), and 3) felt they would be able to encourage a sick child to eat, from 74 percent to 82 percent (p < 0.005). The small sample size and limited duration of the intervention prior to
The survey were noted as weaknesses of the evaluation design that limited measurement of the program's potential impact (Tulane University et al., 1989).

From an institutional perspective, the positive benefits of the project were that CARE staff learned research and inter-personal communications skills that they continue to use in their daily work. They learned to appreciate the importance of involving program beneficiaries in pre-intervention design (formative) research. Supervisory staff also learned how to plan, manage, and monitor educational activities. The need to streamline and simplify the formative research, particularly if it is to be carried out by persons untrained in the social sciences, was also indicated during the project (CARE et al., 1989).

**COSTS:** The costs to mothers of implementing the proposed feeding practices changes were not calculated. The total budget for the project, however, was estimated at $700,000 for five years. This sum included $500,000 for all external technical assistance (staff time, travel, per diem, communications, evaluation expenses, overhead, etc.), and $200,000 in local expenses (field workers travel, per diem, research costs, materials development and production, etc.) (Griffiths, 1992).

Nigeria

**DESIGN:** This project was carried out from 1986 to 1989 in 11 communities of Kwara State by the University of Ilorin in collaboration with the Johns Hopkins University Division of Human Nutrition and the Academy for Educational Development (AED) as part of the AID-funded Dietary Management of Diarrhea Project (DMD).

The project followed the five basic stages described above. Because the original intention was to develop a food to be used during diarrheal episodes, a survey of feeding practices (N = 2655), market surveys of available foods (N = 4), longitudinal diarrheal surveillance and weighed dietary studies (N = 45), and randomized clinical trials measuring the acceptability and digestibility of various foods (N = 69) were also performed.

These studies resulted in the development of an educational program to promote the consumption of a fortified pap (eko ilera) to complement breastmilk and other foods that were regularly consumed by children less than 3 years of age. The pap was made using the traditional fermented maize or sorghum paste (ogi), and adding toasted cowpea flour, palm oil, sugar, and locally-germinated sorghum (malt) flour to reduce viscosity. *eko ilera* had a total energy density of 85 kcal/100 g (when cooked), compared to 25 kcal/100 g for the traditional *ogi* (Guptill et al., 1993).

Community health workers (CHW) were trained by the project staff to prepare the eko ilera ingredients and recipe, and to use the supporting educational materials. The CHW's then trained 10 teaching mothers, who selected and trained 10 additional mothers of children less than 3 years old during cooking demonstrations and follow-up visits. Mothers were given a three-day supply of cowpeas and sorghum (Esrey et al., undated).

**RESULTS:** Trained mothers were able to prepare the recipe properly, using at least 90 percent of the ingredients in appropriate quantities. Sugar, however, was added at less than the recommended amount, and 12 percent of mothers did not add any sugar because it was believed to cause *jedi jedi*, a form of diarrhea. Mean energy density was
91 percent of the original recipe (Guptill et al., 1993).

Knowledge, trial, and adoption of the eko ilera recipe were evaluated among 295 mothers within two to eight weeks of their training, and among 301 mothers who were not trained by teaching mothers. The evaluation found that 57 percent of trained mothers knew how to prepare eko ilera (all ingredients, quantities, and cooking steps), 48 percent knew the recipe and had tried it at least once using the ingredients provided by the project, and 17 percent knew the recipe, had prepared it at least once with homemade ingredients, had all the ingredients in the home during the evaluation visit, and indicated that they would continue to prepare and feed eko ilera to their children (adopters) (Guptill et al., 1993).

Most mothers (85 percent) who knew the recipe had tried it at least once, yet only 29 percent of those who knew and 34 percent of those who tried the recipe also adopted it. Knowledge, trial, and adoption of the recipe were negatively related to mothers' perceptions of its cost and preparation time, but it was not determined whether these perceptions prevented mothers from using the recipe, or if mothers who tried and adopted the recipe subsequently decided that it was not costly and time consuming to prepare (Esrey et al., undated).

In addition to perceptions about cost and preparation time, adoption of the recipe was also related to mothers' parity, education, wage earning status, and her usual method of feeding the child. Whereas mothers with only one child were more likely to know and try eko ilera once, high parity mothers (with more than five children) were more likely to indicate that they would continue to prepare and feed the recipe. Mothers who completed their primary education, who worked as wage earners, and who had children who were not yet able to feed themselves were also more likely to be classified as eko ilera adopters. Adoption rates declined, however, with time since the last cooking demonstration (Guptill et al., 1993).

Evaluation of dietary intakes among 43 children living in intervention communities and 45 children living outside the project area ("controls") found no significant differences in total energy intake between the two groups prior to or following the intervention. Intakes were also not significantly different for sick (with diarrhea, fever, or respiratory illness) and healthy children during the baseline and follow-up measurements. Children living in the project area, however, increased their consumption of paps, whereas control children increased their consumption of solid foods from the baseline to the follow-up studies. This suggested that the enriched weaning pap, eko ilera, was replacing rather than complementing the consumption of additional solid foods among study children (Guptill, 1990).

Thus, although trained mothers were able to prepare the enriched weaning pap promoted by the project, and more than 50 percent of mothers in the project area had tried the recipe at least once, the brief intervention - - a minimum of two cooking demonstrations per mother -- did not result in significantly increased energy intakes among study children during and immediately following the intervention period. Greater success, however, might be expected if additional time and attention were given to promoting the consumption of other solid foods by children also consuming eko ilera.
COSTS: Eko ilera required approximately 30 minutes to prepare when all ingredients were already available, compared to 20 minutes for the traditional porridge given to children. Preparation of a two-week supply of the cowpea flour required an additional three hours (for soaking and sun-drying), and a four to six-week supply of malt required approximately two to three hours over a minimum of three days for processing (Guptill et al., 1993). The total cost of eko ilera was estimated at $0.13/100 g in 1987, compared to $0.05/100 g for the traditional porridge and $0.50/100 g for commercial infant cereal (Bentley et al., 1991).

Tanzania

DESIGN: This project was carried out in 1983 as a pilot intervention implemented by the Tanzania Food and Nutrition Center in Luganga village in the Iringa region. It included local research and household testing of the use of a commonly available amylase-rich flour (ARF) to reduce the viscosity and increase the energy density of a traditional weaning food. The result of the pilot study were subsequently implemented by the government of the United Republic of Tanzania in seven regions, through the Joint WHO/UNICEF Nutrition Support Program (JNSP).

For the pilot study, 40 children aged 5-65 months were randomly selected to participate in an extended feeding trial of three recipes using a mixture of maize and peanuts (95:5). These recipes were: 1) a thin gruel containing 5 percent solid matter boiled in water (the traditional porridge or uji), 2) a thick porridge containing 20 percent solid matter, and 3) the thick porridge thinned with germinated sorghum flour ("power-flour" or kimea). Participating mothers were trained in methods for preparing the recipes, and children were fed, in six demonstrations carried out over two months. Mothers were asked to record their use of the power-flour recipe over a three-month period. After this period, consumption of each recipe by participating children was measured monthly, on three consecutive illness-free days, for six months (Mosha and Svanberg, 1990).

RESULTS: Results of trials indicated that the percentage of mothers willing to prepare the power-flour porridge almost every time they prepared food for their child increased from 13 percent to 28 percent, and the percentage who used the germinated flour at least 25 percent of the time increased from 48 percent to 85 percent, during the course of the three-month trial. The dietary studies found no differences in average intake (g per meal) for the three recipes by children less than 12 months old. Among children 12-24-months, the average consumption per meal of kimea was significantly higher (p < 0.05) than consumption of the thick porridge recipe (347 versus 277 g per meal). The average energy density of each of the recipes was not reported, but researchers noted that the kimea preparation contained four times more energy per unit volume than the traditional uji recipe (Mosha and Svanberg, 1990).

Use of kimea for child-feeding was subsequently promoted (interpersonally and through radio broadcasts) in at least 168 villages as part of an integrated primary health care program that also included tri-monthly growth monitoring, feeding and hygiene education, on-site feeding for severely malnourished children, immunizations, and other maternal and child health services. A 1988 evaluation of the expanded (JNSP) program found that 93 percent of mothers interviewed (N = 443) knew about
**kimea** for child feeding but only 8 percent reported using it on a daily basis (Government of Tanzania/WHO/UNICEF, 1988 cited in Ashworth and Draper, 1992).

A 1989 evaluation in one project district (Kyela) found that 42 percent of mothers knew about kimea, but less than half of these mothers (45 percent) reported using it. Among mothers who knew about kimea, only 37 percent could also correctly describe how to use it to thin children's porridges. Difficulties in correctly preparing kimea-thinned porridges were believed to be due to the common misconception that the germinated "power-flour" was the source of energy in the recipe (Tomkins et al, 1990).

Additional constraints to the successful promotion and adoption of "power-flour" for child feeding included 1) confusion created because mothers were previously advised to increase the energy density of their children's porridges by adding sugar or oil, 2) germinated grains are traditionally used for brewing alcoholic beverages and mothers disapproved of their use for child-feeding, and 3) mothers may not have considered weaning food improvement to be a priority (Tomkins et al, 1990).

Note that although the use of kimea was not specifically advocated for feeding children during and following illness, this project is included in this review because the end result of the use of malted flours -- the production of a less viscous but more energy-dense (kcal/g weight) traditional porridge -- is both nutritionally beneficial as well as potentially attractive to mothers who dilute foods offered to sick children and children suffering from depressed appetites.

**COSTS:** No estimates of the costs of preparing kimea-thinned **uji** have been identified. It is important to realize, however, that the potential benefit of using malted flours arises from the fact that they enable young children with limited gastric capacities to consume greater quantities of a less bulky food. Thus, use of kimea and other germinated grains to thin (but not dilute) traditional porridges necessarily implies greater costs to families: the end result of their correct use is that more raw ingredients are consumed (Ashworth and Draper, 1992).

**The Gambia**

**DESIGN:** Two projects to improve feeding practices during and following child illness have been implemented. The first project was implemented by the Ministry of Health (MOH) in 1981 to 1984, with funding and technical assistance provided by the AID-assisted Mass Media and Health Practices (MMHP) and HEALTHCOM Projects. The second project is currently being implemented by The Gambian Food and Nutrition Association (GAFNA), a consortium of organizations working in nutrition in the country, with technical assistance and funding provided by PRITECH.

The first project (MOH/MMHP) was implemented nationwide, beginning in 1982 and lasting approximately two years. A combination of qualitative and quantitative research methods were used to develop radio programs, and to design and produce simple printed educational materials that were used in five promotional campaigns (Rasmussen and Booth, 1985). The objectives of the program were 1) to teach rural mothers about oral rehydration therapy (ORT) and how to monitor children with diarrhea, 2) to discourage
mothers from withholding foods during diarrhea, and 3) to promote feeding during and after diarrhea episodes. The target audiences were rural mothers, grandmothers, and the older siblings of children under five (Rasmuson et al, 1990).

Approximately 180 health workers were trained for five days in diarrhea treatment and management methods. An additional 650 volunteers were trained to assist mothers with ORT preparation and child feeding. The program focused on feeding during diarrhea in the first year, and after a mid-term review the emphasis shifted to increased feeding of enriched solid foods during convalescence when appetite was restored. Specific solid foods and recipes were promoted as sources of power and weight gain for recovering children. Additional materials were produced and about 100 health workers received three days of additional training on using the revised messages (Rasmuson et al, 1990).

RESULTS: The evaluation included repeated surveys of 800 to 1000 women living in 20 villages, implemented over two to six month intervals for two years. After one year of implementation, 66 percent of women interviewed knew how to prepare ORT and 47 percent reported using it, but only 21 percent reported adopting the program's advice of giving solid foods during and after diarrhea. Shortly after the revised messages were delivered, 55 percent of mothers reported that they continued feeding solid foods during diarrhea, compared to only 14 percent at baseline (Rasmuson et al, 1990).

Likewise, at the end of the revised campaign, 58 percent of mothers reported giving more food to their children during recovery from diarrhea, while 26 percent reported giving the same amount and 16 percent reporting feeding less food. Five months after the intensity of the educational campaign subsided, however, only 44 percent of mothers reported feeding more during recovery, while 33 percent and 23 percent reported feeding the same or less food, respectively. Baseline feeding practices during recovery were not reported (Rasmuson et al, 1990).

COSTS: The costs to mothers of implementing the recommended feeding practices were not reported. Feeding recommendations were formulated based on whether they could be implemented by mothers and not on nutritional considerations alone (Rasmuson et al, 1990).

DESIGN: The second project (GAFNA/PRITECH) is being carried out in several communities (named below) representing five ethnic groups throughout the country. Formative research began in 1990, with an ethnographic study of feeding practices during and following diarrhea in Fass Njaga Choi, Sintet, Jiffarong, Sarra Kunda, and Kulari. This study included key informant interviews (N=65), direct observations of feeding (N=57), and other methods such as free listing, ranking, and triad sorting of foods, food combinations, and recipes (N=111 respondents) (Samba and Gittelsohn, 1991).

Recipe trials were carried out in three phases. The first phase included the development of a nutrition counselling chart for children 0-3, 4-6, 7-9 and 10-24 months of age. This was followed by group discussions and cooking demonstrations in three communities. Household trials of new recipes and feeding practices were implemented in Sarra Kunda, Sintet, and Sankule Kunda among 60 mothers (four visits/mother over two weeks). Of these mothers, 21 had children with diarrhea during the trial (35 percent), 22 had children classified as undernourished (37 percent), and the
remainder (N=17 or 28 percent) had children classified as healthy.

**RESULTS:** The main results of the trials are presented below:

- 57 percent of mothers with children less than 4 months (N=7) were willing to breastfeed exclusively. No mothers who had already introduced other foods and liquids were willing to resume exclusive breastfeeding.

- 68 percent of mothers with children 4-24 months old (N = 31) were willing to add peanut paste to their traditional millet pap (ogi). Most mothers found that their children liked the taste of the enriched pap and ate it well, but five mothers were unable to continue the practice because they could not afford to purchase the peanuts. Four mothers added either bean flour, butter, milk, or dried fish instead of peanuts.

- Mothers of children 4-24 months were willing to increase feeding frequency, either by cooking enriched ogi more often (at 4-6 months), adding adult foods to the child's diet (at 7-9 months), or adding nutritious snack foods (at 10-24 months).

- Mothers of sick and undernourished children were eager to try new feeding practices, and to continue them if their children ate well or liked them (Samba Ndure, 1993).

**COSTS:** The costs to mothers of implementing the proposed behaviors changes were not disclosed.

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**Ghana**

**DESIGN:** This project was carried out from 1986 to 1989 in seven rural and peri-urban communities in the northern savannah (N=2), forest (N=2), and coastal savannah (N=3) agro-ecological zones by the Nutrition Division of the Ministry of Health with funding from USAID/Ghana. The purposes were to conduct formative research on infant feeding practices and to develop a comprehensive strategy for improving them that could later be implemented nationally by the Ghanaian government. Local collaborators included the Ghana Education Service and the National Council for Women and Development. Technical assistance was provided by The Manoff Group, Inc., under The Weaning Project.

A streamlined version of the five stages described above were used to study well-nourished and undernourished children's diets (N=101 for the latter) and feeding practices, and to test the acceptability of behavioral changes that were anticipated to improve their dietary intake (N = 105). These data were supplemented with information obtained through 16 focus group discussions with mothers, grandmothers, fathers, local food vendors, and community health workers (Ministry of Health, 1989a-d).

This research resulted in the development of a broad-based strategy to improve infant feeding, which included communications, legislation, income generation, child care, and other activities. The planned communications activities included the use of individual (interpersonal) counselling and mass media, with messages targeted to mothers with children less than 2 years old, mothers who work, and mothers with ill or
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recuperating children (Ministry of Health, 1989d).

RESULTS: No data are available on the impact of activities in Ghana because the planned materials and interventions to improve infant feeding are gradually being implemented by the government. Results of the household trials, which formed the basis of the educational messages developed for the strategy, found that over a four to seven day period mothers were willing to:

- stop (80 percent) or reduce (20 percent) the amount of water given to breastfed infants less than 4 months old (N=10),

- use both breasts for nursing young infants (90 percent; N=10),

- to thicken the consistency (79 percent; N=29) or enrich the traditional cereal porridge given to children greater than 4 months old with either legumes, fish powder, or oil (81 percent; N=52),

- to increase the amount of other solid foods fed to children greater than 7 months old (82 percent; N=65),

- increase staple or porridge feeding frequency by at least one meal per day (83 percent; N=35), and

- feed fruit to their children (82 percent; N=28) (Ministry of Health, 1989b).

COSTS: The costs to mothers of implementing the proposed feeding practices changes were not calculated. The total budget for the project, however, was estimated at $230,000 for formative research and strategy development. This sum included $170,000 for all external technical assistance (staff time, travel, per diem, communications, overhead, etc.), and $60,000 in local expenses (field workers travel, per diem, research costs, etc.) (Griffiths, 1992).

Swaziland

DESIGN: This was a nationwide project carried out from 1986 to 1989 by the Swaziland National Nutrition Council, in collaboration with the Ministries of Agriculture and Health, UNICEF, and the Swaziland Infant Nutrition Action Network (a local NGO). The purposes of the project were to conduct formative research, develop a strategy to improve feeding practices, and to develop prototype materials that were later produced by UNICEF and used by the Swazi government. Local funding was provided by UNICEF. Technical assistance was provided by the Manoff Group, Inc., under The Weaning Project.

Formative research included the use of focus group discussions (N=20) among mothers with children less than 24 months, first time (primiparous) mothers, mothers who work away from home greater than six hours per day, grandmothers, and fathers. These were followed by a series of household depth interviews and observations in three communities, among 43 families with well-nourished and undernourished children, and interviews with traditional and modern health providers (N=34-). Household trials of behavior changes were carried out with families totalling 31 children less than 24 months of age (National Nutrition Council, 1987; 1988).

Results of the formative research were used to develop a communications program to 1) create awareness about the importance of proper child
feeding during illness, recuperation, and health, 2) improve mothers', other caretakers', and health providers' knowledge, attitudes, and practices regarding child feeding and general child care, and 3) promote specific products (e.g., powdered malt, a child-feeding bowl) to be used to realize specific feeding practice improvements (Swaziland National Nutrition Council and The Manoff Group, 1992).

Educational materials that were developed included computer-generated, individual counselling cards and a flip-chart for use with groups. A local theater group wrote and produced a drama about child feeding, and radio programs were written and recorded. Other promotional materials included a project logo (showing the family food pot and the saying "Feed the Nation of Tomorrow"), banners, and tee-shirts. Project implementation began in August 1989 by training home economists and clinic nurses to use the educational materials. Rural health promoters and male extension workers were trained subsequently.

RESULTS: No formal evaluation of the project has been completed to date. Results from the week-long household trials, however, showed that almost all mothers (89 percent) were willing to improve at least one feeding practice. The most successful trials involved improving the quality of the weaning diet:

- 90 percent of mothers asked (N = 10) were able to add germinated sorghum malt to the traditional adult maize porridge (liphalishi).

- 86 percent of mothers asked (N = 22) were able to add one or more energy dense food (relish, oil, or peanut butter) to the liphalishi.

- 71 percent of mothers asked (N = 24) were able to feed their children at least one additional meal or snack each day.

- 67 percent of mothers asked (N = 18) were able to feed their children a larger quantity of food at each feeding, and

- 67 percent of mothers asked (N = 9) were also able to measure their children's food before serving it.

Several children were said to be sick or recuperating from illness during the trial period, although the exact number was not reported. Infants were given the same recommendations, regardless of their illness or recuperation status. Failure to accept a recommendation because of illness was not mentioned, and illness was cited only once as a reason for discontinuing a recommended behavior (National Nutrition Council, 1988).

A baseline study of child feeding practices was conducted by the University of Swaziland in 1990. Implementation of the feeding practices improvement strategy is ongoing. The benefits from the project to date include 1) an increased understanding of young child feeding and its potential for improvement in Swaziland, and 2) training of local professionals in qualitative research methods, communications, and computer-generated graphics techniques.

COSTS: The costs to mothers of implementing the proposed feeding practices changes were not calculated. The total budget for the project, however, was estimated at $300,000 for formative research, strategy development, and materials development, testing, and production. This sum
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included $150,000 for all external technical assistance (staff time, travel, per diem, communications, overhead, etc.), and $150,000 in local expenses (field workers travel, per diem, research costs, materials development and production, etc.) (Griffiths, 1992).

Niger

**DESIGN:** This project was carried out from 1990 to 1992 in eight villages in the Konni and Dosso areas by the Niger National Diarrhea Control Project. Technical assistance was provided by an anthropologist and a nutritionist, under the PRITECH project.

The formative research included household depth interviews and observations of 64 mothers with children 4–24 months old, at least half of whom had diarrhea in the previous two weeks. This information was supplemented by key informant interviews with modern and traditional health care providers, other mothers, and fathers (Keith, 1990). Trials, which focused on the preparation and feeding of enriched weaning recipes, were implemented in 116 households. In most of the trial households children were ill (42 percent), recuperating from illness (50 percent), or were believed by their mothers to have lost weight recently (5 percent). In less than 3 percent of households were children believed to be totally healthy (Keith, 1991).

During the household trials one of five basic recipes was recommended. Each recipe had a millet-flour base which varied regionally by its degree of fermentation, dilution, and consistency. To this base, mothers were advised to add either peanut solids (kulikuli), sour skimmed milk, or a fried bean, millet, or wheat cake. Sugar was to be added to all recipes. Recipes using the fried cakes and sugar had an estimated energy density of 83 kcal/100 g, which was comparable to the density of eko ilera promoted in Nigeria (85 kcal). The energy density of recipes using sugar and peanut solids or sour skimmed milk was lower, at about 51 kcal/100 g. Protein densities for all three recipes ranged from 1.3 to 1.5 g/100 g. The energy and protein densities of the traditional porridge were 22 to 24 kcal/100 g and 0.3 g/100 g, respectively (Hung, 1992).

**RESULTS:** The results of this research are currently being analyzed to make recommendations for strategies to improve child diet and feeding practices and reduce the nutritional impact of diarrheal disease. As with the previous two projects, only the results of the household trials can be reported at this time. Of the 116 mothers completing the week-long trial:

- 73 percent made the agreed upon recipe at least once per day during the week-long trial period, and an additional 11 percent made the recipe during half of the days. Less than 4 percent did not make the special recipe even once.

- 25 percent modified the recommended recipe by leaving out one of the ingredients because it was unavailable, the child did not like it, or because it was perceived to cause or aggravate diarrhea (i.e., sugar or peanuts).

- 12 percent prepared a special gruel for their children but did not enrich it with any of the recommended ingredients because the child refused to eat them or did not like their taste.

- 91 percent of mothers indicated that they would continue to prepare and feed the enriched gruel after the intervention trial period (Herman and Keith, 1993).
Food frequency studies completed on the first and last days of the trials suggested that the consumption of the enriched gruels resulted in a decrease in the consumption of drinks such as fura. Changes in the frequency of consumption of non-millet snacks and foods on the first versus last day of the trial varied (average range: -0.6 to 1.1/day), depending on the village studied. Children's total dietary intakes (including breastmilk, millet-based gruels and family foods, as well as non-millet "snack foods") were not systematically evaluated, making it difficult to estimate the nutritional impact of the proposed recommendations during periods of illness, convalescence, and health. The costs of preparing the various recipes were not estimated.

**COSTS:** The cost of preparing the different recipes was not estimated. Field work for the formative research cost $5,000 in local expenses. The use of outside consultants required an additional $65,000 (including fees, travel costs and other expenses). Administrative and technical support were approximately $20,000.

**SENEGAL**

**DESIGN:** This project began in 1991 and is still being carried out in nine villages in the Fatick region and district. It is a collaborative effort between the Ministry of Health (SANAS), the Organization for Food and Nutrition Research in Africa (ORANA), and local health providers and mothers working in the project communities. Funding was provided by PRITECH.

