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NUTRITION EDUCATION — A STATE OF THE ART REVIEW

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A B S T R A C T

This review asks three questions: Is nutritional status open to educational intervention? Is there evidence that particular educational programs have affected nutritional status? And, has it been feasible to organize large scale, long term nutrition education activities:

Part one of the monograph looks at the potential for education in affecting breastfeeding among non-rural women, at improving calorie consumption after weaning, and in changing treatment during diarrheal episodes. Part two is an extended review of specific nutrition education projects. Each project is presented as a response to the major problems nutrition education programs need to solve: reaching large and distant audiences, providing systematic, relevant and high quality education, making sure that messages are reinforced through multiple channels, complementing material inputs wherever possible, providing incentives for clients and educators for continued participation, and financing operations. Clinic outreach projects, advertising approaches, integrated media/face-to-face programs, education as a complement to feeding activities, social marketing programs and campaign approaches are all examined.

The evidence for the potential of education is far from definitive, although for important nutritional outcomes it is clear that income does not account for all variation -- a result consistent with investment in education. A number of educational programs using face-to-face methods have had observable impact on nutritional status. However organization and maintenance of such programs on a large scale has not been accomplished and may prove difficult. Some recent mass media-based efforts show the ability to reach large audiences and teach new behaviors and show some promise (although not unequivocal evidence) of affecting nutritional status. The most effective programs integrate broadcasts with data-based content development, continuing field contact, and some incorporation of the health infrastructure.

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INTRODUCTION

Malnourishment is widespread. According to the World Bank (1980), several hundred million people suffer from protein-energy malnutrition; hundreds of millions more suffer from the lack of certain micro-nutrients: -- iron, iodine and vitamin A, for example. The human cost, in early death, in physical and possibly mental retardation, in debilitating illness, and in low energy levels affecting productivity, is awesome. The effects of malnutrition seem to be particularly evident among very young children.

Many sources detail both the nature and the consequences of this malnutrition problem, and examine alternative policy options for alleviating it (cf. Berg, 1981; Reutlinger and Selowsky, 1976; World Bank, 1980; USAID, 1977). Many of those options focus on actions taken in the agricultural sector or in other programs to increase individual incomes. Some involve investments in community infrastructure (water supply or electricity) or health systems. Others are direct interventions in nutrition: food price subsidization, supplementary feeding programs, and development of nutritionally-improved or fortified foods. On most lists of potential policy options (although sometimes well down on those lists) one can also find mention of nutrition education as a promising strategy for

combatting malnutrition. The nutrition-education option is the focus of this monograph. (1)

The central questions here are straightforward: Under what circumstances is there a role for nutrition education? In what content/behavior areas, with what educational methods, and for which populations is there evidence that education is an affordable, logistically feasible and effective intervention? Is it possible that nutrition education can stand on its own or is it exclusively valuable as a component of a comprehensive nutrition intervention?

To answer these questions we need to make three sequential conclusions:

1) We need to show that there is potential for nutrition education. We must show either a) that currently available resources at the household level are not producing optimal nutritional benefit -- that is if people made better use of their current income they would be better fed, or b) that concurrent or coming changes in the environment (including non-educational nutrition interventions) could allow better nutritional status if people knew how to adapt to those changes. If a) can be established it would be consistent with a stand alone nutrition education program. If only b) can be established, then only nutrition education programs introduced in the context of naturally occurring or planned complementary changes can be justified. If neither a) nor b) can be established in a particular context then nutrition education holds no potential.

2) We need to show that educational interventions can bring about desired change in behavior and nutritional status. Establishing that there exist materially feasible changes in behavior which are nutritionally beneficial is not the same as saying that a particular educational intervention can effect those changes. We need to show that educational interventions have resulted in improved nutritional status.

3) Finally, we need to show that effective education can be realized on a scale that will allow a large number of people to benefit. This is the most difficult to establish of the three necessary conditions. The inverse relation between effectiveness and scale, and ways to address that dilemma will be a major theme.

In each of the next sections evidence concerning these necessary conclusions will be presented. Before turning to the first, a brief statement about what will not be done is in order. Essentially for reasons of space, discussion is limited to educational activity which produces nutritional benefits directly.

No programs are considered which try to sensitize policy-makers in other sectors as to the nutritional consequences of their decisions even though the nutritional consequences of a decision, for example, to lower the subsidy on fertilizer may be huge. This represents no judgement as to the comparative efficacy of such indirect versus direct programs -- or any conclusion as to whether those most concerned with nutritional outcomes might have better results were they to put their

energies into the indirect path. It is merely a recognition that only so much ground can be covered in a single presentation.

There is no discussion of the effects of schooling on nutritional status either. Quite reasonable arguments are made that the intellectual skills one learns through formal schooling or adult education affect the ability to take the most nutritional advantage of available resources (Van der Vynckt, 1983). Behrman and Wolfe (1984) present evidence that in some contexts a woman's schooling is more important than family income in predicting dietary adequacy. This is an issue of substantial importance but beyond the nutrition education focus of this monograph.

On practical grounds, there is no attempt to address the myriad issues associated with the implementation of particular strategies. Our concern is with the appropriateness and general approach of investments in nutrition education. For the next level of planning -- once the basic commitment to nutrition education and a particular strategy are made-- reference to other sources (e.g. Griffiths, 1981; Jenkins, 1983; Smith, 1980; Zeitlin and Formacion, 1981; Sweeney, 1982) would be appropriate.

PART ONE: ON THE POTENTIAL FOR NUTRITION EDUCATION

The World Bank puts it bluntly, "Malnutrition is largely a reflection of poverty: people do not have enough income for food." (World Bank, 1980, p. 59) Malnutrition is not a matter of a shortfall in aggregate agricultural production. Global food resources would be more than enough to feed the world's population; indeed, in many nations where protein-energy malnutrition is common, there is enough food to feed everyone. Rather, malnutrition seems largely to be a problem of equity; some people have incomes too small to purchase the food they require. This shortfall exists although individuals are spending a very high proportion of their income on food -- 80% or more among the poorest 50% of the population in Indonesia, for example (World Bank, 1980).

It is no surprise, then, that most sources turn outside the narrowly-defined nutrition sector when suggesting solutions to malnutrition.

Boosting food production (especially food that poor people eat and grow) and raising the incomes of the poor are the two central requirements in most countries (World Bank, 1980, p. 62)

A commentator would be foolish to deny the essential primacy of the income-malnutrition link, or its implications concerning the need for equitable distribution of available food if adequate minimum nourishment is to be enjoyed by all of a society's members. The next question becomes, "is there anything left over not determined by income?" Is there nutritional inefficiency in the use of available resources? That is the key to potential for nutrition education.

Nutrition education is the attempt to enable consumers to use available resources optimally to reach valued ends. If current resources are already being used optimally, then nutrition education has no role. But knowing whether resources are being used optimally is no easy task.

Optimality depends on one's weighting of desired ends. An individual may value the survival and growth of children at weaning age and also the ability of adults to work without energy deficits. In some families optimizing one end may be done only at the cost of the other.

Valued ends may include the desire to conform to community norms, personal convenience, avoidance of economic risk, acceptance of religious strictures, and so on. An argument that a particular practice is not optimal and thus is subject to nutrition education is as much a value statement as a technical statement. It is a declaration about what end(s) should be sought as well as whether current resources are being used efficiently in achieving it (them). The issue is further complicated by consideration of whose ends -- the beneficiaries' for themselves or the educators' for the beneficiaries

-- are to be chosen. Following this logic, we offer two categories of non-optimality before we turn to the evidence for the optimality of particular nutrition-related behaviors.

1) When current resources can be used more efficiently in obtaining a desired end without any cost in terms of other desired ends. This is the easy case when nutrition education need only concern itself with providing information. If one can imagine a situation in which mothers were choosing to bottle feed rather than breastfeed because they believed bottles were nutritionally superior, it would provide the logical possibility for changed behavior as the result of a change in what mothers knew.

2) When two desired ends are in conflict, and the nutrition educator believes that one ought to be valued over the other. A mother may be aware that bottles are less nutritionally valuable than the breast, but chooses the bottle for her infant because her 'modern' social network expects her to. Nutrition education in this context becomes an attempt at persuasion -- to convince mothers to value one end over another.

A closely related circumstance is when a particular end is not currently valued by someone, but the nutrition educator believes it ought to be valued. Parents may not value weight-for-age growth as a definition of adequate nourishment. The nutrition educator who believes it ought to be so valued needs to persuade parents to accept that criterion before teaching behaviors to optimize it.

It will be relatively easy to find situations where current behavior is not optimal if outsiders are permitted to choose which ends are to be sought (Category 2). It is harder to locate non-optimal behavior given that one accepts the existing values of the audience (Category 1). The probability of finding exemplars of both these cases is greatly increased at times of substantial environmental change.

Evidence about educational potential comes from four sources -- logical argument, expert testimony, empirical studies of dietary behavior, and studies of the effects of educational interventions. We first look at evidence about the potential for nutrition education at the household level and then turn to evidence about the potential for affecting within-household nutrition.