The project has been carried out in three phases. Phase I included interviews with 30 health agents and 33 mothers with children suffering from diarrhea, and observations of health agents interacting with mothers in the clinic setting. Interviews obtained information on feeding practices during diarrhea. Observations documented health agents' ability to assess children's clinical states, and the advice they gave to mothers concerning feeding during and following diarrhea (Sene, 1991).

Phase II included seven focus group discussions with mothers who had at least two children under five years and one child under three years of age. The acceptability of various foods for feeding during diarrhea was discussed. Several recipes were prepared and administered to children. The nutritional characteristics of common preparations were also evaluated (Sene, 1992). Phases I and II were completed in urban communities near Dakar and rural villages in the Thies region.

Phase III was designed as an operations-research effort to compare three nutrition education interventions: one using health facility staff only, another using traditional birth attendants, and the third using representatives of local women's groups as nutrition promoters. Ministry of Health personnel from the central level (Nutrition and Health Education Services) and regional and district levels participated in the research.

Phase III field work included four home visits to 1) identify children 6-36 months who had or were recuperating from diarrhea, 2) interview mothers and observe feeding and related child-care practices during a 12-hour period, 3) introduce one or more feeding practice changes based on a rapid assessment of observed practices, and 4) evaluate mothers' reactions to the new feeding behaviors and whether they were likely to
continue them in the future. Fifty-four children from nine villages participated in this stage of the research: 39 (72%) had diarrhea and 15 were recovering from diarrhea during the household trials.

A training module and series of nine counselling cards were developed on the basis of research findings. Eleven health post personnel (e.g., nurses and monitrices) were trained in nutritional concepts and appropriate feeding practices during and following diarrhea, the content of the counselling cards, and how to use them with mothers. Traditional birth attendants and nine nutrition promoters from local women's groups were also trained, in separate sessions, in how to implement growth monitoring activities and in the use of the prepared counselling cards.

RESULTS: The training sessions described above were carried out in April-June, 1993, and information on the program's impact at the community level is not yet available. The rapid assessments characterized the major feeding problems, in descending order of frequency, as 1) insufficient food quantity offered to the sick or recovering child, 2) insufficient food quantity consumed by the child, 3) low energy density of the diet, 4) low frequency of feeding, and 5) failure to feed the child from a separate bowl (Diene, 1993).

During the trials:

1) 71 percent of mothers who agreed to feed their children more food each day (N=7) actually tried this recommendation. All mothers trying the recommendation said they would continue the practice.

2) 77 percent of mothers who agreed to enrich their children's weaning porridge (N=31) with either peanut butter, milk, butter, or oil actually tried this recommendation and all but three of these mothers indicated that they would continue this practice. Milk and butter were the most acceptable ingredients to add to porridge. Butter was more commonly added to the porridge of infants aged 6-11 months; milk was most likely to be tried and continued.

3) 43 percent of mothers who agreed to feed their children more frequently during the day (N=7) tried this recommendation, and all said they planned to continue the practice.

4) 80 percent of mothers who agreed to feed their child from a separate feeding dish instead of the family pot (N=15) tried the recommendation, and all but four (67 percent) said they would continue this practice.

5) 87 percent of mothers who were asked to feed their sick children with a mixture of milk, oil, and sugar (N=30) tried the preparation, and 62 percent of those trying it felt they would continue with the practice.

Mothers said they would continue the recommended practices because they were easy to implement, their children liked them, they promoted weight gain, and they gave their children energy and appetite. The reasons for resistance to trying and continuing new practices were failure to remember the recommendation, the ingredients were not available (e.g., peanut butter) or were expensive, and their children did not like them. Although feeding practices were not perceived as major causes of health and nutrition problems, mothers were motivated to accept
nutritional advice that was new and believed to be effective (Diene, 1993).

Lessons learned from the project included the understanding that health providers require intensive and practical training in how to communicate, persuade, and negotiate with mothers to change their behavior. Operational research efforts are facilitated when research institutions and implementing agencies work together. Such coordination helps to insure that research findings are used to benefit program implementation.

**COSTS:** Only implementation costs for Phase III of the project have been estimated and they represent $35,000 for local expenditures. No international consultant was hired. Monitoring and supervision costs were around $15,000.
Nutrition services that could be provided by the health sector if a radical change in approach were adopted

1. Food supplementation

   a) **FINDINGS AND RECOMMENDATIONS**

   i) **Food supplements for pregnant women**

       Although MCH services are considering the option of dietary supplements, targeting pregnant women rather than children with this intervention may be more productive and cost-effective, because the period during which supplements are necessary (the third trimester) is shorter and the number of beneficiaries is smaller.

   ii) **Food supplements for children**

       Repeated observations in Africa and elsewhere have proven the worth of providing supplements to enhance the nutritional status of children at critical ages when their family situation and customary eating habits do not provide for the nutritional needs of a young child.

       An overview of the assessments suggests the following principal factors that lead to success (this is not an exhaustive list):

       - An initial evaluation that correctly analyzes the situation (extent, distribution, and causes of nutrition problems), with goals adopted and interventions outlined according to the program’s needs.

       - Depending on the situation (for example, the predominance of growth-deficient and/or underweight children) and the objectives (therapeutic and/or preventive care), the appropriate groups are targeted:

           - if the aim is to prevent growth deficiencies, all children under two years are included. Geographical targets may also be incorporated.

           - if the goal is to provide therapeutic care, malnourished children (criterion is height/weight ratio) should be targeted individually.

           - Using weaning foods that are child-specific, culturally acceptable, and have a high energy density.

           - As a counterpart to correct targeting measures, which can help to improve cost-effectiveness, make sure that the target group is adequately covered.

           - Integrate other types of services aimed at this target group (nutrition education, basic health care, etc.)

           - As is the case for many other interventions, community participation appears to be crucial. Only if the community understands and accepts the principle of targeted supplementation will children at risk receive the supplements directly without their being resold, shared, or substituted for the customary food ration. The community should form a local committee that makes the original request for supplements and ensures that the program is managed at a community level. The committee should be kept informed of the program’s progress at regular intervals so that it understands fully any changes made.
Whenever the availability of food supplies allows, limit food imports used for supplements: as with all forms of food aid, imports also have distorting effects. When supplements are needed on a national level and external food aid is required, the aid program should be institutionalized quickly. The health sector should also invite other sectors to put adapted nutrition and food policies into place that include a regional and local distribution plan to be implemented as quickly as possible and to encourage communities to commit to supervising supplementation, particularly to verify that young children are consuming the supplements.

Supplements should not substitute for meals prepared for the family if they are adequate nutritionally. The duration of targeting measures should also be limited.

Nutrition education at an adequate technical level should accompany supplementation in each case, otherwise supplementation acts only as a palliative and does not eliminate the real causes of malnutrition.

b) DEFINITION

Programs whose goal is to supplement the diets of vulnerable sectors of the population (preschool children, pregnant women, nursing women; some programs are also for school-age children) with foods that correct a nutrition deficit and improve the nutritional status of the individuals concerned are grouped in the category of dietary supplement programs. Some programs, however, have functioned more as instruments to redistribute and transfer income and thus reduce the poverty of the families at risk.

Many programs were targeted primarily at improving the feeding practices of mothers in the case of young children, in particular by overcoming certain habits or beliefs; in these cases, the food distributed was accompanied by nutrition education information adapted for this use. Because of the poverty of the families in question, the food is generally distributed free of charge or its purchase is subsidized so that it may be distributed at a nominal price acceptable to the beneficiaries.

c) FOOD SUPPLEMENTS FOR PREGNANT WOMEN

Research shows that it is more effective to supply pregnant women than newborns with supplements if the desired effect is to affect the child’s growth (Kusin et al., 1992). In Africa, however, it has been shown that the practice of not eating too much during pregnancy ("eating down") is common because women fear a complicated pregnancy if the child is too big (Brems and Berg, 1989). Research conducted to date on the effect of supplementation on birth weight indicates a relatively small difference between the weight of infants born to women who received supplements and those born to women who did not. This small difference in birth weight, however, does make it possible to reduce significantly the proportion of infants with a low birth weight: from 23.7 percent to 7.5 percent in Gambia (a difference in weight of 200 grams); a decrease of 29.6 percent in Mexico; and in Guatemala the prevalence was reduced from 29 percent to 13 percent in the poorest women.

According to Prentice et al., the greatest deficiency in growth in utero appears to occur after the 37th week of pregnancy. This means that supplementation during the last trimester
Table VII. Impact on birth weight of various supplementation programs for pregnant women

<table>
<thead>
<tr>
<th>Study</th>
<th>Calories/day before supplementation</th>
<th>Calories/day provided by supplements</th>
<th>Increase in birth weight (in grams)</th>
<th>Comments</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colombia</td>
<td>1620</td>
<td>133</td>
<td>51</td>
<td>birth weight increased by 181g for women with a low height/weight ratio</td>
<td>Herrera et al, 1980</td>
</tr>
<tr>
<td>Guatemala</td>
<td>1415</td>
<td>149</td>
<td>111</td>
<td></td>
<td>Lechtig et al, 1980</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1600-2000</td>
<td>276</td>
<td>55g for boys 35g for girls</td>
<td>during the rainy season (supplementation was ineffective during the dry season)</td>
<td>Adair and Pollitt, 1985</td>
</tr>
<tr>
<td>The Gambia</td>
<td>1419</td>
<td>430</td>
<td>200, +/- 53</td>
<td></td>
<td>Prentice et al, 1987</td>
</tr>
</tbody>
</table>

could have a greater impact on birth weight than supplementation during the first two trimesters.

Kusin and Java's research has shown that children of mothers who received supplements were taller and heavier than other children during their first five years; the weight difference was considerable until 24 months and the height difference until five years. The reason for this difference could be that women who received supplements had more milk.

So, although MCH services are considering the option of dietary supplements, "targeting pregnant women rather than children with this intervention may be more productive and cost-effective, because the period during which supplements are necessary (the third trimester) is shorter and the number of beneficiaries is smaller" (Kusin et al., 1992). It should be noted that supplementation seems to have an effect only if the woman is already malnourished, and it has no effect if she has a good diet.

d) **FOOD SUPPLEMENTS FOR CHILDREN**

i) **Previous assessments**

A distinctive feature of supplementation programs is that they have already been the object of several broad assessment efforts over the last 10 years; these include, in particular, Anderson et al (1981), who focused on the methodology and design of the programs; Beaton and Ghassemi in 1982 and updated by Ghassemi in 1989; assessments between 1980 and 1985 of the "Food for Peace" programs (PL 480, title II) (USAID, 1985); Bremer-Fox et al. (1987) on PL 480 as well; Kennedy and Knudsen (1985); and a new analysis by Mora, King, and Teller of the performance of the programs during the 1980s and perspectives for the 1990s (Mora et al., 1990).

■ The conclusions of these assessments:

On several occasions, the assessments showed an improvement in anthropometric indicators, albeit a modest one; among other effects observed
was a decrease in mortality, thanks to steps taken to decrease the severity of episodes of illness (Rose and Martorell, 1991). The rates of coverage are generally very low even for the most important programs, and these programs have a great deal of difficulty in reaching the youngest children (less than 24 months). The quantity of food provided is often very small relative to the needs of young children; in addition, the actual amount of food ingested by the children is reduced even more since food is shared, sold, or substituted for the normal ration. Target measures, on whatever basis (geography, age, economic status, nutritional status), are usually inadequate. Finally, the staff is often overwhelmed by the tasks required because of a lack of training, especially in the management of this type of program. Some programs obtained good results when they were run in conjunction with other nutrition or health measures (notably education) (see Gilmore et al., 1980, for example).

- Program assessment problems:

  Most frameworks used to evaluate the programs were not suitable for measuring the real impact on nutrition. This is why few reliable results are currently available (see Esrey et al., 1985, for example).

  In Africa, assessments of the "PL 480, title II" programs of American aid managed by the CRS are the most widely available. In Africa, problems often revolved around the definition of program objectives, their relation to the type of nutrition problems in the affected zones, and the indicators used to measure these changes.

  A brief overview of these assessment criteria follows. Of the 43 projects evaluated in 1982 by Beaton and Ghassemi, six concerned African countries; 23 included a control group, and of these only one was in Africa. Of 15 PL 480 program assessments conducted between 1980 and 1985 (USAID, 1985), five include data on the nutritional status of the participants, two of which are in Africa (Morocco: Gilmore et al., 1980; and Senegal: Echenberg et al., 1984). Finally, the author who analyzed the assessments of the PL 480 programs financed by USAID during the 1980s recognizes that these assessments were not designed to demonstrate the impact on nutrition of the programs: of 27 assessments, seven chose an adequate sample size but none of them used a protocol such as a before/after comparison with a control group, which is indispensable for measuring accurately the impact of supplementation on the participants (Mora et al., 1990).

  ii) Problems with program objectives

  Most programs pursued many objectives at the same time, either explicitly, as title II of PL 480 specifies: "...to combat malnutrition especially in children; promote economic and community development with the goal of reducing the need for such assistance...," or implicitly, with the goal of improving feeding practices, preventing growth deficiencies (stunting) and helping children losing weight to recover (wasting), and providing uniform treatment in zones with a high prevalence of both of these conditions.

  In Africa, the anthropometric index used in assessments has generally been the "weight/age" ratio. Only a few programs (none in Africa) have tried to evaluate the impact in terms of actual
energy intake, physical activity, energy expended, morbidity, and mortality. This is the result of the lack of simple, quick, and inexpensive measurement techniques.

Recouping delayed growth in terms of height: Many studies have confirmed the early onset of delayed growth in the first year, which then proceeds at a normal pace (see the results of the Collaborative Research Support Program conducted in Egypt, Kenya, and Mexico, for example; cf: Calloway et al., 1988); the chances of making up for growth deficiencies after the second year appear to be slim even when the diet seems to be adequate, at least in terms of caloric intake. In addition, there seem to be specific ages when growth responds to supplementation, generally during the child’s first year (Lutter et al., 1990).

Recouping weight: Several research projects outlined the effects of supplementation depending on the age of the child and type of malnutrition. For example, an energy supplement given to children between the ages of six and 24 months who were mildly and moderately underweight had a pronounced effect (Rivera, Habicht, Robson, 1991). Narangwal’s study in India (Kielmann et al., 1978) showed that a well-managed and correctly targeted food supplementation program had a significant impact on weight and height, while isolated health measures taken to fight infection had an effect on morbidity and mortality but not on growth; on the other hand, the two programs implemented together had a certain synergistic effect.

The importance of targeting: These results clarify the apparent ineffectiveness observed. In fact, it is not surprising that there is little impact in terms of the "weight/age" ratio because the programs were generally not set up for specific age groups (most often 0–60 months), and they mostly affected children over two years in regions that had a high prevalence of delayed growth in terms of height (and perhaps a mild energy deficit after the weaning period) and did not even target low-weight children. A typical example is the supplementation of preschool-age children in the poorer regions of Addis Ababa in Ethiopia; this is one of the rare longitudinal assessments with a control group using three indices: "weight/height" ratio, "height/age" ratio, and "weight/age" ratio (Demekte and Wolde-Gabriel, 1985). The program’s complete ineffectiveness was demonstrated by the fact that the improvements observed in the group receiving supplements were the same as those observed in the control group. According to the authors, the program covered between 25 percent and 100 percent of the children’s energy needs (but with the usual diversion problems: sharing, selling, and substituting the supplements for customary rations). The programs targeted children between six months and six years (fewer than 10 percent were under one year) in a case in which 46 percent of children were shorter than normal (height/age < -2 standard deviations) and only 3.5 percent were underweight (weight/height < -2 standard deviations)! They conclude that the practice of giving food to children without taking into consideration their age and/or nutritional status should not continue; targeting based on anthropometric measurements is suggested, although whether this should be done using
the "weight/height" ratio or the "height/age" ratio is not specified.

Experience and new information suggest, therefore, that the nature of the objective (and thus of the choice of an evaluation framework adapted to it) is central to determining the choice of implementing factors, which will be examined next (coverage, type of targeting measures, size and type of ration, role of health services, and integration into other initiatives).

- **If the program's objective is to treat underweight children currently at risk in regions where this problem is prevalent**, priority should be given to putting targeting or even screening measures into place based on anthropometric criteria (such as "weight/height" ratio). This framework would be particularly appropriate in zones subject to chronic or acute seasonal food shortages.

- **If the program's objective is to contribute to improving long-term conditions by changing feeding practices and preventing growth deficiencies** (to go back to an old idea, a sort of "vaccination" against malnutrition), priority should be given to targeting based on geographical location and age (for children under two) considerations. This framework seems to be adapted most to zones with a low prevalence of underweight children but a moderate to high rate of children with growth deficiencies in terms of height.

- **If the objective is first to reduce poverty through an income transfer** with only the hope of indirectly affecting nutritional status, targeting measures should be implemented on an economic basis and their effectiveness should also be judged in terms of their economic impact. The income transfer aspect seems to have been significant in a number of programs, specifically in those of PL 480, title II: thus, in Mauritania (McClelland et al., 1984), distributed food represented 14 percent of family income per person and 33 percent for nomads; in Morocco, between 4 percent and 24 percent (Gilmore et al., 1980); in Kenya, between 5 percent and 18 percent, depending on the number of rations in the richest rural families, and between 22 percent to 72 percent in the poorest families (Fleuret, 1985); in Senegal, this represented on average $6, or about 18 percent of the family's income (Echenberg et al., 1984); in Lesotho, it represented $31.50 per family each month (USAID, 1988).

  iii) **Program operations**

  **Supplementation provided directly to households or at health centers:**

- At health centers: supplementation provided at health centers ensures that the desired ration will be consumed. It offers the advantage of providing for the delivery of other services: outpatient care, nutrition education, and growth monitoring. On the other hand, experience has shown that supplementation reaches few children under two years and that the ration substitutes in part for the customary diet. It is costly (infrastructure, personnel) and provides for a low level of coverage in a limited area. The drawbacks of coming daily are evident as are the risks of dependence, relieving the mothers of their responsibilities, and social stigma.
To households: the distribution of food to be consumed at home offers the possibility of providing greater geographic coverage, because a single center can cover several hundred children. Oriented toward the family, it also reaches children under two more easily. Mothers have the advantage of not needing to show up as frequently. It is not as expensive and provides for the possibility of delivering other services at health centers. On the other hand, the risk that food destined for the target group may be diverted (shared, sold) is greater. The distribution center may also be too far away. And because distribution takes place less frequently, educational actions may be provided with less regularity.

Growth or recuperation is believed to be more rapid with supplementation programs administered from health centers. There are not many data to verify this, however. In a controlled experiment in Chad, Stefanek and Jarjoura (1989) found no differences in the effect on growth in the short run (average weight gain after 60 days) between two groups of malnourished children (weight/height < 80 percent of the reference median), with one receiving supplements at a health center and the other receiving the same ration to be consumed at home. In every case, growth was significantly greater than a control group receiving no supplements.

Coverage:

Supplementation programs in Africa are providing increasingly less coverage; there were 2.1 million beneficiaries in 1983 and only 1.3 million in 1989 (Mora et al., 1990). Supplementation programs have had particularly low rates of coverage. During the 1970s, Beaton and Ghassemi (1982) note that programs reached 6 percent to 10 percent of the population of preschool children. These are rough estimates and do not reflect the rate of actual participation. Some African countries have similar rates of coverage: Morocco in 1979 (Gilmore et al., 1980) had 9 percent (11 percent of poor families and 6 percent of malnourished families); Tunisia in 1976, 15 percent; Kenya in 1980 (USAID, 1980) averaged 1.9 percent but varied between 1.3 percent and 4.9 percent depending on the region; Togo, 5.6 percent for children between zero and five (Stephens et al., 1984); Senegal, 10.3 percent of children under three (Echenberg et al., 1984); Gambia, 13 percent of children under three and only 8 percent of the malnourished in this age group (USAID, The Gambia, 1988). Botswana, with 83 percent of children under five years eligible in 1985–86 covered, is an exception in Africa (Quinn et al., 1986).

Such rates suggest that these interventions were not effective in reaching young children throughout the country: they exclude many sectors of the population that have a real need for food supplements. This brings up the issue of geographically targeted measures. In fact, often a program is not well located relative to the geographical distribution of the population and the prevalence of malnourished children. Kenya is a good example of this problem: in 1979, 62 percent of children receiving rations from the CRS lived in the central and eastern provinces, which represent only 33 percent of Kenya's total population. In the central province, the number of malnourished children who could benefit from a food ration supplement reached 21.4 percent, but in the other provinces this number varied
between 2.1 percent and 8.4 percent. The total rate of coverage for children between six and 60 months (the ages eligible for the program) did not exceed 2 percent (USAID, Kenya, 1980).

Logistical problems and inadequate coverage by the health care system are an obstacle to solutions to the problem of coverage in Africa; they also limit the effectiveness of programs on a national level. This is a peculiarity of Africa compared with a large number of Asian and Latin American countries, which provide a much higher level of health coverage. Improving the overall effectiveness and the actual impact of these programs clearly begins with a change in their scale and targeting measures. This may mean new costs, but it also means that the way in which the health sector functions must change. Botswana's exceptional coverage rates (Quinn et al., 1986) are attributable specifically to the high rate of coverage that the health care system provides the population (575 permanent centers and 175 mobile ones for a population of 218,000 children under five years, or about 300 children per center; the distribution of food reached 13,700 children on a daily basis who were < 80 percent of their age-appropriate weight).

An important part of the success of Zimbabwe's program (Mason and Tagwireyi, 1989) is also attributable to its ability to reach remote zones, thus permitting children to be fed a short distance from their homes, which is essential to maintaining high levels of participation.

**Targeting:**

One of the main lessons of the extensive previous assessments is the failure of programs to reach children under two years in Africa and elsewhere.

For preventive purposes in areas where the prevalence of children with growth deficiencies in terms of height is moderate to high and the prevalence of underweight children is low, all the factors used currently, including cost-efficiency, argue for age-specific targeting — under two years and as early as possible, beginning at four to six months — possibly accompanied by geographical targeting. For therapeutic purposes in areas where the prevalence of underweight children is moderate to high, individual targeting (anthropometric) seems necessary and justified in terms of cost efficiency. In Zaire, individual targeting based on need was preferred for participants, depending on their nutritional status, as it offset the subsidy and thus the cost: $0.15 per kilogram of food for well-nourished children, half the cost for first- and second-degree children according to Gomez (weight-age), and free for the most malnourished children (Zeitlin et al., 1987). The program also included geographical targeting of zones with low socioeconomic indicators. The limitation is still the low level of participation above a certain age in growth monitoring programs with which the supplementation program is associated: in the case of Zaire, participation fell considerably after nine months.

The case of Senegal (Echenberg et al., 1984) amply illustrates how the absence of geographical, economic, or age-specific targeting measures decreases significantly the actual coverage of the target population. The program was mainly focused on the rural population (<10 percent were city dwellers), but the distribution centers were not situated in the least-developed zones: they were dispersed like the health centers. In
general, participants were at a slightly lower economic level than the population at large; but 10 percent of the highest-risk families had not heard of the program and were excluded from it. Ninety percent of children were enrolled before they were two, but 20 percent stayed beyond age three, thus decreasing the chance that other children at risk could enter the program. As such, coverage of the population actually at risk was certainly less than the 10 percent publicized. In most of the countries of the Sahel, seasonal targeting measures should be considered (Mora et al., 1990).

In Botswana (Quinn et al., 1986), the program provided general coverage without any specific targeting measures in rural areas during the most acute part of the drought period. When conditions were less severe, targeting measures based on medical criteria were implemented; the focus was initially on children whose weight/age ratio was less than 80 percent, but this was soon changed to include children whose weight had fallen rapidly in the previous three months. This adjustment was made to exclude those whose low weight relative to age was attributable mainly to a significant growth deficiency in terms of height; the result was to enhance the program's effectiveness. Targeting was implemented on a geographical basis at the same time: first, remote villages were chosen and then small farms; during drought, for example, priority was given to cattle breeders with fewer than 40 head of cattle. In Zimbabwe, targeting was implemented based on medical criteria that were thoroughly explained to the population: arm width < 13.0 centimeters (Mason & Tagwireyi, 1989).

**Ration size and type of food:**

For the programs involving food supplements delivered to households, sharing food with other members of the family or selling a portion of it is an ongoing problem. Beaton and Ghassemi (1982) report that in the programs they evaluated, only 40 percent to 60 percent of the food distributed reached the targeted children. Because the programs provided food aimed at decreasing the energy deficit by 40 percent to 70 percent, the result was that in fact only 10 percent to 25 percent of this deficit was made up on average.

To avoid the problem of inadequate food rations, many programs included an estimate of the impact of sharing and resale in their calculation of ration size. Rations of 300-400 calories/day were increased to 600-800 calories/day. As such, in Kenya, presuming that 50 percent of the food distributed was consumed by the child, coverage of the child's needs varied between 23 percent and 47 percent, depending on his age. This practice has its limits, however: assessments made between 1980 and 1985 of the PL 480 program show that in Gambia, in transition periods, title II monthly rations were consumed in two to three days. In normal periods, in Ghana and Mauritania, food distributed for one month was gone in two weeks (USAID, 1985). In Senegal and Cameroon, initial assessments estimated that 6 percent to 11 percent of calories were actually consumed by the beneficiaries (Mora et al., 1990). In Senegal, for example, according to the report done by Echenberg et al. (1984), rations did not last for longer than two weeks; although in theory the goal was to provide 7.5 kg of food monthly per child, each child received 5.53 kg per month on average in 1981 and 3.64 kg per month on average in 1982.
The sale of title II rations sometimes represented a significant amount of a family’s income. Food donations are seen as a new source of income for the family rather than as a way to change children’s customary eating habits. A way to avoid or limit the diversion of food rations is to provide food that is specifically for children.

It is necessary, therefore, to provide nutritionally appropriate and socially acceptable food supplements for the critical age period in which the weaning process occurs; it is important to remember that this is a period of rapid growth— from six months on (and probably earlier for some children), nutrition requirements exceed the nutrition breastfeeding can provide—and that the diet customarily consumed does not have the energy density necessary to meet requirements. Thus, supplementation should be carried out using new weaning foods with a high energy density that are a combination, depending on the situation, of local foods (from domestic, small shop, or semi-industrial sources). It should also be accompanied by nutrition education.

Zimbabwe has attempted to provide an energy supplement based on corn, oil, peanuts, and local beans totaling 530 calories per child (or about half of the daily requirement of a two year old child). But production was insufficient, at least at the local level; this is what led to the push to develop the initiative by giving land and other inputs to women specifically in charge of the problem (Mason & Tagwireyi, 1989). Whenever demand increases as a result of insufficient production due to environmental problems (drought), this solution is not appropriate.

Integration into other health programs:

All the assessments indicate that the impact is greater when a combination of direct and indirect interventions is used. The example of Morocco (Gilmore et al., 1980) seems to demonstrate the impact of the addition of an educational component (11 percent of children are malnourished when supplementation is accompanied by nutrition education compared with 33 percent when no educational component is included). One must recognize, however, that the assessment framework does not really allow for formal conclusions. Growth monitoring seems to have played the role of encouraging nutrition education and has served as a means of integrating this education into supplementation programs. In Senegal, the addition of a growth monitoring and education component did not have the same effect (Echenberg et al., 1984); the educational component, however, did not seem to be very well developed in this case. The quantity of food distributed in the two cases was not the same, with the ration size distributed in Morocco to a large extent having taken into account the possible problem of sharing (three rations per family per month of 500 calories per day); the education program implemented in Morocco was also carefully developed over several years by professionals in this area.

Nutrition education, development of appropriate weaning foods, and monitoring of growth as instruments to follow up a program seem to be the key service areas into which supplementation in conjunction with primary health services (prevention of diarrheal diseases, vaccinations, prevention of parasites) should be integrated. Education is vital to ensuring the
maintenance of breastfeeding during the first months of supplementation (Marchione, 1990).

The Iringa program in Tanzania is an example of a successfully integrated program in which the feeding practices affecting young children were analyzed on the family, village, and regional levels. Various solutions were implemented to address different short- and long-term situations: local or commercial production of weaning foods and increasing food security for households and villages by improving cultural practices. Growth monitoring and educational sessions on the weaning process completed the process. Young children were provided with food supplements in day-care centers whose resources were provided entirely by what was available in the villages and not through external food aid (Seenappa & Ljunqvist, 1988; WHO/UNICEF, 1988).

Roles played by the health center, NGO, and the community:

- At the health center level, two issues seem to be fundamental: extending services provided by the centers and employing competent, motivated, and community-oriented personnel.

Asserting the need for integration brings up again the question of health coverage and thus of increasing the coverage of health centers in Africa. Simply adding a supplementation program to the activities of the health centers under current conditions in most African countries is no guarantee of success. Ghassemi (1989) reports that in fact the two elements that are key to the success of supplementation programs have been the extent to which the health centers have used an active approach to extend the intervention and follow it up and the participation of doctors who ran the program at the local level. Their perception of the role and value of supplementation within the context of clinical medical practices and public health has been a critical factor (Burkhardt, 1980).

Botswana (Quinn et al., 1986) demonstrated the extent to which a good food distribution program may act as a powerful force to attract groups at risk to the health system; preschool children came four times more frequently to health centers with these programs (40,000 in 1980, 140,000 in 1985). This leads to a marked increase in vaccination coverage and a general (and rather unexpected) improvement in the children's overall health as a result of their coming into contact with the health system on a more regular basis. This was the case during the worst drought conditions when the demand for food aid was very high; it is still true in many cases in which the food situation is poor and health coverage is low. One should not lose sight of the fact that food supplements cannot be provided on an individual basis or for an entire population indefinitely; the risk is then that people suddenly stop coming when food is no longer available, as has been noted in many CRS programs (see Diène in Senegal, 1989; Nyiribibi in Rwanda, 1990; etc.), although this is mostly determined by the quality of the health services offered (Mora et al., 1990).

- NGOs play an important role in supplementation programs; encouraging an integrated approach in conjunction with public health services still produces the most convincing results; in Zimbabwe, the NGOs worked under the ongoing supervision of the Ministry of Health and a committee composed of representatives from various sectors, including Agriculture, Education, and Rural Development. Previous supple-
It is difficult, however, to sustain motivation and provide supplies over the long run; the long-term strategy should be modified to ensure more autonomy. This is why Zimbabwe set up a broad program to produce peanuts and beans at the community level to encourage supplementation; unfortunately, the first trials held at about 500 centers took place during a succession of drought years, and the results have not yet reached expected levels (Mason & Tagwireyi, 1989). Tanzania seems to have a successful production and distribution program at the village level (Van der Haar, 1983).

**Effectiveness of some programs:**

The program conducted in Lesotho by CRS in the PL 480 title II framework (USAID, Lesotho, 1988), considered exceptional in its inability to improve the nutritional status of children receiving food, was the subject of a detailed study. The study recommended that the program be terminated and offered numerous explanations for its failure, including: inadequate rations because of sharing and resale, the absence of an educational component, inappropriate targeting measures, and inadequate coverage. Food given to the mothers represented in many cases an income transfer that allowed families to purchase consumer goods having nothing to do with nutrition. Another important factor was that the food did not generally reach the children most at risk because inclusion in the program at the dispensary level was based on the criterion "weight/age ratio," regardless of age. In a country in which acute and severe cases of malnutrition are rare, but where growth deficiencies in terms of height are very frequent, the type of targeting adopted resulted in the inclusion of the oldest children (those who had a
low weight/age ratio because they were growth deficient in terms of height, dating usually from the end of the first year). As such, the preventive objectives of the program were not fulfilled. In addition, since children remained in the program for many years, coverage was not as broad as it could have been.

It is interesting to note that the conclusions of the Lesotho program's final assessment concur with an analysis that could be made based on the understanding of this problem that evolved during the 1980s (see above): in fact, it has been proposed that the only criteria for inclusion in future programs be that children be between six and 24 months of age, that supplementation consist of a specific high energy density weaning food, that an educational component be added, and that the program in its entirety be coordinated with scheduled vaccination times. This should result in increased prevention, especially for children between six and 12 months, a period in which growth slows down in Basotho babies; a marked increase in energy intake, with the specific food limiting resale and sharing; and a higher degree of coverage, with the age limit of 24 months increasing the possibilities of rotating in other children.

During the 1980s, a CRS program in Burkina Faso (USAID, 1981) indicated that 3 percent of children had a weight/age ratio lower than 60 percent of the standard value after participating for two to three years in the program, compared with 10 percent of children who had just entered the program. It should be remembered, however, that this type of framework may be less valid because of self-selection and bias related to the children's changing ages. Moreover, these were cases of severe malnutrition.

Two title II, PL 480 programs in Morocco and Senegal were the object of an in-depth nutrition evaluation. In Senegal (Echenberg et al. 1984), growth (weight-age) in participating children under two years was closely correlated to the level of participation and to the duration of the program. This is a very raw result; in fact there was no difference in growth between participants and nonparticipants of the same age and economic status from the same villages. There does not seem to have been any impact on growth; but mortality rates for the most vulnerable age groups were lower for participants than for nonparticipants. According to a survey of the mothers, the food distributed for the month lasted about two weeks; it was probably used for purposes other than feeding young children. Furthermore, the amount of food distributed was not always consistent with recommendations either because of management problems or as a result of repeated shortages.

In Morocco (Gilmore et al., 1980), a comparison between children who were in the program for the previous two years and those who had just entered showed a reduction of 69 percent in severe and moderate malnutrition (weight-age < 80 percent). An educational component was added during the course of the program. In 1975, 33 percent of children who received a supplement were still malnourished; in 1978, with the combination of supplementation and education, only 11 percent were malnourished. This program, which was exemplary in its content and execution, was put in place at the same time as a number of social changes (some emancipation for women), which may have had a determinant role, were taking place.

The supplementation program implemented in Zimbabwe did not produce satisfactory results.
immediately (MOH, Zimbabwe, 1982). At the beginning, the objectives were not well defined, and the program lacked precise instructions. But successive readjustments were made following an evaluation of the program after three years, and the program has produced better results. Comparison with a control group showed a significant impact; the amount of weight gained doubled, a direct result of the number of meals received. The program was targeted at children who had an arm width less than 13 centimeters (they were underweight). This is an exemplary program in that it progressed from an emergency aid program to a comprehensive and relevant educational program. It led villagers to consider useful changes in their cultural practices, especially an emphasis on the use of peanuts. It led to a project to distribute land for cultivation, seeds, and fertilizer to women with the goal of providing health centers with basic foods (peanuts, beans) for the supplementation programs for young children.

In Botswana (Quinn et al., 1988; Lotfi and Mason, 1989), the success of the supplementation program was to limit the impact of the 1985-86 drought on malnutrition levels. Because household food availability problems under normal conditions remained, the system was institutionalized on a permanent basis: the program's success is due precisely to recognition of the existence of the problem and putting into place a supplementation system (interministerial committee, creation of a department of food resources). The supplementation program was complemented by a special program to rehabilitate children and a "food for work" program. The main result was an exceptional level of coverage; as a consequence there was no sudden increase in the rate of malnutrition during drought years, and there seems in fact to have been a decrease after the program had been running for several years. Botswana's experience can serve as an example for countries that face frequent weather-related or economic problems.

In Gambia, a supplementation program for young children (rations were taken home) was set up in 1981 in 42 centers and was accompanied by a nutrition education program, growth monitoring, and primary health care; it will remain in place until 1994. In 1987, there were 104 functioning centers. There is a high level of participation (97 percent), and coverage rates are about 18 percent (rural areas). The program was targeted at children in risk zones under five years whose weight/age ratio was less than 60 percent, but after an evaluation it was recently refocused on pregnant and nursing women and their children under two years. The food assistance program was also modified to substitute locally produced weaning foods for imported foods (Lotfi and Mason, 1989).

iv) Costs

The average cost of programs conducted in the 1970s was between $15,000 and $25,000 annually (1976 U.S. dollars) per recipient for daily rations of between 300 and 400 calories. Food costs represent about 70 percent of this figure in general. This is relatively expensive given the projects' apparently low degree of effectiveness and compared with other types of intervention (for the record, $0.05 to $3 for nutrition education, $15 to $50 for integrated programs, according to Anderson et al., 1981). Duration and the level of supplementation are two important determinants of the cost.
According to Horton's calculations (1992), the costs of 58 programs conducted worldwide differed according to the program’s target: the cost of distributing supplements of 1,000 calories per day to each recipient annually is $75 for untargeted programs, $64 for targeted programs, $74 for programs run through schools or maternal and child health services, and $134 for highly targeted programs (1988 U.S. dollars). On the other hand, Horton calculated that programs that were moderately broad in scope (between 100,000 and 500,000 beneficiaries) were the least expensive.

The cost of programs in Morocco between 1975 and 1979 reached $35 to $42 annually per beneficiary, depending on the value of the food ration (which varied between 500 and 800 calories, depending on the year). Programs also included a significant educational component (mothers were asked to contribute about $7 per year); the cost of the food represented about half of the total cost (Gilmore et al., 1980). In Kenya, in 1980 for high-energy rations (770 calories), the annual cost per person was about $68; the mothers’ contribution, although it was modest (five Kenyan shillings per child) was high for the poorest families (Hoorweg, 1989). In Lesotho in 1987 (USAID, Lesotho, 1988), the estimated cost was $49.97 per beneficiary, $97 per child under five years, $97 per child under two years, and $386 per malnourished child; food represented about 60 percent of the total cost. In Zimbabwe in 1980–81 (M.O.H., Zimbabwe, 1982), the program’s cost was $12.84 per child annually (62 percent for food, 38 percent for transportation and administrative costs).

In Gambia, for a population of beneficiaries totaling 312,000, the cost was on average $8.90 per beneficiary annually; the extension to 600,000 beneficiaries reduced the unit cost to $4.60. Extending a program is always less expensive than setting it up, especially if targeting efforts have already been completed. In Botswana, the cost fell from $62 in 1985–86 to $38 in 1987–88 following an increase in the number of beneficiaries (the cost in this case is an average estimate that includes supplementation for children and the "food for work" component) (Lotfi & Mason, 1989).

In Tanzania, in the context of the Iringa JNSP (Ghassemi, 1989; WHO/UNICEF, 1988) in 1988, the program’s annual cost (including growth monitoring four times a year, therapeutic care, and food distribution targeted at children between zero and 36 months) was $17 per beneficiary. This includes $3.60 for the preparation phase, $5.30 for the extension phase, and $8.05 for the routine phase. It is probably one of the best programs in terms of cost-effectiveness, as would be expected in an integrated program, since the management and personnel costs are divided among the different activities.

The cost of African programs is generally 10 times more than programs in Latin America, regardless of the cost of food and its transportation to the countries involved. This is linked to transportation costs within these countries, although the number of beneficiaries of each program is generally much lower; the problems of a widely scattered population and accessibility are often considerable in Africa (Bremer-Fox, 1987). The costs are higher for donor countries, the NGOs that manage the distribution (21 percent compared with 9 percent elsewhere), the countries receiving the food aid whose contribution is also proportionally higher, and the beneficiaries themselves: $1.46 on
average compared with $1.01 (Bremer-Fox et al., 1987).

2. Nutritional rehabilitation

a) Findings and Recommendations

- The success and failure rates of home-based rehabilitation are comparable to those of health centers; it is the most attractive alternative wherever primary health care is available and there is an adequate level of medical supervision; it is not expensive, and the family and health care system is fully involved. Home-based rehabilitation is probably the only approach that can treat all malnourished children in the long run. Initiatives of this type should be evaluated quickly and carefully in the future.

- Inpatient or outpatient rehabilitation centers are a better choice than the hospital, which should be a last resort only.

- Inpatient centers are effective when the population density in the surrounding area is low or malnutrition is not very prevalent. In urban areas or densely populated rural areas, outpatient centers are the most appropriate and economical solution.

- The prevalence of malnutrition in a given area should determine the location of the centers to avoid their underuse. Transportation problems limit the impact of the centers to their immediate area.

- There should be a health facility nearby that can provide a minimal amount of medical treatment; a high level of medical supervision and regular evaluation of the treatment results are key to a program's success.

- Centers should not be treating more than 20 to 30 children at a time; they should have specific admission, recuperation, and discharge requirements; they must have a registry, even if only a simplified one, that allows for regular evaluation of results.

- Centers should be reserved for children who are severely malnourished. Treatment of children with a moderate level of malnutrition at centers is less effective.

- Indispensable to the long-run success of these programs is their integration into a coherent package of prevention, screening, reference, and follow-up programs.

b) Definition

Nutritional rehabilitation is concerned with the process of directly addressing cases of severe malnutrition to ensure recovery and convalescence.

In addition, the aim of such rehabilitation is to prevent any relapse and to eliminate possible scars in the medium to long term. Quite often, it is also used for children with less than severe cases of malnutrition. Finally, it frequently includes other types of interventions; traditionally, the three types of nutrition programs that target young children are considered separately: nutritional rehabilitation, and supplementation, and nutrition education. Over time, however, each program has tended to borrow elements from the other two, as Hoekwag points out (1988), although it is
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not always clear which is the most effective element in a given program. This series of programs, which is not limited to therapeutic measures, also includes preventive ones discussed below.

c) JUSTIFICATIONS

Preventive nutrition measures should be promoted initially. There is no doubt, however, that given the somewhat limited success of the measures implemented, severe malnutrition will still affect a small percentage of preschool children in Africa for a long time to come, independent of any unusual circumstances such as famine or food shortages. Although the number of children involved is low, it is still considerable in absolute terms and is sufficient to fill all available beds in the pediatric ward if care for these children were left to hospitals and other similar institutions. It is clear that these children need immediate and appropriate treatment, and if they do not receive it, they are likely to die quickly.

The dramatic "revival" of these children is often a good launching point for nutrition initiatives at a community level; the population pays more attention to prevention advice if the ability to treat those who were ill has been demonstrated.

d) BACKGROUND

Nutritional rehabilitation was the first type of intervention implemented in most non-industrialized countries. It was initially provided in specialized hospitals in conjunction with research work, and the foundation for the various treatments that were subsequently provided almost everywhere was laid within this framework.

The cost of rehabilitation under these hospital conditions was so high that it was impossible to envisage providing rehabilitation in this form on a broader basis. Thus, centers specializing in nutritional rehabilitation that were adapted to local conditions and able to handle a larger number of children with severe or moderate malnutrition at a reasonable price were developed. Pengo proposed the general principle on which these centers were based in 1957. They began to enjoy real success when it became apparent that, with the treatment methods used at the time, the mortality rate was much lower in these centers than in hospitals.

That these centers could play a role in the education of mothers during the course of their children's treatment became evident after a short time, and as a result, they took on a new dimension; the goal was no longer just to rehabilitate severe cases of malnutrition at a low cost but also to avoid relapses, which were rather frequent in children who were treated at hospitals.

Because the centers were increasingly located closer to the population, emphasis was placed on increasing the participation of the mothers. The centers began to operate more frequently in large, integrated spaces that provided preventive and/or therapeutic care. Efforts also were made to make the mothers themselves directly responsible for severely malnourished children in their homes under the looser supervision of health personnel.

The success or failure rates and the cost of these centers seem to be about the same as those of other countries; this is also true in the case of operational problems and their possible solutions. There is really nothing uniquely "African" in this area, nor is there a problem of transfer of any sort of new technology. Rather, the problem is one of
a lack of exchange of experiences within and between countries to ensure that positive results are achieved uniformly throughout the continent.

e) **Hospital-based rehabilitation**

In the first extensive assessment of the effectiveness of hospital treatment for cases of severe malnutrition, Cook (1971) pointed out that all of the articles published between 1956 and 1969 reported a mortality rate between 8 percent and 52 percent, with the majority between 20 percent and 40 percent. He also noted that there had been no improvement in 15 years. Among the 24 reports cited, 11 originated in Africa, indicating that the situation there was the same as everywhere else in the world. The reasons given at the time included: admissions that were too late in a number of cases, the frequent separation of the child from his/her mother, infections that were often acquired in the hospital, the time and patience required of hospital staff often overwhelmed by other tasks to feed children, and the low quality of care in hospitals outside of the university or research hospital networks.

Other factors include the number of deaths during the first year after release from the hospital, which is between 14 percent and 37 percent of children who received treatment, or a mortality rate of more than 50 percent. Many of the survivors still suffered from malnutrition in varying degrees at the time of the most recent check up. In contrast, these relapse and mortality figures after less than five years are much lower for alternative institutions, such as nutrition rehabilitation centers or dispensaries.

Considering the number of available beds and the prevalence of severe malnutrition; the cost of rehabilitation in a hospital, which is five to ten times higher than that of a specialized center; the failure, death, and relapse rates; and the lack of instruction provided mothers during their stay the hospital clearly represents a waste of resources.

Has the situation changed since then? First, in terms of short-term results, particularly the number of deaths during hospitalization, most reports indicate similar results. Teyssier et al. in 1983 in a large hospital in Dakar, Senegal, reported a risk of death of 43 percent, similar to the level already reached in 1964; Hazoume and Toukourou confirmed that hospital treatment of malnutrition at the University Hospital Center (CHU) in Cotonou, Benin, in 1982 was long (30-45 days), difficult, and still had a death rate of 33 percent; Tolboom et al. in 1986 in Maseru, the capital of Lesotho, reported a mortality rate of 25 percent; Assimadi et al. in 1984 also mentioned a mortality rate of 20 percent to 26 percent at the CHU in Lomé and pointed out that the average rate for all hospitals in Togo at the same point in time was 26 percent, reaching as high as 35 percent in some cases. In 1990, Atakouma, also in Lomé, still reported a mortality rate of 25 percent.

The cause seems to be clear; the hospital is not really the place to treat severe malnutrition. Although during the same time period, much better results were achieved by a number of pilot centers elsewhere in the world (a few percent in Jamaica, for example), and in nonhospital centers even in Africa, many pediatricians have become convinced that the special characteristics of malnutrition in Africa result in a mortality rate that is necessarily higher. However, Andrien notes a reduction in risk of death from 36 percent to 10 percent at the Bouake Hospital in Côte
d'Ivoire between 1970 and 1981; in 1986, Van Roosmalen et al. reported a mortality rate at hospitals in Tanzania of 9 percent; Teyssier et al. acknowledge that a change in hospital treatment methods for severe malnutrition in Dakar, Senegal, in 1984 led initially to a reduction in the mortality rate from 43 percent to 20 percent. Success is not directly linked to recruiting less severe cases; in Niger, in a rural hospital setting with a minimal amount of equipment, which was not part of pediatric services, Pecoul et al. (1988) registered a mortality rate of less than 15 percent (the rate is almost 50 percent for patients who leave the hospital on the first day!) for cases of severe malnutrition.

The best results obtained by Teyssier et al. in Dakar and those noted by Andrien at Bouake are related to more rigorous control of the treatment process, particularly of feeding the child, after evaluating the results, reviewing previous operating principles, and more effectively motivating project leaders and the entire staff. On the other hand, in a zone in Zaire where forms of severe edema are common, in 1983 Janssen et al. tried to decrease the high rate of mortality recorded in their hospital (20 percent to 30 percent) by using more sophisticated and aggressive medical techniques including in particular parenteral treatment for their patients. The mortality rate remained unchanged (29.8 percent), indicating that these techniques did not provide the solution to the problem; in fact, this type of treatment does not shorten the duration of treatment or improve its quality and includes a high risk of infection and complications linked to transfusions, given the conditions under which most hospitals in Africa operate.

In 1984, Hone conducted a nationwide assessment in Zambia of the operation of public and private hospitals. The operating assumptions, which correspond to the current consensus in the area of treatment (WHO, 1982) included the following: initial stabilization of dehydration, treatment of infections, and the use of a balanced and high-energy semiliquid diet. The results showed that in most cases, hospitals did not operate at a satisfactory level and improvement was necessary and possible. Only 21 percent provided an adequate and accurately determined diet; among the possible causes of this is the lack of basic ingredients such as powdered milk, oil, and sugar, which should be distributed to hospitals on a therapeutic basis.