Educational Potential at the Aggregate Household Level

The conventional wisdom is that malnutrition at the aggregate household level is, for all practical purposes, defined by income. Knudsen and Scandizzo (1979) set the correlation between income and energy consumption per capita at about .95, based on their reading of data from six country consumption surveys (from Bangladesh, India, Morocco, Sri Lanka, Pakistan and Indonesia) using the household as the reporting unit. Their results say that, among the poorest in the poorest countries, for each additional 10% of income there is a 7.5 - 8.5% increase in energy intake. These results leave little latitude for education in improving general household nutrition. (2)

However some counterarguments may be worth noting. First there is a residual argument that, energy aside, some nutrients are missing from typical diets, and not because of cost considerations. For example, Vitamin A deficiency is common -- 50% of developing country children are said to suffer from it (World Bank, 1980) -- and some would argue that it is remediable through addition of small quantities of locally available foodstuffs or from the products of small home gardens.

Second, at a certain level of income some families consume more calories and are better nourished than others. While intra-income-level variation in energy consumption will not be enough to resolve the nutritional deficits of substantially impoverished families, households at the poverty line may show important variation in dietary adequacy. Then even a high correlation between income and energy consumption does not deny all potential role for nutrition education.

A related argument would be that the general income/energy correlation may hide pockets of non-optimal consumption. New urban migrants, or refugees, or others may find themselves required to make radical changes in dietary behavior; practices which previously took maximum advantage of available income may no longer be appropriate given changes in income, in household structure or in employment pattern. Similarly, the sudden availability of new foods or of changed prices for available foods may dictate changes in dietary behavior if maximum benefit is to be derived from available income.

A third argument would be that calories purchased are not equivalent to calories utilized for nourishment. Food preparation and storage may have important effects on nutritional benefits, both because nutritive value may be directly affected and because the gastrointestinal illnesses associated with inadequate preparation and storage may affect utilization of available calories. Again a potential educational role may remain.

While each of these arguments suggests possible roles for nutrition education, they do not necessarily describe targets for nutrition education of the same magnitude as those which are addressed in the next section. Each argument refers to a special circumstance. They justify particular directed educational efforts if evidence shows that for a particular group the generally high correlation between income and nutritional status does not hold.

Educational Potential Within the Household

If conventional wisdom is skeptical about the potential for education affecting aggregate household consumption, it is rather more enthusiastic concerning intra-household consumption. In Berg's view, "Sometimes .. malnutrition occurs simply because food habits are inappropriate... It is not uncommon, for example, to find children suffering from malnutrition in households in which incomes and food are adequate. Even among the poor, such childhood malnutrition could apparently be avoided." (1981, p. 26) Zeitlin and Formacion take a

similar position, "A major proportion of this malnutrition <at weaning age> has been shown to be caused by ignorance, incorrect food and health beliefs, and resultant poor feeding and health practices, rather than lack of basic food resources." (1981, p. 4)

Evidence for the proposition that malnutrition is not entirely determined by incomes come from a variety of sources. Perhaps most commonly presented are descriptive studies of existing practices which implicitly or explicitly are viewed by their investigators as dysfunctional.

The largest volume of these are anthropological studies of dietary behaviors of given cultural groups, often based on intensive observation of a relatively small sample of people. Many such studies are summarized and referenced in the Maternal and Infant Nutrition Reviews prepared by the staff at the International Nutrition Communication Service and now available for Egypt, Lesotho, Liberia, Morocco, Nepal, Pakistan, Sri Lanka, Tanzania, Thailand, Tunisia, and Zaire (INCS, n.d.) These are very useful for exploring both specific practices within a given culture, and suggesting belief systems which may underlie those practices. However such studies do not provide a strong estimate of how widespread a particular practice or belief is in a given country. Such studies may suggest a greater universality of practices and explanations for practices than is in fact the case.

To obtain evidence about the extent of a given practice, one must turn to nutrition surveys which ask for (but often do not further validate) self-reports of current beliefs and practices. One recent survey done for CARE and reported by Vemury (1981) questioned randomly selected samples of rural mothers in six countries (Bangladesh, Colombia, Guatemala, Jordan, Peru and Tunisia.) Table I reports relevant practice data vis a vis several relevant themes from Vemury. We make use of specific data from this table in subsequent discussions.

These data (and the many smaller descriptive studies not summarized) do suggest that many apparently dysfunctional practices are widespread although some are less common than has been suggested. If credible, these data represent one step toward an argument in favor of educational solutions, but in no sense are they a final step. As has already been suggested, failure to act according to optimal recommendations of outsiders may not reflect lack of knowledge, but a conflict between insider and outsider values.

For each of the themes customarily addressed by nutrition educators it would be possible (and essential if one were developing an education campaign) to ask how current behavior is best explained. Does the source of the behavior lie in lack of knowledge, preference for optimization of another value, or disinterest in maximizing a particular value? Is the outsider preferred behavior simply not feasible on economic grounds?