An evaluation of the length of treatment in the hospital, another limiting factor of a hospital-based approach, indicates that hospital stays of two to three weeks are long enough, which helps to reduce costs; any additional time is not justified, and it is clear that an institution more basic than a hospital and nearer to the family's home should provide follow-up care.

Additional factors that limit the success of hospital treatments: excessive delay in recruiting patients and improperly selecting them. The hospital in Bouake (Andrien, 1983) attributes its improvement in part to the screening by health care institutions referring cases to the hospital earlier. This is an important aspect of the hospital's role: it should be integrated into the circle of health care institutions for both admissions and discharges. In 1990, Atakouma in Lome confirmed that 25 percent of admissions are not appropriate because of a lack of exact admission criteria. This is a problem at all of the rehabilitation centers: few of them have well-defined admission criteria, and this should be addressed by precise recommendations for the entire health care system.
The other major criticism of rehabilitation institutions is that their failure rate in the long run renders the money spent on them in part an absolute loss. Van Roosmalen et al. in Tanzania (1986) mention a death rate of 8 percent, mainly during the first year, a relapse rate of 13 percent, and a rate of maintenance of good nutritional status of 75 percent. In 1987, Hennart et al. in Zaire note a subsequent mortality rate of 15 percent over five years, with a rate of 9 percent for the first year; the other children remained underweight and at a low height-for-age. Okeahialam in Nigeria (1983) notes a death rate of 8 percent, a less than satisfactory rate of subsequent growth for the survivors (rapid stagnation in growth). This is the major problem faced by these institutions: what becomes of the children who are partially rehabilitated at the hospital when they return home, when the mother has not received even a minimum amount of education during the hospital stay and without any follow-up?

The Bouake hospital addressed the question of education during the hospital stay, and Andrien (1983) evaluated the results. In Andrien's view, providing instruction is feasible. It is difficult, however, because doctors in charge of pediatric care must be willing to make prevention of infant malnutrition a priority, a central agency and local administrative body must support the effort, a training program for staff in charge of nutrition education must be established, and staff members must be given a certain status to give weight to their efforts in this area. Finally, nutrition education requires a commitment to confronting the problem on an individual level and to establishing a real dialogue with the mother so that this brief contact is useful to her and responds to her specific concerns.

It is clear that, with a few exceptions (Van Roosmalen et al. in Tanzania, 1986; Bacc in Bophutatswana, 1986 for example), there is practically no coverage of cases of severe malnutrition in the region by these hospitals.

In conclusion, the hospital is the institution of last resort among health care facilities available to treat malnutrition, particularly in severe cases. To limit their cost, hospital stays should be short, and as soon as the treatment no longer includes measures that are specifically medical but rather are based on diet, the child should be referred to a more appropriate institution that costs less and is able to provide long-term follow-up.

Precise admission and discharge criteria should also be well defined.

Mortality rates should not exceed 10 percent in the worst-case scenario. If rates exceed this level, the treatment provided should be reevaluated with reference to recommended international methods; it is also advisable to confirm that staff members have sufficient time and training to provide good-quality care and that supervision of the care is competent and effective.

On a national level, the results achieved in different regional hospitals should be evaluated on a regular basis and their practices coordinated.

An effective methodology exists; the conditions under which it should be applied so that rehabilitation is successful have also been known for some time (Bengoa, 1957; 1967; 1976). The lack of opportunity on a national and international level for practitioners to compare their work, which is in part related to the very independent character of most of the public and
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private institutions (no systematic assessments), is the reason for this failure.

f) NUTRITIONAL REHABILITATION CENTERS

There are two types of nutritional rehabilitation centers: inpatient centers, where the mother and child stay full-time during the entire course of treatment, and outpatient centers, where the mother and child go on a daily basis for a certain amount of time and return home at night. There are a number of variations of the latter model that involve changes in the frequency and duration of the mother’s contact with the center: visits may be on a weekly or monthly basis or several times per week or month during a period of a few weeks to several months.

Some centers, especially the inpatient ones, are attached to or near a hospital or other significant health care institution; they may be closely related, as in Dabou, Cote d’Ivoire (Bouvier, 1985; Ferre, 1991) or in Bophutatswana (Bac, 1986) where the hospital controls the center, or loosely associated with it. Other centers function independently or even in an isolated fashion. They are sometimes grouped together under a shared supervisory and assessment structure (Whyte et al., Kenya, 1989).

Another important distinction is the presence or absence of long-term follow-up of the families and the community. Sometimes this is provided by mobile teams that also ensure screening in villages (Bac, 1986; Ferre, 1991; Gressart, 1974).

They are also distinguished by other operational characteristics: in terms of recruitment, nature and number of activities (associated medical treatment, cooking demonstrations, gardening and breeding of small animals, health and nutrition education, food distribution), or their degree of integration into the community (local management committee, community participation in maintenance of the center).

To assess the performance of these centers, a number of criteria are used. First, their impact on nutrition is evaluated, which is divided into two phases, as in the case of hospitals: the recuperation phase or the center’s initial therapeutic success, which corresponds to the first month of treatment, and the long-term phase in the subsequent years, which is a measure of the success of the instruction provided to the mothers, although other variables inevitably affect the outcome. Another criterion is the decrease in malnutrition rate among the siblings of treated children and in the community of which the family is part. Finally, the center’s cost-effectiveness must be evaluated.

i) Short-term success

Risk of death: It appears evident from a reading of most of the reports that the centers have a risk of death during inpatient care that is significantly lower than most hospitals, or at least no higher than the most effective hospital institutions (Bengoa, 1976). Larchet et al. in Burkina Faso (1977) give a death rate of 4.6 percent; Ojofeitimi and Teniola in Nigeria (1980) recorded 3 percent; Jansen and Verkley in Kenya (1986) reported 6 percent; Birem-Etchebes and Gonzales (Central African Republic, 1987) give 12 percent; Whyte et al. (Kenya, 1989) estimated that the mortality rate among their centers varied between 5.4 percent and 10 percent; finally, Beau et al. (Senegal, 1990) indicated that the average risk of death was 2.6 percent (but 11.4 percent for children with kwashiorkor). This result is enough
to justify rehabilitation in a center rather than a hospital, except for very difficult cases. One factor is certainly the reduction of the number of infections acquired in a hospital setting because of the small number of children gathered together in a center and isolated from children with the types of infectious disease normally found in the pediatric ward of a hospital.

- **Rate of attrition:** An important obstacle to the success of these centers remains the high rate of attrition or premature departure that is noted to some degree almost everywhere, as was already the case for hospitals: Gallin and Pécout in Niger (1988) in a mobile program had a 39 percent attrition rate; Dagnélie in Kenya (1979) had a rate of 35 percent for recuperation treatment lasting two to three months; Larchet et al. in Burkina Faso (1977), 25 percent; Beau in Dakar (Beau et al., 1990; Fontaine et al., 1984; 1987) gives rates of 6 percent to 13 percent, depending on the time period (1984-1990), with treatment lasting an average of 12 days compared with 20 for the others.

Some of this attrition is explained by the severity of the cases: the parents are convinced that the child cannot be cured. Other cases are a result of the duration of treatment or its cost for the mothers (transportation in the case of outpatient centers).

- **Nutritional status:** the criteria used most often are weight gain and the weight-age index. In reference to the latter, Beghin and Viteri, in their 1973 overview, consider recuperation effective in 70 percent to 80 percent of cases in well-maintained centers; the failure rate is probably a result of the choice of the weight-age index for admission and discharge, which does not fully reflect the nutritional status at the time or the progress actually made during the course of treatment.

WHO (1982) recommends daily weight gains, depending on weight, of 50 to 100 grams during the recuperation phase. Asokumar and Enahoro in Nigeria (1991) mention daily weight gains of five to 20 grams, depending on age and the recuperation phase, which is low; Whyte et al. (Kenya, 1989) indicate that 26 percent of participants have a weight gain of more than one kilogram for treatment lasting more than three weeks, 29 percent have a gain of between 500 grams and one kilogram, and 34 percent have a gain of between 100 grams and 500 grams, while 11 percent lost weight: a weight gain less than 500 grams during this period is insufficient; Birem-Étchebes and Gonzales (Central African Republic, 1987) believe that 30 percent to 45 percent of children are cured with a weight gain of 800 grams in 20 days; Beau et al. (Senegal, 1990) estimate the average weight gain to be 10 grams/kilogram/day (which is approximately WHO's recommendation). Regaining weight is on average much slower than in a hospital; but this is compensated by the longer duration of treatment in general, from at least 20 days to several months.

ii) **Long-term success**

- **Relapse and death rates after discharge from the center:** Ojofeitimi and Teniola indicate a 7 percent relapse rate; Larchet et al. give a death rate of 7.8 percent, a relapse rate of 3 percent, a stagnation rate of 12.5 percent, and a favorable progress rate of 76.5 percent; Birem-Étchebes and Gonzales (1987) had a subsequent death rate of 12 percent on average during six
years of operation and a relapse rate of 20 percent, of which half recuperated again under favorable conditions. In fact, this aspect is not adequately evaluated in most centers; it is difficult to estimate these rates after the fact, since the center loses track of a significant number of participants. Center administrators, however, are certainly increasingly aware of this problem and are trying to set up a more effective home follow-up program during the first year after the child has been discharged.

- **Nutritional status of children who have survived and not relapsed:** these results are also difficult to assess for the same reasons. The general impression is that, following several months of rapid growth once the children leave the center, their growth patterns are identical to those of children their age who have not experienced severe malnutrition. Some consider this a success; others consider it a failure of sorts (this probably depends in part on the nutritional status of children of the same age in the region). Kraut (1978) observed excellent results in the short term by following a treatment similar to that recommended by WHO/FAO (1971) (over a period of three to five months), but no difference at all in the long run with children of the same age. Rehabilitation is generally incomplete at the time of discharge from the center; the duration of treatment is too short to have a long-lasting effect; and the impact of education, in view of the conditions under which it is generally provided and the fact that it calls for foods that are largely unavailable locally, is not very convincing. As living conditions have not really fundamentally changed, it is not surprising that the long-term impact is negligible.

- **Impact on the younger siblings of children receiving treatment and the community:** Brown et al. in Zaire (1979; 1980) studied the effect on siblings and did not consider that the impact was positive; but the choice of controls is never perfect in this type of study, and the centers evaluated did not function well (there was no improvement in the short or long term in children receiving treatment). Therefore, no conclusions can be drawn.

iii) **Reasons for the effectiveness or failure of centers depending on their characteristics**

Short-term variations are the result of many factors:

- Inadequate ration size: low energy density, infrequent meals (see, for example, the assessment of Whyte et al. of 12 centers in Kenya, 1989).

- The recruitment level: children suffering from severe malnutrition regain weight at the most striking rate; the effect is not as impressive in cases of moderate malnutrition, when in some cases the treatment has no effect at all. The criteria used to recruit children, therefore, must be appropriate for the capacity of this type of center.

Other factors related to the centers' operating conditions include:

- A significant problem that is frequently encountered is the staff's inability to follow the development of children and make the appropriate decisions when a problem arises because of the lack of an exact "guide" to recuperation. To remedy this state of affairs, Asokumar and Enahoro (1991) propose using a system to calculate a score based on the variability in weight gain according to body
weight. This system would be determined by each center based on its average results. Another method proposed by Beghin and Van Lerberghe (1989) is the target-weight. The applications are still limited, and it is impossible to say which of the methods is more likely to improve the outcome of treatment provided by the centers. The need exists, nevertheless, and should be addressed by the use of appropriate written materials (follow-up guide and simplified set of instructions in case problems arise) that are widely distributed (Ferre, 1991 in Dabou, for example).

Korte and Patel (1974, Tanzania) compared the two types of centers: inpatient and outpatient; the average length of treatment is slightly shorter in the former (41 days) than in the latter (47 days), which cancels out the cost difference for the same degree of rehabilitation. The inpatient centers offer the possibility of admitting children whose mothers are not able to travel, although in these cases recuperation takes much longer. The mother’s presence leads to better results in the months that follow undoubtedly because of the instruction she receives at the center. The population covered by an outpatient center is necessarily smaller than that covered by an inpatient center, except in urban areas or densely populated rural zones. In fact, two important factors favor inpatient centers: the mother’s contact with instructors is much closer, and the child receives a sufficient number of meals during the day if the center is well managed. In these cases, the mothers recall more easily what they learned at the center, and home visits demonstrate that their habits have changed.

Outpatient centers are always unsuccessful when the mother and child spend only a few hours at them: the mother should stay at the center for seven or eight hours each day so that she can participate in meal preparation, educational sessions, and other demonstrations while ensuring that her child receives at least three substantial meals. This simple change has improved the performance of several centers (Beau, personal communication). In rural areas, the inpatient centers generally produce better results, at least in the short run, than the outpatient centers.

The length of contact with the center: four weeks seems to be the maximum required for education to be effective in the long run; there is no evident benefit for longer periods of contact (Schneidman et al., 1971, in Uganda). Usually, the result of a several-week stay in a center is an improvement in the mother’s understanding of malnutrition and food, but little change in her habits. When there is change, it is usually reflected in the mother’s offering a greater variety of foods to her child but not more food. This certainly explains the lack of improvement in the child’s nutritional status in the longer run.

An alternative that is frequently explored: once the delicate first week has passed, centers ensure prolonged contact with the mothers and their children through a weekly or monthly visit to a center or in their village to weigh the children and to provide nutrition and hygiene instruction, cooking demonstrations, and sometimes food. The hope is to maintain contact with the mothers for a longer period of time while avoiding the saturation period noted after several weeks at
the centers. However, participation rates dwindle as time progresses. Lemair et al. in Burundi (1990) registered a follow-up rate of 75 percent over an average duration of 20 weeks, with good results for severe cases, and less positive results for the moderate cases. Wittaker et al. (South Africa, 1985) had sustainable results for the 80 sessions on average (at various intervals) over eight months. Verkley and Jansen (Kenya, 1983), who had a mixed approach that was mobile and followed by a home-based check up (one visit monthly for six months), obtained disappointing results: motivation was linked to the distribution of food; it disappeared as soon as distribution ceased.

Gressard (1974, Rwanda), cites a mixed system of long duration; after eight days in a center and supervised treatment at home for one month (the average recovery time), the mothers attend a "school for parents" once a month for two years: the average follow-up time was 28 consecutive months for 1,500 families! Many factors may explain the success of this system, including the prevalence of malnutrition in the region or even the distribution of food to poor families. Education changed the mothers' understanding of malnutrition and relapses in the long term, and fewer new cases of malnutrition in families with one child already affected were reported. Providing all the health care-related activities at the same place and same time for the mothers, keeping the distance to the center as short as possible, and providing a concrete program all help to encourage participation.

- A good launching point in some cases is food distribution, but this can have a distorting effect; it is only justified for destitute families and should be targeted on an individual basis. In these cases, associated agencies must commit to addressing the problem directly in socioeconomic terms, especially in urban areas; this is why social workers assisting the centers are needed, especially in urban areas. Sometimes the distributed food requires specific preparation instructions and is no longer available once the recipient returns home. Once the first phase is complete, meal preparation conducted at the centers must include foods that are available at home. Innovations should be limited (utensils, cooking techniques), so that they are more easily adopted by the mothers.

- Some centers were located in relatively isolated areas because of the concern about being close to the population. The centers should be close to a health care institution to guarantee access to medical care, which inevitably will be needed, and to group together health care services at the same location to avoid unnecessary trips for the mothers. Centers located at a hospital have a disadvantage: recipients are sent to the hospital for the smallest complication, and the frequent result is a back-and-forth whose effectiveness has not been proven. In addition, the mothers become accustomed to the medical treatment approach to malnutrition and resist the idea of a center that does not provide medical services (Bouvier, in Dabou, 1985).

- After Bengoa's publication, many centers were created with the objective of ensuring strictly dietary treatment. The "demedicalization" of the process was designed to show mothers that treatment was possible to a large extent under simplified
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conditions. It is now clear that treating associated infections is also necessary, inoculating against measles after the first few days of life is an effective measure, and providing good medical supervision by a pediatrician and possibly a nutritionist (who cannot be recruited for the center's needs alone) are essential conditions for a center's success.

Among the reasons regularly advanced to justify the above is the staff training required in rehabilitation techniques. This factor is rarely addressed in the descriptions or assessments of the centers, and one may suppose that it is rarely considered. Nonetheless, it is reported that staff is incompetent or insufficiently trained. Regular internships in the pilot centers for all staff sent to the dispensaries or other institutions to screen or treat severe malnutrition would be an effective way to increase and consolidate knowledge in this area.

Some cases would suggest that encouragement is more effective than education (Glatthaar et al., South Africa, 1985). The fact that the best "educators" when the children return to their communities are the mothers who play a dominant role in social terms rather than the mothers who have received a good evaluation would tend to confirm this. Introduction of motivational techniques at the centers (which would require staff training) could be an additional success factor. In the same way, on the community level, support provided by dynamic and motivated individuals in the community is more effective than education over the long term (Lifanda, Burkina Faso, 1988).

Several assessments mention the degree of integration into the community. If the confidence of the villagers has not been won beforehand, no preventive measure will be effective. One way to encourage the community to participate is to set up a local health care committee or invite an already existing committee to participate in the operation and management of the center (Stanfield, Uganda, 1971). The trials described, however, were not always successful in this area.

The centers' longevity is related to several factors besides their therapeutic effectiveness. First, the source of financing is important. In practice, many centers remain dependent on external financing, which varies with economic conditions and is therefore very vulnerable to ups and downs in the economy. At the same time, external financing plays a bigger role during times of economic upheaval (Whyte et al., 1989). Dependence on external sources of financing often accentuates the independent nature of centers compared with other public health institutions that balk at providing the centers with more support than that provided by their customary services. This source of conflict (Beau, personal communication) must be avoided by putting the centers under the official medical supervision of the regional public health authority. The political support of local officials and officials of the various ministries concerned should be sought: this is how a coherent policy can be put into place little by little. The problems of building maintenance, training, and staff availability can be addressed only if they are considered from the beginning; this implies implementing a comprehensive administrative and financial strategy to attain the desired goal and coordinating
with other nutrition and health programs in the country (Stanfield, 1971; Whyte et al., 1989).

f) **Costs of the Centers**

In 1973, Beghin and Viteri cited the cost of one day at the center, which was 10 times higher (five to 18 times) than one day at the hospital. That stays at a center tend to be longer than those in hospitals, however, must be taken into account. Rehabilitation is also more thorough at the center, and the risks of death or relapse are lower: the cost-effectiveness relationship, therefore, clearly favors the center.

The exact operating cost of the centers is not always mentioned. Cook indicated an average cost of $80 to $120 for a hospital stay in 1971 compared with $12 to $13 for a center. Atakouma (1990) cites a figure of $130 in the CHU of Lomé, Togo in 1990. Korte and Patel in Tanzania in 1974 estimated the cost of rehabilitation in an outpatient center at $56 (47 days), an inpatient center at $79 (41 days), and $83 for a 21-day hospital stay. Beau (1990) estimated the cost of an outpatient center in Pikine (Senegal) to be $12 (20 days) (but the center’s upkeep and part of the food for the mothers are provided free of cost).

The emergence of AIDS threatens to disrupt the operation of some centers; young children contaminated by their mothers become ill rather early and end up in the rehabilitation centers as a result of their weight loss, without having yet been diagnosed as seropositive for HIV. These children, like those infected with tuberculosis, for example, do not recover or recover very little during their stay. The increase in their numbers may hurt the centers’ effectiveness and may worry other participants, and their admission to the centers is not appropriate. The Dabou center in Côte d’Ivoire (Ferre, 1991) conducts a systematic screening test given the considerable increase of AIDS in recent years (14 percent in 1988). The risk of death is very high: 63.6 percent compared with 10.4 percent for those testing seronegative (Rey et al., 1990). Whyte et al. (1990) mention this increasing concern in various centers in Kenya. Any indication of generalized adenopathy and/or tuberculosis requires screening.

g) **Center Limitations**

Although the rehabilitation phase should no longer pose any particular problem, the long term is still a stumbling block. The best results of the education provided in the centers are obtained in reasonably fertile zones with families that are not too poor. In the more deprived zones, feeding or supplementation programs are probably more effective (Hoorweg, 1988). These regions often have the highest rates of severe malnutrition, whether temporary or permanent in nature.

Instruction at the centers is an effective way to increase the mothers’ knowledge, in particular in making them understand that the causes of the illness are linked to food; this influences their acceptance of the treatment. On the other hand, the possibility of changing mothers’ attitudes and behavior in other areas remains limited when there is no further contact with them after they leave the center.

There does not seem to be a relationship between increasing the mothers’ knowledge and the child’s ability to catch up during the course of treatment. Rather, instruction seems to enhance the mothers’ ability to reproduce what they have learned (Korte and Patel, 1974); based on this fact, it is misleading to think that the mothers who
have improved their knowledge are good at demonstrating what they have learned in their communities, as some programs propose.

For Whyte et al. (1989), these centers alone will never be effective on the community level; they run the risk of failing if they are set up in a vacuum as a local strategy for improving living conditions.

The gap between the estimated number of children who could benefit from treatment at a center and the number actually treated is considerable. Whyte et al. (1989) cite, for example, 72,000 children under the 60 percent weight-age ratio in three provinces in Kenya in 1989. The number of children actually treated is around 2,000 in the FLTP centers. Even if this figure were doubled or tripled to take into account the services provided by other health institutions, the result is far from the estimated number of those needing treatment. This poses a real problem; the long-term solution seems to lie in treatment at home under the supervision of primary health care center.

h) HOME-BASED REHABILITATION

In view of the limitations of vertical interventions and the cost of centers in rural areas, inexpensive horizontal solutions were investigated: this is the case of home-based treatments. Beghin believes that the cost of a center may represent one-fourth to one-third of the cost of a local primary health care system; although this cost is much less than that of a hospital, it is excessive in some poor regions. He also thinks that only a rehabilitation program conducted entirely by the mother can really prevent relapses and the appearance of malnutrition in siblings over the long term. Finally, he believes that rehabilitation is technically feasible at home as long as the local health service provides adequate supervision.

Tellier provided the first assessment of a home-based treatment program in Zaire (1990). It is based on an actual signed contract between the mother and the health care center. The health care center provides the medical treatment that may be needed during the entire course of rehabilitation (13 weeks) as well as a weekly exam with weighing and individual counseling. It also furnishes a sufficient quantity of soy for the local manufacture of pap, and the mother agrees to give the pap four times a day to her child (soy is widely produced and used in this region). The financial contribution of the family equals the price of the soy provided. The mother agrees not to wean her child if she is still nursing when malnutrition is diagnosed (this is true for 44 percent of the children). This system is attractive because of its complete independence of foreign sources, its integration into the local health care system, and the active participation of the family. The assessment concerned about 100 cases: the mortality rates are not higher than those for other types of rehabilitation; weight gain is slower. A clear improvement was observed in 67.5 percent of the children at the end of the contract, a slight improvement in 15 percent, and no improvement in 16 percent. There was only one failure, and 18 percent left the program. The success rate is definitely comparable to that of other centers. A lack of progress is attributable to the family's motivation (irregular visits) and the fact that health care workers lose their motivation as the results become disappointing. Weekly visits seem to produce the best results: more frequent meetings are too burdensome for staff and
families. Good medical supervision remains essential.

Lifanda, in Burkina Faso (1988), gives an equally enthusiastic account of a similar setup. For her, success is a function of individualized attention and regular follow-up. The mother's motivation and patience are more important than the food given, which more than anything else, serves to attract people initially. The commitment of the staff and important or influential people guarantee success on a community level.

i) The very long term outcome for rehabilitated children

The first concern has to do with recuperation of low height-for-age children. In fact, while weight begins to increase immediately during the course of recuperation, very often height does not increase or increases very little during the first several months, and many children remain noticeably shorter after several months. Satgé et al. (1970) studied in Senegal what became of a number of rehabilitated children in the longer term; somatic recuperation seems complete from the age of four to five, with the exception of a marked delay in the bone growth. Briers et al. (1975) in Uganda and Stoch et al. (1976) in South Africa reached similar conclusions. Bowie et al. (1980), in South Africa, and Cameron et al. (1986) attempted to follow recuperated children beyond the age of puberty. Their growth during puberty is less but is more prolonged; although these children generally remain smaller than their reference groups in somatic terms, they are similar in size to other children of the same age in the community.

Other aspects of recuperation in the long run were considered in a number of studies, in particular possible nervous system scarring. Stoch and Smith (1976) in South Africa, Fisher et al. in Zambia (1972), and Hoorweg (1976) in Uganda noted a slight permanent effect on the brain. Despite the methodological differences among these studies, their conclusions are similar to those more recently produced by Galler et al. in Barbados (1987), who conducted a meticulous study of fine motor skills and the intellectual performance of young adolescents between the ages of 10 and 15 after their nutritional recuperation. Aside from minor differences noted between children suffering from kwashiorkor and wasting, most of these children still have some trouble in these two areas, confirming a slight unrecoverable impact on the nervous system.

Because of associated environmental factors related to the family, a strict control is evidently difficult.

3. Growth monitoring and promotion

a) Findings and recommendations

- Given the cost and apparent inefficiency of the various known programs, a reexamination of their objectives and operations is necessary. Monitoring growth can be a screening method that follows each child's growth, a social welfare tool, or a way to bring together different initiatives to improve the nutrition situation. Programs are rarely able to integrate all of these aspects simultaneously.

- Programs that do not really use the weight gain information as a means of educating mothers should be discontinued, and an alternative use should be found for the time subsequently available for the mothers and staff. The available
resources should be dedicated initially to staff training in the nutrition problems of young children, methods of treating them effectively, improving health care coverage, educating the community about the problems linked to poverty for the most destitute, the lack of time for mothers, etc. Growth monitoring is not required to achieve this result; it is a useful addition when everything else is in place.

- An exact strategy including possible obstacles to decision making and implementation should be defined, along with steps for a regular evaluation: Are the targeting measures adequate to achieve the objectives? Are the decision criteria or the method of applying the strategy correct? Alternatives based on the answers to these questions must be designed and tested.

When this objective is met, a program of individual growth monitoring for all children may gradually be put into place with the intention of actually monitoring growth. Criteria for enrolling in the program and completing it should be defined. Monitoring should be promoted from birth (not beginning at six months) until the child reaches 36 months. This monitoring should be very simple, based on the principle that a competent person who is able to communicate the appropriate lessons should be available to weigh the children and counsel the mothers.

- If the health care system decides to undertake an initiative such as monitoring and promoting growth, it must be integrated into other health care activities to ensure optimization of the system’s operations, costs, and effectiveness: single health committee, single health care system information system, linking interventions to identified problems, etc.

- Growth monitoring should not be the first activity implemented in the hope of attracting patients to the health care center, but rather the last, when the overall health care system is operating adequately and providing good coverage, educational sessions for the community are available, and the problems of integration into — and participation of — the community have been resolved. At this time, a real growth monitoring system would give families the ability to interpret test results, decide which interventions to undertake, and verify the effect of these changes on the growth of their children. In this context, weighing is only a way to monitor the outcome: it may be done periodically, probably on a quarterly basis, and may serve as a method of nutrition monitoring for the community.

- Nutrition training and supervision must be strengthened, especially with the prospect of increasing coverage by a diverse and often illiterate staff.

- Given this, promoting a single model without adapting it to local conditions (such as the quality of health care services, population density, and accessibility) should be avoided. Growth promoting measures may also be implemented without necessarily weighing the children.

b) DEFINITIONS

Growth monitoring covers all activities that involve following the growth of individual preschool-age children on a regular basis to determine their health and nutrition status over the course of time and to intervene to improve it when necessary.
Growth monitoring and promotion

This generally implies inviting a group of mothers and their young children to regularly scheduled weighing sessions; after recording the weight on the appropriate chart, the evolution of each child's weight relative to his age is explained and various health or nutrition interventions are suggested.

This type of activity has become an essential element of primary health care services in a number of countries; its implementation, however, has met with so many obstacles that some consider it doomed to failure and wonder whether it should still be implemented when more effective alternatives exist. These doubts concern not just Africa but all of the developing countries in which this initiative was put into place (Gopalan and Chatterjee, 1985). Thus, the question becomes whether these frequently encountered obstacles are a result not only of the conditions in which the measures are carried out (Hendrata and Rohde, 1988) but also of an error in the underlying theory on which they are based, or at least a gap between the ideas and the objectives actually pursued, or the inability of the proposed actions to reduce the risks linked to a slowdown in growth (Lotfi, 1988; Nabarro and Chinnock, 1988). The current approach is to refer to growth Monitoring and Promotion to show that the ultimate objective is not monitoring.

c) **Why monitor children's growth?**

Growth is monitored because it is one of the most accurate indicators of nutrition problems. Growth monitoring may also address different objectives, as illustrated in this chapter. Clear and realistic objectives must be defined for this type of activity, which requires a high degree of involvement on the part of health care workers and families; each time a priority objective is defined, the cost and feasibility of existing alternatives must be analyzed: systematic measurements of arm width in villages to screen for cases of severe malnutrition, small-scale surveys to determine the prevalence of malnutrition or the improvement resulting from an intervention, etc.

i) **Relationship between growth and mortality in young children**

The relationship between malnutrition and mortality has been demonstrated by now classic studies in India and Bangladesh (Kielmann and McCord, 1978; Chen et al., 1980; Briend et al., 1986). In Africa, work in Zaire (Kasongo Project Team, 1983), Tanzania (Yambi, 1988), Guinea Bissau (Smedman et al., 1987), and Senegal (Garenne et al., 1987) helped to refine our understanding of the problem. In zones where mortality is low and the nutrition deficit roughly homogenous, as in the case of Kasongo, the risk of death also seems to be homogenous, regardless of nutritional status. In Tanzania and especially in zones in the Sahel where there are high rates of mortality and malnutrition, the relationship is proportional to the deficit in nutrition indicators. Linked mostly to the weight/heigt deficit in the early years, the risk of death may also be related to stunting in older children. The weight/age indicator, which combines the effect of the two phenomena, and arm width represent the closest link between growth and mortality.

Studies examining transversal and longitudinal measurements at more or less close intervals (one to six months) have shown that the latter were not better. The relationship is important especially for short periods of time and for significant weight loss at ages when mortality is high (six to 24 months) (Kasongo Project Team, 1983, in
A two-step approach appears to have been somewhat successful: screening of the most malnourished children and monitoring of these children's growth on a monthly basis to intervene as soon as weight begins to fall or the child has a severe infection. This system probably explains how the SCF project in Gambia obtained a reduction of 50 percent in the infant mortality rate compared with national levels: 83/1000 compared with 167/1000 (as long as other factors do not intervene simultaneously) (Shorr et al., 1989). In Benin, more or less regular contact with a community health care worker at home or during a consultation turned out to be a factor that protected against the risk of death (Velema et al., 1991); this factor alone has nothing to do with growth monitoring in the form in which it is carried out. If the desired effect is on mortality more than anything else, it may be better to free up health care workers for home visits with the best possible coverage than to impose growth monitoring sessions on them.

Finally, demonstrating a link between malnutrition and mortality is not enough for an improvement in nutrition to lead automatically to a reduction in mortality; malnutrition may represent only one of many confounding factors. This link has yet to be demonstrated (Nabarro and Cinnock, 1988).

ii) Relationship between growth and morbidity

The most widely held opinion is that malnutrition predisposes a child to infections, or at least lengthens the time it takes to treat them, while at the same time infections may be responsible to a great extent for cases of malnutrition.

Briend recently examined in the published literature the validity of these two relationships as far as diarrheal diseases are concerned (Briend, 1990). The first view, that is, that malnutrition predisposes a child to diarrhea, seems to be self-evident (in Africa as elsewhere: Tomkins, Nigeria, 1981 and Gambia, 1989; El Samani et al., Sudan, 1988; Maire, Senegal, 1990). On the other hand, although diarrhea certainly has an effect in the short term on weight gain, it is not clear that it has a long-term effect. Other than for very difficult conditions in which food is scarce, it seems that catch-up growth happens naturally, all the more because most diarrheal episodes in communities are moderate (Moy, 1990). Under these conditions, preventing infectious diseases will certainly have a beneficial effect on children's mortality and physical well-being, but it will have little effect on improving growth (editorial, Lancet et al., 1991). In a study conducted in Gambia (Rowland et al., 1977), the quantity of food ingested by the child was the main limiting factor in the off-season: in these cases, diarrhea does not make a great difference. Dickin et al. (1990) in Nigeria, arrived at the same conclusion: variations in energy intake related to diarrheal episodes are small, while the energy deficit in daily intake, even in the absence of illness, represents the most significant problem. Black (1991) concludes that even if diarrhea has an
unambiguous effect, managing to provide adequate nutrition under ordinary conditions clearly has a more pronounced effect on growth than preventing fever and infections, including the practice of ORT. The relationship is obviously more meaningful in the reverse: maintaining adequate food intake may decrease the effect of infections while preventing infections has little impact on growth.

iii) Relationship between growth and improving nutritional status

Growth patterns observed in young children in African communities demonstrate that after a rather quick take-off period, the deficit increases progressively around six or seven months. Graphs illustrating the rapidity of weight and height increases on a curve show a steady accumulated delay compared with standard measurements until about 12 to 18 months; after that time, some weight is frequently gained back around 24 months. At this point, the problem is that the accumulated growth deficit in terms of height is still present and persists in a more or less pronounced fashion during subsequent years, depending on the circumstances (Van Lerbeghe, 1988).

This has implications for growth monitoring based on weight gain, which is generally how growth is monitored. An increasingly significant part of the slowdown in weight gain is related to the delayed growth in terms of height; this deficiency represents the most important quantitative indicator in many African countries (national survey in Congo: Cornu et al., 1989; national survey in Swaziland: Serdula et al., 1987a; Carlson and Wardlaw, 1989). The situation becomes more complex given the fact that some ages seem to be better than others for optimal recouping of weight and height: for Lutter et al. (1990), this would be between three and six months, for example; programs that do not enroll mothers from the time their children are born or that do not advise early supplementation to avoid the risk of changing breastfeeding routines and thereby increase the risk of death from diarrhea cannot benefit from this window of opportunity. Although similar results are not available for Africa, this information should be considered. Armah-Klemeusu et al. in Ghana (1991) demonstrated that early supplementation with a traditional fermented pap can ensure excellent growth rates without significant drawbacks as far as infectious diarrhea is concerned (Mensah et al., 1988). This approach can make a considerable difference for children whose mothers are no longer able to provide adequate amounts of breast milk during the first six months.

When the prevalence of underweight children is significant, as a result of a lack of food availability, targeting food aid to low-growth children may be effective (Botswana program; pre-harvest gap periods in the Sahel). This is not the case when growth deficiency in terms of height is at issue.

The effectiveness of growth monitoring in improving nutritional status is difficult to verify insofar as it is never conducted in isolation even if it is implemented independent of other measures. At the very most, the programs with the greatest number of health and nutrition components seem to have the greatest effect (cf. Iringa, in Tanzania, where the program includes micronutrient supplements, which could have contributed to its effect on growth in terms of height). A representative transversal survey conducted beforehand to evaluate this aspect
seems to be the most important factor missing; this component should be systematic (if necessary, by means of simplified techniques such as arm width measurements).

d) GROWTH MONITORING OBJECTIVES

i) Growth monitoring as a selection technique to improve the effectiveness of health care services

Growth monitoring is often used as a means of screening children who should benefit from specific intervention measures: medical treatment, food supplements, treatment for malnutrition, social services, nutrition and health education, etc. To be effective, this step must satisfy very specific conditions: good level of coverage for the population, specific selection criteria, effective interventions, and lower costs than those of the proposed intervention.

An example of the problems linked to selection through growth monitoring is provided by a project in Zaire (Gerein, 1988): the selection of "at-risk" children was based on the existence of an infection at the time of weighing and/or a slowdown in growth in terms of weight. This strategy quickly failed: 44 percent of children seen presented a problem with gaining weight and another 20 percent had a health problem; screening thus detected 64 percent of "at-risk" children whose mothers were invited to participate in educational sessions. Because this type of screening method effectively excludes one-third of all children, it is not efficient in theory; this is particularly so because the children will all fall under the "risk" category at different times. It is better to attempt to provide education without discrimination to all mothers, without any preselection.

Limited coverage is clearly the major obstacle in every case. A national program like the one in Indonesia, analyzed by UNICEF in 1990 and considered relatively successful, has an average coverage rate of about 40 percent. In Zaire, recent analyses of various programs indicate an average coverage rate of about 30 percent (Gerein, 1988; Ceplanut, 1990). This is the case of numerous programs in Africa (see below). A population selected in this way has several specific characteristics: a common geographical location based on the distance from the gathering point, and the mothers selected were the most concerned with the health of their child (generally the most educated, especially in rural areas; see Ceplanut, 1990) or the least overburdened (Gerein, 1988; Lovel et al., 1984; etc.) In other words, the lower the level of coverage available, the less selection through growth monitoring will be able to screen for children who are most in need of the proposed services.

If growth monitoring is to be used as a tool to provide better therapeutic and preventive supervision of children, its first objective should be to increase coverage. Unfortunately, available assessments show that the use of services provided by health care centers is often not associated with growth monitoring because these programs are managed completely or in part independently (Gerein, 1988; Diene, 1989; Nyiribibi, 1990). A system that requires the mother to spend hours in transport and/or in the waiting room to hear that she must return on vaccination day to finish the injections needed has an unacceptably low cost effectiveness (of the three programs analyzed by Gerein in Zaire, two deferred preventive
treatment for infections to the next consultation; on average, 35 percent of children had an infection when they were weighed).

ii) *Growth monitoring as a tool to mobilize health care officials and health care workers*

Many growth monitoring programs have put a data collection and analysis system into place to follow developments in the community's nutritional status. These results may have many uses: they may be feedback for community health care workers and officials and a monitoring tool for government authorities or even a means of appealing to decision makers. This activity occupies a significant amount of time of the workers responsible for monitoring (existence of several weight recording aids: individual weight record and "master chart" in the CRS projects; up to three in Gniby, Senegal, none of which, moreover, was adapted to the preparation of a report: Diene, 1989).

Longitudinal data are often interpreted from a transversal perspective; a system of rapid transversal surveys at repeated intervals is more efficient and less costly. The problem is whether the data are representative: Serdula et al. in Swaziland (1987b) demonstrated that at the country level, compared with the results of a national survey, these data were useful if only new participants were taken into account (how representative they are varies inversely with the regularity of visits); regional differences do not appear to be reliable. CRS has demonstrated that analysis of monthly or seasonal trends based on monthly weight data could be done in a satisfactory manner, even if these data were not representative of the nutritional status in the region in absolute terms. There have been few attempts to analyze the trends in terms of numbers of children gaining or losing weight; the potential of longitudinal measurements has not been fully exploited.

Following an evaluation conducted in seven countries (two of which were African), UNICEF proposes (UNICEF, 1992) not encouraging growth monitoring without integrating growth promotion measures. A three-step growth monitoring program has even been suggested:

- promoting growth without growth monitoring;
- promoting growth with selective growth monitoring, which requires that the community request this and that sufficient resources to train staff to monitor are available; and
- promoting growth with comprehensive growth monitoring. This option requires the most resources, and the first two phases should be completed before this is undertaken.

e) *OBSTACLES TO PROGRAM EFFECTIVENESS IN AFRICA*

i) *Objectives in project assessments in Africa*

A survey of the literature on these programs suggests a global desire to reduce morbidity and mortality and improve the nutritional status of children in the community. At the same time, growth monitoring in the field is assigned limited objectives, which vary greatly from project to project and which are not always in agreement with overall objectives.
Among the best assessments conducted are those in several regions in Zaire since 1987 (Gerein, 1988; CEPLANUT/UNICEF, 1990). Before the 1970s, a growth monitoring program called "kilo" by the participants themselves existed; it was coupled with vaccination sessions, and its actual objective was to ensure that all participants were fully vaccinated. Implementation of growth monitoring programs along with primary health care programs then spread to other parts of the country. Although for a significant number of mothers, the purpose of the program is still vaccination, the goal of the health care services is primarily to screen children who are at the highest risk for malnutrition.

Several initiatives related to growth monitoring added a distribution program of weaning foods to families at the same time; this was the case for most of the programs supervised by CRS, which used North American food aid to Africa for this purpose. Participation was closely linked to food distribution. In fact, the main purpose of this type of program was to select groups needing supplements and to evaluate the effect of the latter on the children's growth.

One of the objectives of the Joint Nutrition and Supplementation Programs set up in various African countries over recent years (PCAN/JNSP, run by UNICEF, WHO, and FAO) was to reduce the morbidity and mortality of infants and young children by enhancing their growth and development. This generally involved a community development strategy that included prominently among its activities growth monitoring, with two ostensible objectives: to allow the community to judge the extent of the malnutrition problem and find ways to address it; and to explain the problem clearly to planners and decision makers at various levels so that they apply the necessary resources to enhance the children's growth and development. In practice, different programs emphasized different objectives: screening for severe malnutrition, selecting beneficiaries for admission to various intervention programs, community contact, educating mothers, mobilizing decision makers with the data collected, etc. Very few programs have been able to pursue all of these objectives at once with any degree of success, as has the Iringa program in Tanzania.

In Ghana, in the rural Kitampo zone, growth monitoring was initiated in 1987 as a starting point in a comprehensive program of health care and agricultural activities (Shorr et al., 1989). In Gambia, an NGO established this activity in a remotely accessible zone in 1985 to serve as a point of contact for various health care services and increase community participation (ref. id.). In Senegal, in the rural areas of Fatick and Kaolack, several growth monitoring experiments begun several years ago are still in existence (Diene, 1989); the health authorities are concerned with producing an "integrative matrix" based on the preventive activities: vaccinations, malaria prevention, prevention of diarrhea, etc. For the time being, the objectives being pursued in most of the projects are screening for severe malnutrition and collecting the type of information that will permit nutrition monitoring of the community.

The criticism generally leveled against these programs is that the staff (and the mothers) often trust their understanding of clinical assessments and the child's approximate weight more than the direction of the weight curve (APHA, 1981; Lovel et al., 1984; Gerein, 1988; etc.). Does this mean
that intuitively they think that this way of judging a child's health is more relevant to the objective being pursued? Before even considering whether the technical aspects of a program have been effectively implemented, the theoretical effectiveness of growth monitoring in achieving a number of objectives could be debated, as Lotfi has done (1988).

ii) Coverage, another obstacle

The problem of coverage represents a significant obstacle to growth monitoring, as it does for most health care interventions. It is not always precisely understood.

Some programs have achieved spectacular results in terms of extending coverage initially: Cole-King in 1972 in Malawi reports that coverage of children under five years by the health care system was increased from 17 percent to 40 percent in two years. Morley (1973) cites coverage levels in excess of 80 percent in Ilesha (150,000 inhabitants) and Esa-Oke (7,000 inhabitants) for pioneer projects in Nigeria, with a high rate of regular attendance, and 67 percent in Zambia. Currently, some programs are still producing good results (M. Bac in Bophutatswana attains coverage rates of 90 percent in a very integrated and decentralized system; the Iringa program attained a coverage rate of almost 100 percent: Moneti and Yee, 1989). One of the reasons for the impact of the Botswana program, based on the distribution of food to children determined to be at risk by the growth monitoring program, is the program's high level of coverage, which reaches almost 80 percent of the target population (Lotfi and Mason, 1989). But many other programs have a modest level of coverage of their target population, especially in the case of large-scale projects in less accessible zones (Zaire: Gerein, 1988 and Ceplanut, 1990) or less densely populated areas (Sahel zones). Rwanda's national program (Nyiribibi, 1989) estimates its coverage to be less than 20 percent; as previously noted, assessments made in Zaire between 1987 and 1990 produced an average figure of 30 percent (from 12.5 percent to 41 percent). This figure varies between 25 percent and 35 percent in Somalia (ISS, 1989). In Congo, it is 63 percent on average but less than 40 percent in the north, where access is difficult (Cornu et al., 1990).

Coverage usually depends on the distance to the health post: in Zaire (Ceplanut, 1990), 37 percent of participating mothers live at a walking distance of less than 10 minutes; 52 percent, between 10 minutes and one hour; and 11 percent, more than one hour. These mothers would like to see these activities decentralized to the village level, or even the hamlet or neighborhood level (Diene, Senegal, 1989; Cornu, Congo, 1990). To make up for the limited number of staff, the solution generally adopted is to leave the weighing sessions up to community health workers or women's organizations. Another solution is to empower other agencies to conduct monitoring other than that associated with health care: social development workers and Multipurpose Rural Extension Centers (CERP) in Senegal, for example (Diene, 1989). This requires rigorous training and constant supervision.

Targeting children at risk may be achieved through a quick transversal survey to determine the communities at risk; the objective is to prevent malnutrition in these groups rather than just to monitor their growth. In Angola, the national program was initiated in a small city by drawing up a complete list of children under five and their nutritional status and designing a map indicating the houses of the most malnourished children,
which allowed them to be included as a priority in the program (Delahaye, 1983).

The mothers frequently mention that they did not participate in the program because they did not know about it. In Zaire (Ceplanut, 1990), on average, 52 percent of the population has access to health care services, but no more than 30 percent of the population uses them. The program in Rwanda is attempting to create village health care committees to spread information about the program’s existence, motivate the community, and encourage it to participate (Nyiribibi, 1990). These committees should not be different for each health care agency: in Senegal, growth monitoring and food distribution initiatives led to the creation of specific mothers’ committees; how to integrate them into the health care committees is currently a problem (Diene, 1989). In Ghana, the FFH program used local information transmission techniques (tam tam); they appeared, however, to favor one social group (Shorr et al., 1989).

iii) Regular participation, another obstacle

The constraint of growth monitoring compared with other health care interventions is that it requires a significant number of consultations, regardless of the urgency or seriousness of the child’s state of health. This essential point is underestimated, however: growth monitoring makes sense and may be effective only if follow-up occurs on a regular basis, which allows the speed of growth to be determined. In Congo, follow-up varies quite a bit, depending on the centers: the minimum is once every four months over approximately a 12-month period. Effective follow-up is determined by the age of the mother, her level of education, and her proximity to the center; the regular follow-up visits decrease from 72.5 percent when getting to the center is easy to 38.6 percent when it is difficult (Cornu et al., 1990). The distance constraint is generally the main reason why follow-up is not conducted on a regular basis.

Despite a very structured program with a good level of coverage in Bophutatswana, Bac (1985) notes that the average number of visits yearly per child is seven after five years of operations. One of the difficulties is related to the variety of people accompanying the children: in 32 percent of the cases, it is the mother alone; in 36 percent, it is alternately the mother, grandmother, older sister, or aunt; and in 32 percent, it is someone other than the mother who accompanies the child each time. This is why the entire family needs to be aware of the importance of regular follow-up. Some programs have instituted home visits the day before the sessions for the mothers who did not participate in the previous session (FFH, Ghana: Shorr et al., 1989).

Another essential factor is the mother’s perception of the benefit of follow-up; in this context, following children of a certain age when the benefit of doing so is uncertain should be avoided, and an attractive array of services should be offered at the same time as follow-up visits.

Many programs initially chose to monitor the growth of all children of preschool age. However, children over 36 months represent 15 percent to 25 percent of participants at the centers in Zaire, for example, according to Gerein (1988). Several programs are currently proposing to reduce the age for monitoring to 0–36 months, as was the case in the PCAN/JNSP programs.
This seems to be a reasonable objective because the problems related to being underweight, not including exceptions to be verified beforehand (the Kivu in Zaire, for example), occur before the age of three. Beyond that age, the subsisting problem is mainly growth deficiency related to height that growth monitoring cannot easily address. The age groups effectively represented in practice are often fewer: most regular visits consist of children under 18 months or even 12 months in urban areas (often linked to the vaccination schedule). Efforts must be made, however, to persuade mothers to continue visits on a regular basis beyond this time frame; only 4.6 percent of children are more than 12 months old in Congo (Cornu et al., 1990). As such, in some urban areas where social welfare programs are in place (Dakar, Senegal), participation may be a function of incentive payments made until that age, and one solution would be to increase the age at which the last payment is made (this applies, however, to less disadvantaged social groups).

Monitoring should begin at birth rather than six months, as is the case for some programs (such as Gniby, Senegal: Diene, 1989), because the curve's direction is determined in the first few months, and it takes several months for the mother to understand all of the counseling she has received. The initial counseling sessions should reassure the mothers that breastfeeding is going well and encourage them to continue with it as long as possible; the curve should be the actual individual guide to gradual supplementation (Greaves and Hendrata, 1990).

One alternative is to modify the spacing of visits depending on age. The program in Rwanda recommends one visit per month from zero to 12 months, one visit every three months from 12 to 36 months, and one visit every six months from 36 to 60 months (Nyiribibi, 1990). The effect on participation in and organization of these services has not yet been determined. The Iringa program in Tanzania, which has had some success, operates on the basis of quarterly visits (Moneti and Yee, 1989).

Simultaneously providing a variety of services that meet the mothers' expectations in particular (preventing intestinal parasites is often requested: Senegal, personal observation; Guyon in Zaire, personal observation) or that have a dramatic impact (food distribution) helps to promote loyalty to the program; the disadvantage is sometimes that less attention is paid to promoting growth as such: in Zaire, 60 percent of mothers believed weighing sessions were one phase of the vaccination process (Gerein, 1988)! Inversely, halting food distribution in CRS programs resulted in a huge drop in participation (Diene, 1989; Nyiribibi, 1990).

Several additional solutions were attempted in various places, but their effectiveness at the local level and ability to be reproduced elsewhere have not yet been assessed. In Rwanda, for example, mothers receive a "certificate" at the end of the weighing and educational sessions (Nyiribibi, 1990). In Senegal, in the Kaolack region, several initiatives of this type were attempted: commercial (sewing, truck farming) or social activities, weighing sessions at the homes of village chiefs who were supportive. etc. (Diene, 1989). The problem is to ensure that health care services summarize and share their experiences and results with other centers. Finally, a prior survey of local customs and discussions with the community itself will avoid scheduling conflicts with family or cultural ceremonies and activities related to agriculture, which is a reason frequently given for missing appointments. Other reasons
given include mothers' illnesses and the completion of vaccinations (Shorr et al., 1989; Ceplanut, 1990).

In spite of the time lost with the sessions, which is between two and six hours in Zaire for example, for many mothers these sessions are a social event that encourages them to participate in the program, even though weighing takes only two minutes, the individual consultation two minutes, and the group instruction, 10 minutes. They are afraid of criticism by their neighbors or the health care workers, however, when their child is not well; any approach that tends to reprimand the mothers of children at risk, therefore, has a negative effect on participation (Gerein, 1988; Ceplanut, 1990).

iv) Targeting, another obstacle

If the goal of growth monitoring is to promote normal growth, there is no reason to modify targeting measures, other than for the age problem as referred to above. In programs with limited resources, however, it may be prudent to target the highest risk communities; in cases where malnutrition is very prevalent, it may be necessary to target as a priority the highest risk children. Few examples exist, however, of this type of targeting; it should probably be based on polls or screening conducted beforehand. The SCF project in Burkina Faso (Lifanda, 1988) proceeded along these lines by using very specific screening criteria as a basis for its targeting. Growth monitoring is more a way of verifying the effectiveness of the measures implemented than of promoting normal growth, even if the ultimate objective is to use it for the latter once the child has attained an adequate level of growth again.

Simondon (1991) has shown that birth weight in Senegal and Congo has a definite predictive value for moderate malnutrition and growth deficiency in terms of height. Specific targeting based on the birth weight with the goal of maintaining the highest level of growth possible in these children could be somewhat effective; this has not yet been tested. Along the same lines, she noted that height at six months has a predictive value for later growth deficiency (supporting the conclusions of Henry et al., 1989, and Huttly et al., 1991, in other countries); although introducing routine height measurements may not be realistic given the difficulties this would create for a number of programs, she believes measurements could be taken at certain key ages (six and 12 months) to prevent or make up for the height deficiency that occurs between these two ages. This targeting is worthwhile, however, only if one knows how to prevent or recoup the height deficiency at this stage, which is not always the case.

f) Other obstacles to implementing these services

i) Weighing

To measure weight gain accurately, a precise scale is needed (within about 100 grams); even inexpensive hanging scales are adequate. Dilapidated and poorly calibrated scales are still frequently used (Gerein, 1988) by staff who are not trained in how to maintain them. Weighing and recording errors are more often the result of the sessions’ having been conducted too quickly than of a misunderstanding of the results (some sessions involved more than 100 children! In Zaire, 40 to 50 children were weighed on average, with groups ranging from 19 to 162). In
cases like these, more sessions must be provided, which poses a financial problem.

A survey conducted by APHA in 1981 indicated that Gambia, Lesotho, Malawi, Burkina Faso, Zaire, and Zimbabwe as well as Morocco, Tunisia, and Egypt had a national system based on the weight curve as a function of age (refer to Harvard, NCHS, or Tanner). Botswana had an experimental system at this time based on the height/age ratio and the weight/height ratio and sometimes on arm width. Kenya (MRC) also opted for a system including these two indicators and arm width. Programs begun by CRS in various countries were all based on the weight curve as a function of age (APHA, 1981). Rwanda has just decided to introduce all of these indicators into its national program (Nyiribibi, 1990).

Arm width measurements give satisfactory and inexpensive screening results and detect cases of severe malnutrition with a sufficient degree of specificity and sensitivity; they are not sufficiently sensitive, however, for growth monitoring or for use in nutrition supervision. Introducing height poses an additional measurement problem that is difficult to solve; it is easy to manufacture the necessary equipment on site, however, which makes it inexpensive. The JNSP in Sudan (ISS, 1989) refused to introduce the weight/height indicator because of the belief that it was beyond the abilities of the community health care workers and midwives. In Senegal, in Gniby (Diene, 1989), indicators used for screening malnutrition (weight/height ratio or arm width, depending on the literacy level of the community health care workers) are differentiated from those used for growth monitoring (weight/age ratio). Dealing with the different indicators does not seem to pose any major problems after initial training, but retraining on a regular basis is recommended.

ii) Using growth charts

The number of curves actually plotted is still insufficient; in Congo, although 60 percent of mothers participate in the sessions, at most 19.1 percent have a curve that has been plotted (Cornu et al., 1990). One must be able to locate the weight on the curve with sufficient precision (within 100 grams); unfortunately, most available curves have successive gaps of 500 grams each, which makes the task difficult for the health care workers (eight of 14 charts are correct in Zaire: Ceplanut, 1990). Griffiths introduced a "bubble" curve that includes two improvements: first, it has a steeper slope to make the increases more visible at ages when weight gain is on average rather small; second, "bubble" markers are placed every 100 grams and may be counted and checked off (Griffiths, 1987b). A test was conducted by comparing this with a traditional linear graphic system, but recorded every 100 grams, in various countries (specifically in Lesotho in Africa). Fewer weight-reporting errors and more age-reporting ones resulted. Trainers prefer the traditional linear graphic system, but the health care workers like the "bubble" system (Griffiths and Berg, 1988). The new system must still be tested in routine use.

Another type of chart was introduced by CRS in all of its African programs: it is composed of tables or contour curves that express the position in percentage of weight/age ratio (see weight/height ratio or arm width as in Burkina Faso, for illiterate people) (APHA, 1981). This system is attractive because it gives a straight line for normal growth and a negative slope if weight gain between two measurements is insufficient,
which simplifies interpretation for the health care workers: the slightest delay in growth is immediately evident and leads to an intervention. The comparison between the "road to health" system and the percentage weight/age line system was made recently in Lesotho (Ruel, 1990 and 1991). The reaction of the health care workers was tested first; the two systems, which were taught for the first time (one week), were generally assimilated equally well. Health care workers faced with a system change are still more confused when they go from the "road to health" to the percentage weight/age tables; introducing such a change, as some have proposed, is thus not recommended. When mothers were confronted with the two systems, they performed better if they were trained in using the "road to health" system instead of the system used by CRS. Lesotho adopted the "road to health" system nationwide for this reason. This assessment should be repeated in countries where the literacy level of mothers and health care workers is lower than that of the Lesotho study.

There are numerous variations on the health care record or growth charts; the charts must be durable but inexpensive to produce: in most cases, keeping them in a plastic covering that is wider and longer than the sheets themselves maintains them during the monitoring process, despite their being transported and stored at home. Finally, it is important not to confuse people by using several health care records (vaccinations!).

Whether the growth charts should be kept at home by the mothers or at the health center has been frequently debated. Morley (1973) had confirmed some time ago that the loss rate when mothers kept the charts was identical to or even lower than the loss rate for health centers, but large variations were noted depending on the projects: 1 percent loss rate in Nigeria and almost 20 percent in Zambia and Malawi. Lovel in rural Ghana (1984) notes that the mothers carefully store the charts and consider them an important document; they always bring them along when they travel or go to the hospital. Some programs (FFH, Ghana: Shorr et al., 1989) pick up the charts the day before the sessions and return them the following day, which encourages a good level of participation; but this system works only where small groups of mothers are concerned, otherwise it is too much work to sort the charts. In a center in Zaire, the chart management system uses a specific person at each weighing session.

iii) Interpreting growth curves

Insufficient time, vague instructions, and a misunderstanding of the cumulative effect of repeated small slowdowns in growth are all factors that mean that, in a certain number of cases, weight is not recorded on the curve or that children who have not gained enough weight will not benefit from additional studies (20 percent in Zaire according to Gerein, 1988). An adequate physical examination of the children was conducted in only four of the 14 sessions also evaluated in Zaire (Ceplanut, 1990).

The principal finding is that health care workers rely too much on the position of weight on the curve rather than on the curve's appearance, although it is generally recommended that they now concentrate on weight gain rather than the weight/age ratio. It should be explained to them that analyzing weight gain is designed to improve their judgment and the mothers' ability to think critically. This aspect is often neglected or
Growth monitoring and promotion is the subject of a cliched question-and-answer session; the only way to improve their understanding of the context of children's growth is to foster a dialogue, but this requires special training of the health care workers, which has rarely been available to date.

Although the absence of weight gain is easy to analyze, this is not the case for insufficient weight gain. Beyond 24 months, weight gain is slight; the accuracy of the scale and weighing, in addition to physiological variations unrelated to growth, often result in larger differences: daily fluctuations in weight have a standard deviation of 200 grams for monthly weight gains of less than 200 grams (Zerfas, 1979); Van Loon believes that the confidence interval of 95 percent of weight measurements in routine programs may be greater than one kilogram without close staff supervision (Van Loon, 1987). Therefore, it is not easy to determine at what point growth is actually insufficient; the programs do not always provide clear guidelines. The instructions for the WHO work sheet (1986) and the training manual for primary health care workers (WHO, 1986) are very basic. Steveny (Mokolo, Cameroon, 1982) published an interesting example of the types of decisions made depending on age and the curve's appearance; the Boga program in Zaire (Gerein, 1988), which includes some clear instructions, was adequately implemented overall; the Kasongo program, however, had an algorithm-based decision process that was too sophisticated and had not been used for very long.

Education level plays a role in the mothers' ability to interpret the charts correctly; according to Lovel et al. (1984), however, in Ghana, 40 percent of illiterate people are able to interpret them correctly after some instruction. In Boga (Zaire: Gerein, 1988), 76 percent of illiterate mothers were able to understand the charts, although no efforts were made to instruct them. Few women, however, are able to make the connection between the curve and the status of their child's health (5 percent, according to Gerein in Zaire; 2 percent, according to Lovel in Ghana). Gerein notes that in Zaire, mothers understandably often still have questions concerning how to change their childrearing techniques given the shape of the growth curve.

iv) Counseling mothers

The percentage of mothers who are actually counseled in these programs is quite variable: from 57 percent to 75 percent in Somalia (ISS, 1988); in Zaire, according to Gerein, almost all of the mothers know their children's weight, but only 50 percent of mothers with a child at risk receive growth information on their child; the curve is not always shown or explained to the mothers in this case (10 of 14 in the Zaire assessment conducted in 1989 by the Ceplanut). Seventy seven percent of mothers of children with a low weight/age ratio return home without counseling of any kind in Solenzo, Burkina Faso (Sauerborn et al., 1989). In Zaire, a counseling session (when provided) lasted an average of two minutes. If growth monitoring is to serve as a "gateway" into the health care system for mothers, as is the ostensible objective in several programs, a sufficient amount of time for each visit between mothers and staff members must be set aside to review all of the child's and mother's health problems. The number of mothers involved in each session should be limited, therefore, and the number of staff members or home visits should be increased: this system is necessarily more costly, but at least it will achieve one of the defined objectives.
If advice that is cliched or too general is to be avoided, a frequent criticism of these programs, understanding the attitudes and behavior of the mothers at the outset is important. This is seldom achieved. In a study in rural Ghana (1984), Lovel demonstrated that communities have their own ways of monitoring if a child is growing normally (leather bracelets of varying sizes for arms or legs, for example), and they have their own solutions that should not be ignored. This study was also able to show the limits of the mothers’ knowledge in this case: the notion of slowing down of growth in terms of height as a factor in malnutrition is not understood by many mothers (only 22 percent). The survey indicates that, in fact, very few mothers make a connection between weight and the child’s growth; their understanding of their child’s nutritional status remains “transversal.” This has also been observed in other assessments. To enhance the effectiveness of growth monitoring, mothers must understand and be persuaded that analyzing weight gain in accordance with the results of successive weighing sessions can help them to monitor their child’s growth more accurately. But this also implies that the staff be trained in this area and that they know how to talk with mothers in the context of their local knowledge and attitudes. They should also work continuously to identify the most effective nutrition messages, to which mothers are very sensitive and which determine their subsequent participation (Diene, Senegal, 1989). The directed nature of this counseling, without interaction, is also a result of a lack of training of health care workers in adult education techniques; specific training in this area is essential.

Educational sessions are essential initially to teach all mothers to recognize the signs of malnutrition in a child, identify possible causes, prevent it from developing, and understand why growth monitoring is important and how it works. The assessment of Gniby in Senegal (Coly, 1989) clearly demonstrates that the mothers who frequent health centers without growth monitoring know nothing about nutrition; this difference is made even clearer by the fact that 26.2 percent of mothers without any instruction give a child only the family meal while 2.9 percent still do so after instruction (the effect on nutritional status, however, has not been measured). In Zaire, according to Gerein, in areas where radios, newspapers, and other forms of written material are rare, and where there are few women’s groups, information on the nutritional needs of children is provided basically by the growth monitoring programs (13 sessions out of 14 included a group educational session lasting between five and 42 minutes). This is a positive outcome (the same result could be obtained without using the growth curve, which is actually not really used by more than 5 percent of mothers).

Individualized instruction must take into consideration the mother’s educational level; group instruction should be provided in small groups corresponding to the children’s different age groups (which determines the frequency of their visits). Discussion should return frequently to the same topics to ensure that they are well understood and memorized, and it should be interactive to bring up any questions the mothers may have and the steps the community itself can take to respond to them (Gerein).

Burkina Faso (Lifanda, 1988) presents an alternative: educational outreach sessions (observations, demonstrations, dialogue) lasting
two weeks and given in the villages themselves by a traveling instructor. This type of immersion is attractive and is worth evaluating in other contexts.

Dietary recommendations and an improved pap recipe have been effectively passed on through educational materials (Diene, Senegal, 1989). Practical advice, however, concerning weaning foods, the appropriate age to introduce them, and the type of supplementary foods to provide for young children is not adequately provided and is often very clichéd or even conflicting. Health care workers feel helpless given the difficulties these mothers face, and they do not seem to be trained to propose any alternatives. The results of research in this area should be disseminated quickly (Alnwick et al., 1987; M.S.A.S. in Congo, 1991, for example) to program authorities, in particular concerning modifications in the energy density of the paps and the effect of traditional fermentation techniques.

v) Staff training and supervision

The goal of the Gniby program in Senegal was to test the community health care workers' ability to implement the tasks required to prevent malnutrition through growth monitoring and promotion activities: although initially their performance was rather poor, at the end of one year, the workers, including illiterate ones, had satisfactorily mastered the tasks; the monitoring quality depends on their motivation more than anything else. An assessment of the results that focused on the knowledge and attitudes of the mothers demonstrated that they had noticeably improved compared with a neighboring village serving as a control. Supervision at all levels is still a problem in this program (Diene, Coly, 1989).

Training is very brief (one to two weeks for several community health care workers); growth monitoring and nutrition are not specifically taught in many of the nurses' training programs: they still do not consider them "medical" in nature, which is why they do not tend to initiate or supervise such activities themselves. Training is not appropriate to the situation: nurses in Zaire do not mention to mothers that they should give their children more than two meals a day; they believe the mothers do not have the time to do so, but they do not offer them any alternatives. They are also not trained in teaching adults (too authoritarian and not interactive enough), and they have a great deal of difficulty in allowing their knowledge to be questioned. Finally, retraining is as much a problem as initial training.

The first problem supervisors frequently encounter is how to define what they should observe: the national program in Angola produced a specific supervision work sheet to be filled out at the time of each visit (Delahaye, 1983). It is often perceived as a way to check up on the program rather than an analysis of what is happening, and the results and good initiatives are not always analyzed and passed on to other centers. One key role of supervision is to produce clear and up-to-date guidelines and to sustain staff motivation over the long term. It is up to the supervisors to come up with alternatives in cases where growth monitoring clearly does not favor growth promotion in the community concerned (Gerein, 1988).

Written reference materials appropriate to the context are lacking: the supervisors' role should be to adapt the equipment available for use by the
health care workers at the centers. At the very least, the following should be defined and verified: the criteria for inadequate weight gain, the types of possible additional physical examinations, questions to be asked of the person accompanying the child (depending on the nature of the relationship to the child) steps to be taken by the mother and the health care system, and the nature of follow-up (Gerein, 1988).

h) HOW CAN GROWTH MONITORING AND PROMOTION BE IMPROVED?

i) Through integration into other health care activities

An assessment of health care services at Solenzo in Burkina Faso (1989) reports that more than half of children had one of the risk factors defined by the center: weight loss or weight below the third percentile; despite this, no intervention, therapeutic treatment for associated infections, or nutrition treatment was proposed for them. They were simply given an appointment for the next consultation. Providing therapeutic treatment for infections noted at the time of the weighing session should be systematic (accomplished in six sessions out of 14 in Zaire: Ceplanut, 1990), especially when they are accompanied by noticeable weight loss: the situation then clearly represents a risk of death. If the entire team at the center is not involved, the infection is treated out of context, independent of the broader issue of the child's growth (Gerein, Zaire). Integrating growth monitoring into the rest of health care center activities often runs into the problem of a limited number of health post managers overseeing both therapeutic and preventive activities at the same time. This is really a training problem. One solution is to entrust the health post managers with supervision of the health care workers responsible for growth monitoring and to incorporate the use of data into the health care monitoring system (Diene, Senegal, 1989).

Aside from food supplements, few growth monitoring programs systematically include other nutrition initiatives. The JNSP (ISS, 1989) combined more or less successfully growth monitoring and prevention or treatment of anemia in the mother and vitamin A deficiency in the child, monitoring the nutritional status of pregnant and nursing mothers, treating severe cases of malnutrition, and providing food supplements for moderate cases of malnutrition or a demonstration of weaning foods (Sudan, Tanzania). Some also include participation in agriculture-related activities to help to improve food availability in cases where growth deficiency in children does not seem to be a result of problems of infection (Mozambique, Tanzania) or activities designed to increase family income (or even access to credits: Tanzania) or fish breeding (Zaire). This type of measure, which tends to promote basic solutions to problems of growth deficiency, is still relatively rare.

ii) Through integration into the community: decentralization, home visits

For most programs, integration into the community comes through using health care workers who come from the community itself and creating village health care committees. The participation of the community is sometimes sought to equip a building or provide minor services. Overall, however, few programs have known how to use growth monitoring initiatives effectively to involve the community in the health
Growth monitoring problems affecting them. The communities must still be encouraged to participate (Gerein), and this should not be left to chance but rather be part of staff training. This type of program should probably not be started until the community is aware of its importance and requests it. Only community involvement, using growth monitoring as an indicator of what is really happening within the community, can suggest appropriate interventions that are outside the realm of the health care system (Kasongo in Zaire: work load of the mothers).

To increase mothers' participation, the SCF project in Gambia (Shorr et al., 1989) held community-wide meetings to discuss malnutrition-related problems, the inability of health care centers to satisfy the needs of all children, and thus the establishment of exact criteria before sending children for treatment (slowdown in growth over the previous three months). A women's committee was elected to help the nurse in rehabilitation procedures, demonstrations, and preparation of appropriate weaning foods.

The establishment of mobilization committees (FFH, Ghana: Shorr et al., 1989), working if possible in conjunction with the health care committee, may ensure the cooperation of important people and local political and health care leaders. If monitoring is indeed the basis of a nutrition management system, the information gathered must be shared with them to sustain their support.

According to the assessment in Zaire, few differences seem to exist between the programs managed by private charity groups and those run by nurses working in the public health care system; the nuns are highly motivated, but their training is not better: the problem of retraining is pervasive. Integration of services provided by the churches into national programs does not seem to have created any problems in Malawi (Cole-King, 1972) or Zaire. The three Zairian programs analyzed by Gerein are typical of many of the projects managed by NGOs: they benefit from a more consistent source of financial support and have a more flexible administrative operational system. They are very open to the community, innovation, and research. In terms of results, there do not seem to be significant differences (Shorr, 1989; Yee, 1989).

i) SUCCESSFUL EXAMPLES

A growth monitoring program involving five regions in Togo (approximately 83,000 mothers) in place since 1982 was evaluated in 1986 by USAID, Pricor, and CRS, working with national health authorities (Badonte and Johnson-Welch, 1990; Government of Togo, 1990). Apparently, the program had not had yet an effect. The mothers were not permitted consultations lasting more than one minute, and they were not really informed about the progression of their child's growth. The staff was poorly trained and supervised. Given this state of affairs, the program leaders moved quickly to improve the program to make it more responsive to the needs of the mothers, who participated in the meetings. Among all of the types of problems identified, four were studied by working groups to define solutions for them. To increase the number of home visits, "visiting mothers" were recruited to reinforce the educational messages on health and nutrition; weighing sessions were reorganized to allow for longer individual meetings; supervision was strengthened to allow staff to receive more assistance in technical terms for weighing and consultations with the mothers; finally, home monitoring by the center staff itself was...
established specifically for children of weaning age. These measures were developed based on their feasibility and their cost-effectiveness.

The effect of these changes was evaluated several months later: the participation of the mothers was clearly encouraged by the "visiting mothers" and changes in their behavior resulting from the advice they received were evident; the weighing sessions improved considerably, as the mothers took responsibility for distributing food while staff worked exclusively to weigh the children and provide advice for the mothers; the supervisors became more involved in the entire process, and precise technical manuals were produced. At the same time, the staff increased their understanding of the community and their contact with the mothers by increasing the number of home visits.

Although the effects of various measures on increasing children's growth in these regions were not measured, this program demonstrated how different phases of the process might be improved, albeit with the usual reservations regarding the appropriateness of the initiatives to achieving the objectives.

No growth monitoring system works immediately at the outset; ideally, a periodic evaluation should be included to make adjustments in the system; the Iringa program in Tanzania institutionalized this step with some success through the three A concept (assessment, analysis, and action). In fact, aside from a good initial evaluation, this program included integration of various health care activities into a dynamic process of community participation, which are the basic ingredients of a good health care and nutrition system — an ongoing ability to assess and change (Moneti and Yee, 1989; ISS, 1989).

Program leaders decided on a clear objective: to ensure that the population had a precise understanding of what malnutrition is, its prevalence in the village, and the measures available to combat it. Growth monitoring, in a simplified form (weighing once every three months) served as a tool to discuss the results at a village level and underscore the possible causes of malnutrition and death. The overall program, however, also included health care initiatives (with a coverage rate of almost 100 percent), an improvement in hygienic conditions and the water supply, and a higher level of financial and food security. Of course, it is difficult to determine which factors actually played the most important role in achieving the results obtained. This operation was very expensive: $3.60 per child at the beginning, $5.30 for the expanded program, and $8.05 for its annual operation. In addition, this program had a higher level of operations at the outset than many other programs (65 percent of children already had a health care card in 1980).

Senegal, like other countries cooperating with CRS in growth monitoring associated with food aid, was faced with the prospect of no longer receiving this assistance. The reintegration of growth monitoring without food aid into peripheral health care services as a whole created a number of problems: the need to sustain the mothers' motivation without the assistance of food distribution, to rethink the financing aspect, the collection, and the analysis of data (formerly conducted by CRS), to merge the mothers' committee and the health care committee, to coordinate this post's operations with those of
other health posts also conducting growth monitoring programs, etc. This was an occasion to review the different ways of operating on a local level, to listen to the mothers’ requests, to identify the existing gaps, and to try to define a national strategy based on the sum of these experiences. A pilot project was analyzed at the end of one year and readjusted (Diene, 1989; Coly, 1989). This experiment, conducted under other conditions, should be continued if it is appropriate to extend.

j) Costs

The average cost per child annually is between $1 and $2 (salaries, health care records, staff transportation costs), according to Van Lerberghe (1989). As the UNICEF report in Zaire (Ceplanut, 1990) underscores, with the high inflation rate of some countries, the cost can vary significantly over the course of a few months (between $.70 and $1.30 per child annually between the beginning and the end of the study). Based on a total of $.70, investment costs represent $.58 (scales, training and monitoring vehicle), and operational costs represent $.11 (work sheets, gasoline, salaries of the staff weighing children and the supervisors).

McGuire and Austin (1978) cite $1.50 for Nigeria (according to Gwatkin et al., 1980), $4.49 in Indonesia at the same time (but between $1.40 and $4.10 currently), and $9.98 in India. In Angola, according to Delahaye (1983), the cost of this type of program is relatively low when a health care system is already in place and no additional staff are hired. Some systems are in a precarious financial situation: the new registrants exactly match the salary costs in Kasongo or Katana in Zaire, for example (Gerein, 1988); others like Boga, also in Zaire, or Gniby in Senegal (Diene, 1989) produce surpluses: this has obvious implications for any changes in participating conditions (age groups), for example.

Given that only small projects with few participants and a good management structure seem to obtain results, costs will exceed their current level if the desire is to make them more effective, since this implies better staff training programs, more recruiting, and more sessions. Many programs also operate with equipment (scales, growth charts) supplied by UNICEF or the NGOs. An increase in coverage means providing more equipment, and thus incurring a higher cost.

The cost for families is not always assessed. In Senegal, the PPNS program included a growth monitoring component coupled with a supplementary food distribution program; participation cost $0.67 per child at each monthly session. After food was no longer distributed, the family’s contribution was reduced by half. Officials still support the idea of communities’ participating in financing — and management — to ensure the autonomy and viability of this type of activity (Diene, 1989). In Zaire, in 1989 the cost for the mothers was estimated at $.25 (one to seven hours every two months by the mother), or one-quarter of that of health care operations. This certainly seems high for such a poor result; the question is whether this money could have been better used, for example, to purchase supplementary food (Ceplanut, 1990).
Nutrition education

Because nutrition education is included in most health care services, we will consider it separately.

1. Introduction

Nutrition education has been a routine part of many health care programs for some time; in 1978 (Austin), a survey of 201 programs in 66 countries mentioned that 91 percent of these programs already included it. But the real impact of nutrition education is rarely analyzed; despite its almost universal use, nutrition education is generally viewed as relatively ineffective. Are the messages inappropriate, the method of communicating them inadequate, or does education in fact do nothing to improve nutrition? Nutrition education has been shown to change feeding practices and thus contribute to improving nutrition, and as such, little debate exists concerning the last point. Opinions vary, however, on the first two points. In other words, when a nutrition education program is not effective, nutrition education itself should not be held responsible; one should analyze how the program operated and adjust it: "When a school does not work, it is reformed, not closed, because schools are the only way we have of learning; the same holds for nutrition education."

Effective ways of teaching nutrition education exist. The issue is how much it will cost to obtain the expected result and what means are necessary to do so. Is it reasonable to invest in education as an isolated measure or should it be accompanied by other initiatives? A publication by ACC/SCN (Hornik, 1985) has already attempted to address many of these key questions for health care planners. Experiments conducted in this area in Africa will be examined in light of this document.

Health care intervention programs call nutrition education "information/education/communication (IEC)" to highlight its principal characteristics. IEC cannot pretend to make any immediate changes in the socioeconomic context; activities in this area will thus be limited to promoting changes in behavior and practices within the family to encourage a redistribution of available resources, particularly food, to the child and mother. Depending on the circumstances, this redistribution leads to a better understanding of the nutritional needs of the child and mother, a change in attitudes (eliminating taboos or changing attitudes about women and children), or a package of new and inexpensive techniques to implement. New knowledge, attitudes, and practices should lead to an improvement in the nutritional status of the mother and child.

2. Findings

■ Results will not be forthcoming without a significant investment in this effort. Awareness of this fact is still limited, although investment is essential to the implementation of well-designed programs that can produce results. Nutrition education cannot operate as a low-priority activity to which few resources are assigned, particularly human resources.

■ Professionals (foreign or national) in the areas of communications and nutrition should be called upon to design and supervise the program.
This is a requirement for a successful program, even if it involves a greater cost.

- For field and paramedical health care workers to play an educational role in the nutrition area, they must be guaranteed adequate training and support. Training in educational activities should be part of health care workers’ basic and ongoing training. Training should be upgraded constructively, supervised continuously, and accorded the same importance as other medical initiatives. The effect of educational activities should be evaluated, and the results communicated to health care workers to motivate them.

- Coverage is the most significant problem after the relevance of the proposed initiatives, the type of message, and the equipment used. Interpersonal communication is the most effective method, but it does not provide extensive coverage. Even the use of health care and community workers, who are inexpensive and abundant, does not resolve this problem entirely. In fact, they are often overburdened, and training, retraining, and supervising them may be difficult. Mass communication may be used to supplement interpersonal communication initiatives. It allows greater coverage, and the educational messages may be aired repeatedly. It is not as effective as direct contact, however, nor as effective as passing on complicated messages; finally, as the mass media are not interactive, mass communication cannot address individual questions. As a result, it is generally used to inform, raise the awareness of, and encourage the population to consult health workers. A good communications strategy will use many complementary means of communication. The messages transmitted through various media and health care workers, however, must be complementary and not contradictory in the least.

- Moving from the level of a pilot project to a large-scale project is not only a problem of magnitude. New variables are introduced with the increase in scale of a project. The supervision, quality control, and coordination of a large project are more difficult.

- Generally, not much demand for education exists; it is not easy to supervise because few methods exist to verify on an ongoing basis whether the educational messages are correctly transmitted, reach their target audience, and are completely understood. Their effectiveness will depend on the motivation of those responsible for them. In the long run, this means broad political support and a financial commitment, both of which are difficult to achieve insofar as few results in terms of improved nutritional status are available.

3. Recommendations on the steps to follow for the design of a nutrition education project

The goal of an educational program is to change behavior — that is, to replace harmful practices with those that improve nutritional status; the nutritional status of a given population will improve only if this change occurs. The challenge faced by nutrition education programs is to identify the interventions that will lead to modifications in a population’s practices. To achieve this, certain steps should be followed in designing an education nutrition program:

- First, the situation must be analyzed. This analysis has several facets: one must (i) do an
inventory of existing programs and their results; (ii) study the target populations in depth, their feeding practices, their problems and needs, the socioeconomic context in which they live, and their sources of information concerning health and nutrition; and (iii) evaluate the various means of communication used among these populations. In addition to these studies, an inventory of available human, financial, and logistical resources should be drawn up. This prior analysis is necessary to identify relevant and specific interventions for the target populations that will be compatible with their cultural practices.

- Second, based on the results of the prior analysis, precise and measurable objectives in terms of changing attitudes or behavior and a communications strategy that specifies the target groups and the means of communication to be used to reach them should be defined. The content of the educational messages and the choice of the communication pathways to be used will be determined separately for each target population.

- Once the communication strategy has been developed, the first two interventions should be increasing the awareness of political leaders whose support is necessary to the program’s success and training staff responsible for carrying out the program at all levels.

- Program content, equipment, and strategies should always be specifically defined (no predetermined models) based on the target populations and with their participation. All equipment or messages should be pretested on the target populations to ensure that they are understandable and compatible with local cultural practices.

- Regular follow-up and periodic evaluations will be necessary to verify progress toward meeting the objectives and immediately readjust the program whenever problems arise. Many programs have been running for years without any knowledge of their effectiveness.

- Nutrition education initiatives are rarely analyzed. They should be analyzed not only while the project is running, as mentioned in the previous paragraph, but also upon completion of the project. This would allow one to determine whether the project’s objectives have been attained and to draw lessons that might be useful in the design of other projects. This analysis, however, will not be possible unless it has been anticipated from the beginning (necessity of baseline data that must be collected before the project begins) and the objectives are measurable.

- If the program is set up with the aid of technical assistants, ensuring that their knowledge will be transferred quickly to the organization responsible for the program in the long run is essential. Changing behavior is a slow process that requires message repetition, and thus a lot of time. Without this transfer of knowledge, the program will not become autonomous and sustainable. This transfer process is called the institutionalization of the program.

4. Background

Nutrition education, like education in other health-related areas, was traditionally provided essentially by staff at remote health care centers as part of therapeutic interventions or during growth monitoring sessions (Wone et al., 1981, for example). Its first limitation, therefore, was that
it affected only those people who came to the health centers. It was provided by staff rarely trained in communication techniques, whose knowledge was limited and sometimes out-of-date, and who had difficulty adapting their theoretical advice to the needs of each individual, as they did not necessarily know anything about their lifestyles and individual problems. These staff members, frequently overburdened by routine medical care provided by the center, had very little time to devote to this type of initiative. The system accumulated a lot of problems: limited coverage of the target population, limited knowledge in the communications and nutrition area, difficulty in adapting the educational messages to the target population, and no way to reinforce the messages. Although the example described here is overstated, health care centers whose nutrition education programs have these gaps are frequently found.

Since the 1980s, new trends have influenced the way in which health and nutrition education programs are implemented. These tendencies take into consideration the contributions of behavioral science, the epidemiology of the problem one wants to resolve, the methodology used for market studies, and the techniques of audiovisual and mass media professionals (Mahonne, 1982; UNESCO, 1987). The last of these often receive a great deal of attention because they are the only means to reach a broad audience and to broadcast the same messages repeatedly at a lower cost. They also represent a way to reach people without requiring that they travel anywhere. The women can listen to the radio while engaged in their normal activities.

The use of these media has made health care communications professionals aware of the need to do an in-depth analysis of the target population, its practices, needs, media-related customs, and its sources for health care and nutrition information, as do commercial marketing specialists, from whom they borrowed some of these techniques. Based on this analysis, one may identify available solutions and develop a solid intervention strategy.

Some have compared multimedia instruction to instruction provided directly, "person to person." In fact, interpersonal communication is one of the ends of a continuum extending from face-to-face communication to the mass media, including small- and large-group instruction. Each method has different characteristics and needs to be used according to these characteristics as one of the elements of the strategy. Interpersonal communication is certainly the most effective means of changing behavior, especially if it is accompanied by concrete demonstrations and sessions where the mothers can practice what they have learned (learning by doing). To be really effective, however, (i) educational content must be relevant and culturally appropriate — that is, it must be based, as for all other means of communication, on an in-depth analysis of the situation and the target population; and (ii) every health worker should be responsible for only a small group of people at risk (18 in Jamaica). Extending coverage in this type of system is difficult.

Given the advantages and disadvantages of different types of communication, the tendency is to use several means of communication, including interpersonal communication, in one strategy. This has two advantages: it may be a way (i) to increase coverage, since no single method will reach the entire target population and (ii) to reinforce the main message through various
means, each with its own characteristics, for those who are reached by several means simultaneously.

5. Nutrition education experiments in Africa

a) Initial Experiments

According to Schürch (1983), nutrition education was characterized initially by a condescending approach, based on the presumption that the mothers had no understanding of their problems and that it was necessary to repeat over and over the popular explanation for malnutrition at the time: an unbalanced protein intake in their child's food ration. Nutrition education sessions based on learning about three types of food groups followed: the groups were those rich in protein, energy, and vitamins and minerals, with the emphasis clearly on the first, particularly for protein of animal origin. The promulgation of this protein myth did not produce the expected results, and it promoted a false idea in the minds of numerous educators over the years. This fiasco, attributable to scientific ideas at the time, should make us reflect again today: how many failed nutrition education programs are the result of insufficient knowledge?

In view of these failures, a new educational program was implemented, generally at nutrition rehabilitation centers. It was based on closer staff observation of the mothers' problems. The pilot projects implemented in Uganda (Schneideman, 1971; Stanfield, 1971) paved the way for close monitoring of the family setting, collecting the views of members of the community, and continually evaluating the effect of the advice given to the mothers. During these experiments, the use of culturally acceptable materials was routinely tested: photographs of children before and after rehabilitation, proverbs, songs, agricultural demonstrations, and radio programs. The problem of the energy density of food for the young child came up repeatedly, which led to research on the causes of and solutions to the problem and the use of more appropriate nutrition advice. The results were convincing in several pilot tests in terms of increasing knowledge about malnutrition, the nutritional value of food, and feeding practices. In general, however, the results were often short-term; an intense but limited exposure period cannot produce long-lasting results. These programs did not emphasize that this new way of feeding a child should become the normal way to feed him, and insofar as the child's malnutrition was treated, the mother did not always see the necessity of continuing with what she considered a treatment rather than a normal diet.

Since this time, a comparison of education provided at a recuperation center within a hospital with that of a center in a remote dispensary (Hoorweg & McDowell, 1979) has indicated that the results were better at a dispensary because the sessions took place closer to the mothers' home and a social worker regularly visited the homes to reinforce the messages taught in the group sessions. Additional lessons drawn from these experiments are that nutrition education should: (i) precisely identify the nature of the problem and possible solutions in the local context; (ii) involve the mothers and influential members of the community, especially in the subsequent communication of the messages received; (iii) use traditional channels of communication; (iv) repeat the basic messages; (v) be integrated into all health care-related educational initiatives; and (vi) call on motivated individuals capable of initiatives...
to supervise the whole program (Stanfield, 1976). Before the 1980s, the joint efforts of health care and social science professionals laid the basis of community nutrition education in Africa along lines similar to those of the "new education."

Apparently, these prudent lessons were not applied or were applied only partially. Experiments that were precisely described, or more rarely, analyzed, were compiled by Schürch and Wilquin (1982), Burgess (1982), and Israël and Tighe (1984). They seem amateur in terms of their design or implementation, and neglect certain stages that are critical to the success of a communication project.4

b) PILOT PROJECTS: SOME SUCCESSES AND THEIR LIMITATIONS

Ghana and Lesotho (Austin et al., 1981): The Catholic Relief Services organized nutrition programs for preschool children that included, among other factors, food distribution associated with growth monitoring and nutrition education. Since these were multifactoral programs, the specific role of each factor was difficult to discern. An assessment made after six months' exposure to the program, however, showed a significant correlation, after controlling for different variables, between the mothers' knowledge linked to education (understanding of the growth curve, which could only have been acquired at the dispensary, for example) and adequate nutritional status. This conclusion would tend to prove that the educational factor had an effect; improving the mothers' understanding, however, was mostly linked to individual and personalized counseling rather than to group instruction sessions. This is a very important observation because it indicates that a choice must be made between less frequent individual contact (which could occur at the time of weighing sessions, for example) and group meetings.

Finally, women living near the dispensaries who were relatively well off were the priority of these programs in terms of their coverage; coverage of the target group in Ghana (8 percent) was very low, but it was better in Lesotho (about 30 percent). This seems to indicate that a good level of coverage cannot be reached without resorting to community health care workers who can help to reinforce the educational messages, a critical factor in making them effective.

Morocco (Gilmore et al., 1980): A food supplement program for young children was set up by CRS in 1975. In 1978, a nutrition education component, which had been ready for some time, was added to the program. The assessment conducted in 1980 unexpectedly confirmed that although the distribution of food had been very effective, the addition of the educational component really made this intervention worthwhile, since the malnutrition rates (weight/age ratio) of those who only received food supplements and those who had benefited from the supplements and the educational component were 33 percent and 11 percent, respectively. There are good reasons for the effect of educational measures in this context, and they are worth discussing here. First, the implementation of the nutrition education component was carefully planned: the Ministère des Affaires Sociales (Ministry of Social Welfare) established an Institut de Nutrition (Nutrition Institute) in Marrakesh to train motivated women to supervise operations at the various regional levels; the trainers themselves had undergone a three-year training course at the Institut National de Nutrition (National Nutrition Institute) in Tunis. Five hundred women from rural areas...
were then recruited as monitors at the village social development centers.

These women had mastered their tasks skillfully, which is not the case in many other education programs. From the beginning, one of the objectives was to orient the program toward the problems of mothers in poor areas by proposing practical solutions to them. The availability of food supplements was a powerful motivating factor that led the women and their husbands to accept the difficult and long trips to the distribution centers, and it led to regular attendance. The size of the rations distributed had in fact been calculated to provide a sufficient quantity to young children in spite of the inevitable dividing up that occurs among poor families (three rations per family per month providing a supplement of 500 calories and 16 grams of protein per daily ration, which exceeds all other known supplementation programs). The program contributed to changes in the mothers’ knowledge, attitudes, and weaning practices; a synergistic effect also occurred in terms of the evolution of the women’s status. Without a doubt, coming to the center was to some extent an emancipation for the women: they were more open to the other services provided in the village and gained some mastery over their environment. The instructional initiatives did not stop at the educational sessions but rather continued on an ongoing basis informally, thanks to a remarkable level of interaction with the mothers. This program was also limited, however, in its ability to provide sufficient coverage of the target population.

**Burkina Faso (Zeitlin, 1981):** Ways to improve the diet of the young child at home were tested in one district in this country. The project used illiterate community workers to distribute improved recipes; the goal of this alternative was to allow broader coverage of the population for less than the cost of the distribution of an industrially produced weaning food. According to the assessment, the experiment had convincing results in only one district.

Beginning in 1969, the Yako district recruited 300 "pap monitors" in addition to customary medical personnel. The monitors attended community education sessions once a month with a local education official; these monitors, themselves mothers with young children, returned to their villages to do demonstrations for their neighbors. They visited mothers with a child of weaning age to give them personalized advice on their child’s diet and nutrition. In addition, they were responsible for screening malnourished children and monitoring children returning from rehabilitation centers. The monitors, compared with the community health care workers, had no other responsibilities: their only objective was to improve the diet of the young children in their village. This approach, consisting of passing on a message that would be retransmitted in turn in open discussion, proved to be effective because it allowed the mothers to express themselves and at the same time provided some supervision of the final version of the message passed on. Because of the success of this project, it was replicated in several other regions in this country.

An assessment was conducted after eight years of operations in Yako (Zeitlin, 1981). It was based on a small group of mothers (equivalent to that supervised by three outreach workers). Although several changes were made over the course of the project that might have contributed to an improvement in nutritional status, the project seems to have had a real effect: overall, the Yako project probably decreased serious malnutrition.
Nutrition education

(60 percent of the average weight/age ratio) in the project area to 0.2 percent, compared with an average rate of 3 percent to 15 percent in the rest of the country. Ninety four percent of the mothers were able to recite one or more nutritionally balanced pap recipes and implemented the advice they had received on a regular basis. This project was compared with an educational system using mid-level government workers in another region: the latter had a smaller impact (78 percent of the mothers could recite a recipe, but the recipes were often less balanced) because the workers were not from the villages and used a more formal and less participatory method of instruction.

In 1988, national leaders in charge of health education in Burkina Faso tried to replicate the aforementioned project in another province; as no documentation on the project existed, however, the government agency in charge of nutrition was not able to repeat it. Instead, it had to "reinvent" a new method. This example illustrates the need to document each project and not to rely on a few motivated individuals who are able to get pilot experiments going successfully without integrating them in a sustained way into the operations of the country's health care system.

Côte d'Ivoire (Andrien, 1983): Andrien had the opportunity to evaluate a hospital-based traditional educational program provided to mothers whose children had been hospitalized for severe malnutrition. An initial formative assessment showed that instruction about various food groups was not well understood by most of the mothers and was not a necessary step, given the program's objectives. This might have been due to a time lag in relation to the messages provided by other agencies. An analysis of the target population showed that there were four categories of mothers who should have received different types of instruction, based on the communication method adapted to each group. Instruction within a health care framework is not able to provide this. The program was revised to include more appropriate educational methods and tools, and a final summary assessment showed improved results. Nevertheless, in a subsequent publication, Andrien (1986) wrote that this initiative had serious limitations; the causes of malnutrition were not analyzed, and the focus was limited to dietary recommendations passed on in conversations that gave the mothers themselves few opportunities to participate. The program also depended on the dynamism of a highly motivated leader, and with his departure, it lost its momentum. Finally, although considered an exemplary program for the country, it was not really integrated into an overall health care policy; its influence remained very limited, and it was never replicated on a local level.

c) LARGE-SCALE PROGRAMS CONDUCTED BY HEALTH CARE COMMUNICATION PROFESSIONALS

The previous pilot experiments originated from a global nutrition education movement that was attempting to understand not only what worked in this area but also why and how it worked (Gussow, 1984). This resulted in the definition of a series of concepts concerning the relationship between knowledge, attitudes, and practices and the means to change them fundamentally through large-scale campaigns using the mass media, of which the "Food is Life" program in 1975 in Tanzania is an example (see Hornik, 1985; p. 57). Designed to improve the population's knowledge in nutrition matters, overcome food taboos, and encourage improved production and storing methods for food, these efforts probably reached an estimated 1.5 million
people, thanks to broad political support and extensive preparation; the effect, however, seems to have been short-term, which often characterizes these "blitz" campaigns.

Gambia (HealthCom., 1985): This USAID program (messages concerning ORS and dietary practices during diarrhea episodes) was managed in direct consultation with the Ministry of Health and Social Welfare. It lasted three years, beginning with a six-month-long preliminary program. It combined radio announcements (600/year), printed materials (250,000), and interpersonal communication between community and village workers. The messages were changed in accordance with the seasons and reinforced by a radio-sponsored lottery. A majority of the target population had access to the radio or a community worker. Although one-third of the population of women was illiterate, it was possible to provide explanations of the printed materials (coded with colors that the population could recognize) through the two channels mentioned above. In sum, three-quarters of the women had a pamphlet, half of them heard the messages on the radio and had also heard of the lottery, and the majority of them had the opportunity to talk to the community workers. As such, the project effectively used several information sources to communicate the messages to the mothers. This media combination was clearly effective in reinforcing the messages: in terms of increasing knowledge, it was a success for all issues related to rehydration. Follow-up demonstrated that a learning-forgetting-relearning cycle occurs, making periodic repetition of the messages necessary for about two years to make sure they are retained. Increased knowledge was accompanied by changes in behavior, including in feeding practices during diarrhea: children were put on a starvation diet less frequently; but as soon as the messages ceased, these new behaviors declined (Rasmuson et al., 1990). An assessment of the nutritional status of these children following the program, however, did not show any improvement; overall, the children lost weight, as in a similar program in Nicaragua. This was probably caused by deteriorating economic conditions during this period resulting from worsening drought conditions.

Swaziland (Hornik et al., 1986): Radio broadcasts were also used in this case (five to six times weekly, in addition to broadcasts or radio messages to raise awareness several times a day), distribution of pamphlets (260,000) and posters (7,500), and interpersonal communication at dispensaries during consultations for diarrhea or through community agents who used the yellow curtain method at the doorways to their homes to indicate their qualifications. In terms of nutrition, the messages emphasized the importance of continuing to feed the child during diarrhea episodes and of giving him special foods afterwards.

In all, 85 percent of mothers questioned were exposed to at least one aspect of this campaign. One of every six people was in touch with a community worker, but 60 percent heard the radio messages; even if personal contact seems more effective, broadcasting the messages by radio is essential to reach the target population, at least in a country like Swaziland where a significant number of people have a radio, listen to radio programs, and where radio is a credible source of health care and nutrition information.

Although solid data on actual practices and the ultimate effect of the project on nutritional status are not available, ORS practices seem to have improved nationwide as a result of the radio
campaign. The dispensaries do not seem to have had an effect because they limited their efforts to distributing packets, when available, without providing any explanation. As far as diet during diarrheal episodes is concerned, convincing more mothers to feed their children at this time was difficult, but a majority recognized the importance of feeding them with specific foods once the diarrheal episode was over. This does not seem to be a result of contradictory messages but rather of the fact that the messages concerning feeding during diarrhea episodes were neither assimilated nor understood.

Once again, the relative success of this campaign was the result of the enthusiasm of several well-trained staff members. The idea of preventing diarrheal illness with ORS had already been propagated in a variety of ways over the course of several years and was not an unknown, unlike the initial situation in Gambia. But this campaign was managed outside of the normal institutional framework, and whether it may be continued and institutionalized to produce longer-term results is not clear.

Ghana (MOH, 1989): A nationwide program made a careful initial examination of living conditions for the young child in each region to underscore the differences and similarities between the radically different environments in the country’s northern and southern regions. While maintaining the particularities of each region, the project emphasized the similarities, given that the problem is basically the same throughout the country: at six months, growth in terms of height becomes progressively delayed. A quantitative and qualitative analysis was conducted for each age group to develop concrete suggestions for the mothers. Trial interventions were conducted in about 100 homes for three to four days to see whether the mothers had run into any specific problems in the process of making the recommended changes. This crucial stage showed that the mothers are ready to change their practices if what is proposed is relevant and not too difficult to implement. In addition, group discussions allowed the participants to identify the advantages and disadvantages of each of the changes.

The next stage involved integrating the greatest number of agencies possible into discussions concerning the project’s implementation; awareness and participation from many areas are necessary to institutionalize and sustain a project. Among the merits of this project are the following: (i) it conducted a far-reaching and in-depth analysis of the target public, which led to a good understanding of how and by whom mothers are influenced at any given moment, and (ii) it anticipated appropriate messages for each group. The project resulted in several recommendations aimed at modifying legislation related to food aid, promoting income-producing initiatives, involving street vendors, etc., according to the idea advanced by Berg (1976) and others but not often retained by educators to date. The idea is to try to change the basic factors that limit improving nutritional status (Gussow, 1984). Unfortunately, an assessment of the program’s impact has not been conducted.

Swaziland: A program was implemented under the aegis of the Health and Agriculture Ministries, with technical assistance funded by UNICEF and USAID (National Nutrition Council, Swaziland, 1988; Aphane, 1989). It developed along the lines of the Ghana program; once again, painstaking preliminary studies showed that mothers’ feeding practices could be improved from the birth of their children (rejection of
colostrum, providing nursing infants with water, use of industrially produced milk) to the end of the weaning period (inadequate portions given to the child, food that has been too diluted, insufficient number of meals, etc.). The solutions were carefully discussed at group meetings and tested to verify their acceptability. Aside from these home-based initiatives, recommendations were made to officials concerning how to improve the situation nationwide: limiting importation and promotion of industrially produced milk and bottles, environmental clean-up measures, more appropriate staff training, etc. As in the case of Ghana, no assessment of the program's progress and impact was conducted.

Cameroon: This project was initiated by Manoff International in conjunction with the American Center for Education, CARE, and the government of Cameroon in two regions in the country's most northern province. In fact, the project was integrated into a primary health care project that had been operated off and on since 1984 (Manoff, 1987 and 1989; Hollis et al., 1989). This project is important because it used the ability of public awareness measures to change the habits and practices of mothers in areas where access to the media was rare, and the surrounding environment was rather barren, isolated, and without infrastructure. The population was almost entirely illiterate, and only 30 percent of households had a radio. The project was based essentially, therefore, on the efforts of community health care workers already working on the CARE project who visited the villages two or more times per month. During the first visit, the health worker organized a weighing session with individual counseling provided to the mothers; the second visit was dedicated to group educational sessions. The entire program was implemented in four phases: basic analysis, formulation of different program strategies, implementation, and assessment.

An assessment was conducted one year after the program was initiated. It showed a significant extension of coverage in the villages by the community workers (participation in the growth monitoring sessions increased from 13 percent to 44 percent in less than six months in some villages), and a modest improvement in the mothers' knowledge (directly related to their level of exposure to the program), but few concrete changes in their daily feeding practices for young children. This project had a limited budget and a short initial phase. Staff training in communication techniques and supervision of them was clearly inadequate, while the proposed techniques were rather sophisticated for staff of this nature: different strategies depending on the age groups, etc. Finally, incorporating an ongoing evaluation component into the program appeared necessary to adjust the activities better during the course of their implementation. In sum, although this project was based on the same principles, it did not benefit from as careful preparation and implementation as other projects. Only a new assessment can determine this program's degree of success in terms of its impact and sustainability.

Congo, 1980–1990: The CARE education project, known as NUTED, was initiated in 1980. It represents a project conducted nationwide that has lasted for an exceptionally long time. It was designed to train staff in various ministries in nutrition and hygiene education, import or produce educational materials locally to support national initiatives, and create an educational resource center in Brazzaville. An initial study was conducted on nutrition problems in Congo with USAID (Huntington, 1986); it showed that
Nutrition education
despite a prevalence of moderate malnutrition in young children, food appeared to be sufficiently available. The age at which food supplements were introduced varied — either too early or too late — and an increasingly marked tendency to use imported food supplements was noted. The situation seemed to be related to the family's level of instruction. An important program was implemented, therefore, that included training for 300 field workers and their supervisors; development of educational and food demonstration materials, radio programs, a manual, posters, and academic programs for school children in rural areas; and scales for maternal and infant health care centers. All of these materials were tested beforehand. According to the first assessment team, the program seemed to be comprehensive and well planned, and its implementation followed the predetermined schedule for the first few years.

Not long after the project began, however, problems appeared: staff training was considered too short, the objective was too narrow (based on the introduction of complementary food at the right age), administrative problems received too little attention, and the need to encourage political leaders had largely been neglected. In addition, the foundation of the program was a base assessment that had focused on malnutrition problems without analyzing their socioeconomic and cultural aspects; changing mothers' behavior without knowing what determined it seemed difficult. Finally, the media strategy had not been clearly defined. In view of these determinations, adjustments were made in the program, and its scope was broadened: it promoted breastfeeding, oral rehydration therapy, growth monitoring, and improved weaning conditions. The program began to show some real success beginning in 1985, and it became popular throughout the country. The situation began to worsen in 1988, in part because of unfavorable economic conditions and poor management, which led to several changes in foreign partners. A new assessment conducted by UNICEF in 1990 recommended that the project be discontinued and integrated into a nutrition project under the tutelage of the Health Ministry (Ministère de la Santé), whose principal educational component had been replaced by sectoral educational initiatives. In particular, ORS messages, which had been promulgated by another agency without coordination with the NUTED project, could now be integrated into it, thus avoiding redundancy and contradictions (Dillon, 1990).

Because of a lack of appropriate baseline data, it was not possible to assess the project's impact. In operational terms, one may conclude that it never reached the projected performance level in spite of its real success at popularizing improved weaning techniques between 1985 and 1988. As the result of not maintaining real skills in communication techniques, the educational component linked to the media, which was initially important, was gradually phased out. The implementation of a growth monitoring system produced mixed results: 38 percent of mothers had a growth chart in 1987, but analysis shows that the system was operating without any real supervision and did not lead to appropriate individual counseling for the mothers. The factors that contributed to these poor results were the verticality of the project, because of which essential collaboration from the Health Ministry was not always available; the absence of precisely defined objectives (the only clearly formulated objective, "improving the nutritional status of Congo's young people," fell under a multidisciplinary initiative that was never really implemented), and the lack of precise assessment.
criteria; the lack of supervision in a project that was too centralized; and increasingly discouraged personnel.

The Sabel: A rapid overview of the work of the African Nutrition Education Network (Réseau d’éducation nutritionnelle Africain or RENA) (Lejeune and Andrien, 1986) confirms that the French-speaking countries are not very advanced in the area of education: projects are incomplete, use traditional education techniques, and are not adequately supervised or assessed. A recent evaluation of the difficulties encountered in the education area by diarrheal disease prevention programs in two countries in the Sabel provides a good illustration of these problems (Pritech, 1990).

Four main problems have been identified:

- Lack of message coordination among the various projects, as in many other places, causes confusion among the target public (Andrien and Lamotte, 1986): in a suburb of Dakar in Senegal, the messages broadcast by a university-based institute to ensure educational coverage for several neighborhoods were different from those provided by health care dispensaries in the same neighborhoods;

- Underuse of educational materials: as preliminary assessments showed that the principal source of information for more than 65 percent of the mothers is health care workers, diarrhea prevention programs produced important educational materials; supervisory visits, however, showed that these materials were not used sufficiently. A study of the reasons for this underuse was conducted in several treatment centers that operated with a variety of health care personnel, ranging from hospital doctors and nurses to field nursing staff and paramedics. The results show that in the PMI and hospitals, staff suggest that radio, television, or video be used for nutrition education. In fact, they do not want to take personal responsibility for a task they do not believe will enhance their medical work, that takes them away from their consultations, and for which they admit they are hardly qualified. Midwives and nurses are rather discouraged in view of the few visible changes after so many "chats." Materials are the least underused at the remote centers;

- Training staff in interpersonal communication and the use of the materials is inadequate: staff who are asked to take on these activities (midwives, nurse-aides, social workers, and less often, nurses) have generally little or no training in this area; this category of personnel are motivated and available, and they would like the materials to be more diverse and better explained so that they feel more prepared; and

- The media used are not always appropriate: Andrien demonstrated that in Pikine, a suburb of Dakar (Andrien & Lamotte, 1986), only 28 percent of residences had a radio and only half of the targeted families did. One of the characteristics of target populations affected by malnutrition is that they do not have access to information through the media. The attitude of doctors in Niger and Mali, given that the radio, television, or video must be used to educate people, is tantamount to an abdication of responsibility (Pritech, 1990) on the part of health care workers.
6. Lessons learned from projects implemented in Africa to date

This section contains a summary of the lessons learned from the projects described above. Overall, each of the projects seemed to have gaps. The following lessons emphasize that, for a project to be successful, each stage must be followed and certain key criteria must be satisfied.

PROJECT DESIGN: Several factors must be considered when a communication project is designed:

- Projects must be based on a prior analysis of the situation, providing answers to the following questions in the case of nutrition education: which behaviors affect the nutritional status of the target population; what are the determinants of these behaviors; what is the nature of the resistance to changes in these behaviors; who are the various target groups; what are the most effective channels of communication to reach each group; how should messages be formulated for each channel of communication; does the planned initiative complement national health care programs; how does one conciliate the promotion of new behaviors with respect for local cultural practices? Any message that is read or heard is not magically assimilated, leading to immediate changes in behavior. The key is (i) a prior investigation of the problem at hand that helps to identify acceptable solutions depending on the target population(s); (ii) designing messages that must be pretested (in some cases, several times) through sample testing of this population; and (iii) continuous adjustment of the messages based on the public's reaction.

- Health and nutrition education projects should be designed by communication professionals based on a rigorous methodology. Specialists in the social sciences and communications must work with nutritionists to assist them in the design and pretesting of appropriate messages.

RAISING THE AWARENESS OF POLITICAL LEADERS: Concerned: Making political leaders aware of the importance of the program so that they do not create any obstacles to its implementation and they support it. This stage is often overlooked because leaders are not directly involved in the project's execution. Their support is still needed.

TRAINING: As many projects have shown, problems resulting from the project implementors' lack of training often arise. Training should be improved for two types of staff workers: (i) those responsible for interpersonal communication and (ii) those in charge of the design, planning, and implementation of communication initiatives. These gaps became major problems in programs in Congo (1980–1990), Cameroon (1988), and frequently in the Sahel.

- Workers responsible for interpersonal communication. The importance of health and nutrition education should be reemphasized by defining precisely its content and status in all health care training programs and by making medical authorities aware that, even when they do not participate, they should at least facilitate use of the materials and ensure supervision. Basic training provided these staff should include instruction in communications and community assessment. But until the basic training programs are revised, and staff trained in them from the beginning is available, currently employed health
care workers should be retrained in interpersonal communication and the use of IEC materials. Community workers should also be retrained in community organizing and interpersonal communication.

- Staff in charge of communication initiatives. Training for these staff members is often inadequate and fragmented. Many of them need additional training, especially in communications-related planning.

In addition, this retraining should be accompanied by "constructive and positive" supervision by field workers. This type of supervision plays a very important role because it serves as a quality control measure for the initiatives, provides continuous training for staff, and provides them with moral support (Indonesia, 1985).

COMMUNITY ACTION: Extension programs to villages and neighborhoods are needed; this ongoing development could be carried on by community health care workers or social workers, whoever is more motivated, provided that resources are obtained for training and educational materials. The distribution and maintenance of these materials should be managed in an organized fashion. These workers also seem to be more effective when they are known by the community rather than when they are outsiders (see Burkina Faso, 1981).

NEED TO EVALUATE THE AVAILABLE MEANS OF COMMUNICATION: A close study should be done before any means of communication is chosen; this choice should not be made under pressure from organizations specializing in mass media or governments eager for new gadgets. The choice should be guided by the characteristics of the target public (Is it literate? What are its credible sources of information? What are its listening habits? What channels have the greatest likelihood of reaching it?) and available resources. A large-scale program in Zaire (Barnes-Kalunda, 1986) is an example of a bad choice: it was based on the use of television, which was not widely accessible at the time. Two other examples mentioned above are those of Senegal and Niger, where use of these media did not respond to the public's needs but rather represented an abdication of responsibility on the part of health care workers. In fact, several media should be combined to obtain a cumulative effect: the same message broadcast by several sources will be reinforced.

NEED TO TARGET THE MESSAGES: Messages should be designed to ensure that the target public feels involved and identifies with the messages. The program in Burkina Faso also demonstrated that mothers were attracted by clear messages that directly addressed their immediate problems and whose expected benefit was visible: a response to a problem that is widely felt is the key to motivation (McSweeney and Friedman, 1980). How far nutrition education messages are broadcast and their impact must also be monitored to avoid any harmful effects. Pagézy and Subervie (1990) relate how messages broadcast by a development program in a region with a low level of agricultural productivity and monetary economic activity in the northern part of Zaire had a catastrophic effect in an adjacent region with a different environment.7

FOLLOW-UP AND ASSESSMENT: From the moment the project is designed, follow-up measures and plans for ongoing and comprehensive assessments should be developed. As mentioned several times above, follow-up is
very important in determining the necessity of modifying a project that is already underway. Ongoing assessment should document how a project was implemented, what worked, and what did not work. Such information will allow the project to be replicated and improved at the same time (see the problem with a lack of documentation in the Burkina Faso project, 1980–1990). As far as the comprehensive assessment is concerned, in many cases baseline studies must be conducted before the project begins, allowing for pre- and post-project comparisons. Indicators should be identified that allow one to assess whether the project’s objectives have been attained. Without an assessment, as was seen in a large number of projects described above, determining whether a project has had an impact is impossible, and drawing useful lessons from these projects is difficult.

ROLE OF CAMPAIGNS: The use of intensive campaigns is common. These campaigns help to raise the awareness of, inform, sensitize, and mobilize the population (Tanzania, 1975; Gambia, 1985), but they will have only a short-term effect if they are not followed up by ongoing IEC initiatives that reinforce the messages launched at the time of the campaign.

COORDINATION AMONG PROJECTS: A frequently encountered problem is the multiplicity of similar educational messages or initiatives that are not coordinated beforehand. Several examples of this problem were mentioned above, in particular in Congo, Côte d’Ivoire, and Senegal. This lack of cooperation is always inefficient, but it may also be disastrous if the messages are contradictory.

INSTITUTIONALIZATION: One of the reasons a number of initially successful NGO, university, or foreign assistance programs have been unsuccessful in the long run is that they have been designed from the outset outside of official health care institutions, based on a very “medicalized” treatment method that relies mostly on sophisticated health care structures. An initiative aimed at modifying behavior in the nutrition and health area cannot be designed without coordination among all the communication structures concerned (Andrien, 1986). Education programs should be comprehensive in scope and should integrate all health care concepts related to families that are useful or immediately usable to avoid any bias. The Ouando program in Benin (Fakambi, 1990) emphasized nutrition in young children and because of this, the mothers were fairly knowledgeable in this area, although they clearly did not know enough about maternal nutrition, an important aspect in these regions. Because too many programs are preoccupied with efficiency, they focus on specific issues; if initiatives are not pursued simultaneously to address the various bottlenecks, the effect on changing practices remains slight. In Congo, the UNICEF assessment identified the lack of integration of this type of program into other programs run by the Ministry of Health as one of the reasons for its failure. A program’s durability also should not depend exclusively on a few motivated individuals who will run the program well but who will become “indispensable” to its operations. This was a problem in Côte d’Ivoire (1980), Swaziland (1984–85), and Congo (1980–90).
The health sector and nutrition interventions in Africa

7. Costs

Adding education to the food distribution program in Morocco (Gilmore, 1980) increased the program's costs by $1-$3, making the total cost $34.47 per person annually, compared with $10 in Kenya and $32 in Colombia for programs during the same time period. The contribution requested from, and accepted by, the mothers, given the substantial amount of food supplied, allowed the centers to be financially independent. Asking participants to contribute to an education program that does not provide them with a material return, however, appears problematic.

The cost of the educational component for the Ghana and Lesotho programs was estimated at $2.80 and $2.48, respectively, per person annually (Austin et al., 1981).

The cost for the government of the Yako program (Burkina Faso) was $0.53 per mother annually. This program was not costly because it was based essentially on community health care workers. The cost of a similar program using mid-level staff was higher with fewer results (U.S. $2.24). The cost of programs implemented at health care centers is clearly the lowest in absolute terms; but as the coverage provided is very low, the comparison of individuals reached is not valid. In the case of Yako, if one does not consider simply providing instruction to the mother (seven hours per week) but rather the number of cases of malnutrition avoided, the cost falls by 2.5 to 19 times, depending on the program components considered (this is a multifactoral program, including food distribution). Improving cost effectiveness is directly related to better coverage of the target population and substituting less qualified for better qualified staff (Schürch, 1983; p. 177).

One of the reasons cited for using the mass media rather than personal instruction is the high cost of the latter for similar coverage. Programs like those at Yako, however, have shown to what extent the populations were able to pay for some of the costs, so that the government did not have to cover too much of the costs relative to the overall budget.

As for more modern national programs, initial research is estimated to cost between $30,000 and $50,000 (for a small country or region); the cost of reproducing the materials, about $150,000; the cost of project execution, between $40,000 and $75,000, if materials used have already been tested and are not excessive in quantity; and the cost of monitoring and evaluation, $50,000 per round. In most cases, using the media costs nothing, and training and supervision of staff are included in integrated costs of normal operations for health care services. Once the program has been set up, which is the most expensive phase, maintaining it should not exceed reasonable budgetary limits for most countries (Griffiths, 1989).
This overview of project assessments suggests several priority recommendations for Africa:

- Health care services should use a community approach as early as possible. This implies training staff in this area, defining community participation, and decentralizing decision making, and hence, budgets, to the district level. Without a community approach, the coverage, impact, and viability of programs will continue to be inadequate.

- Nutrition training for health care workers and those in other sectors should be rethought, more adapted to a community approach, less academic and more practical, and simpler overall. This is the case for basic training as well as retraining when workers are already employed.

- Health care services must become more efficient by concentrating on what they can do best. This document has attempted to show how these choices can be made. Some initiatives can be undertaken easily without a lot of resources (salt iodization, prevention of anemia, among others). No further delay is justified in putting such programs into place: the problems have been identified, solutions exist, and only the will to implement them is lacking.

- Decision makers at every level should be made aware of nutrition problems. The problem of breastfeeding is typical: numerous African decision makers ignore us when we tell them about this problem because, as they say, all African women breastfeed; this is true, but the women often breastfeed incorrectly and do not wean the child properly, as is demonstrated in the chapter dealing with this topic. The health sector ought to serve as an advocate for nutrition in relation to other sectors. This could increase the health sector’s coverage and encourage it to undertake preventive interventions. For example, the only way an effective salt iodization program will be implemented is in collaboration with the Ministry of Commerce.

- Effective decision-linked monitoring and assessment systems should be put into place. Many projects are too small or poorly assessed. This should be initiated at the time the project is designed, when the objectives are determined. Baseline data should be collected to measure the project’s impact and cost. Too many midwives and nurses spend hours every week filling out forms for reports that are scarcely read rather than assisting in decision making.
Benefits already provided by the health sector


Prevention of vitamin A deficiency


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Nutrition education


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1. This review focuses on programs aimed at preschool-age children and pregnant women; it does not address emergency food aid, school feeding programs, food fortification, "food for work" programs, or hospital and nutrition rehabilitation center food supplement programs. These aspects, however, are sometimes integrated into a few programs.

2. Nutrition education within the formal framework of a school will not be addressed here; although it is certainly an important area, no assessments are currently available that would illustrate how this type of instruction operates, its cost, and its impact. Educational aspects of specific programs such as those for iodine deficiency or vitamin A will not be mentioned; the greatest amount of attention will be paid to instruction provided to mothers within the framework of preventing protein-energy malnutrition in young children.

3. Many small-scale programs in Colombia (the Promotora à Candélaria Program serving 920 families), Thailand, and Jamaica (serving a population of 60,000 people) (Hornik, 1985, pp. 42–43) managed to improve the nutrition situation in this way. Broadly extending coverage through such a system, however, is difficult.

4. For example, in Zaire in 1980, in a large nutrition education project that used mass media (radio, television), an initial survey was indeed conducted of the knowledge and behavior of mothers and the listening audiences of radio programs, but the program was then designed behind closed doors at the central government level, without any prior testing of the messages or assessment of their potential impact. In fact, a closer analysis of the initial survey revealed that living conditions for the mothers (little access to food, lack of fuel, lack of time) were more likely to be the issue than a lack of knowledge (Tandberg).

5. The participation of the target public in formulating the messages turned out to be a good way to come up with relevant messages and to identify acceptable behaviors for the population.

6. The success of the program in Indonesia (Manoff, 1985), based on the use of the media and community health care workers known as kaders, is basically attributable to the quality of supervision and its appropriateness, allowing operational difficulties related to the targeted goals to be continually corrected. The program objectives should be precisely defined to guide in the development of a strategy and to allow the assessment and follow-up to be conducted.

7. The message recommended the adoption of a corn-flour based pap, called "energy"; in the course of broadcasting the message, the necessary supplements were gradually left out. In this population, the transition used to be made directly to the family diet based on cassava, supplemented by green leafy vegetables, fish, and wild game. After several years, corn cultivation was broadly extended into the region, contributing to alcohol's manufacture; mothers increased their work load with long corn pounding sessions, which resulted in children's not receiving pap on a regular basis; weaning foods were frequently modified without any evident benefit to the children.
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