TABLE ONE

Self-reported Nutrition Behavior -- Vemury Six Country Survey

Issue	Peru	Colombia	Guatemala	Tunisia	Jordan	Bangladesh
Feeding Preference-- %						
Husband	57.3	52.6	45.5	73.0	27.0	64.0
Child under 6	4.3	8.2	5	3.7	8.9	2.4
Not Reported	4.2	27.7	48.3	12.1	40.1	5.3
Other	34.2	11.5	5.7	11.2	34.0	28.3
Harmful Foods -						
Largest % naming any one food.	*	*	*	11.0	4.0	12.0
(* -- No food mentioned as harmful by more than 2% of the sample)						
Diet of Nursing Women						
% Who Report Eating:						
More than normal	49.2	62.5	53.5	72.0	56.9	75.1
Normal	49.5	34.5	39.3	22.4	39.5	20.4
Less than normal	1.1	2.4	3.5	4.2	2.6	1.7
Initiation of Breast-feeding.						
% Giving pre-lacteal feed	43.5	73.4	86.9	58.3	97.2	95.5
% Giving breast immediately	35.9	21.9	48.5	0.0	0.0	4.9
If not immediately mean hours to initiation.	25.7	34.0	16.4	46.6	62.2	62.1
% Who breastfeed	98.7	98.0	99.2	95.1	96.6	99.9
Mean months of breastfeeding	16.8	14.0	13.0	21.5	16.4	27.3
Treatment of Illness						
% Who:						
Withdraw breast if child is ill	47.6	41.3	40.0	41.8	34.7	60.5
Purge during diarrhea	11.6	8.3	16.3	2.1	3.4	9.1
Purge at unspecified times -- possibly during diarrhea.	0.0	64.7	36.1	81.1	21.7	27.3
Feeding Children						
% Who:						
Introduce foods before 6 months	72.9	81.5	63.7	43.9	66.3	59.4
(N)	(841)	(853)	(520)	(471)	(507)	(910)

In this presentation we will not examine these issues intensively for every potential nutritional theme. Instead we treat just three problems, and try to look at the state of knowledge concerning the explanations for each practice. We look at breastfeeding among non-rural women (among rural women it is not so great a concern), the feeding of sufficient calories to children at weaning age, and treatment of children during diarrhea.

Parallel analysis could have been undertaken for other behavior domains often chosen by nutrition educators: supplementation of diets of pregnant and lactating women, production and use of vitamin A and protein sources and improved sanitation, among others.

Breastfeeding among non-rural women. Survey after survey reports that when asked why breastfeeding was never instituted or not continued for very long, women reply that they had "insufficient milk". Since physiological inability is rarely found, most investigators find that answer less than full and seek explanations elsewhere. The hypotheses are many:

Ignorance explanations -- women do not understand the relative advantages of breast over bottle.

Medical system explanations -- hospitals interfere with the development of the sucking reflex by rigid and dysfunctional nursery

practices; medical professionals work hand-in-hand with infant formula salespeople.

Marketing system explanations -- women have learned to denigrate breastfeeding as non-modern as the result of advertising campaigns or other social communication processes.

Economic explanations -- women are working out of the home in larger numbers; they are so malnourished themselves that they cannot support their infants.

Social psychological explanations -- urban stress interferes with the letdown reflex; the lack of an extended family eliminates crucial social support and advice.

True preference explanations -- women prefer bottle feeding for reasons of convenience (others can share bottle feeding responsibilities), modesty (city life may be less accepting of public breastfeeding than rural life), fear of loss of attractiveness, or desire to satisfy group norms.

Only some of these explanations are consistent with the data now available, however. For example, surveys consistently find that women know that breastfeeding is better than bottlefeeding. While the true degree of advantage may not be universally understood simple messages about comparative advantage, based on the assumption of ignorance in this area, are not likely to promise much change. Similarly,

elimination of pictures of healthy babies from the labels of evaporated milk cans (as pernicious as those are symbolically) is not likely to have much effect on duration of breastfeeding.

More complex misinformation may still be common. It may be many mothers are in doubt about the quality of their milk and believe that some combination of breast and bottle is ideal. Premature supplementation may, in turn, affect the mother's milk supply and produce the common and then accurate survey explanation for the end of breast feeding, "insufficient milk." (Sanghvi, 1983; Valdivia, 1983).

Existing data are somewhat ambivalent about the role of hospital practices (e.g. separation of newborn and mother, provision of pre-lacteal feeds, delay in initiation of breastfeeding). Winikoff and Baer (1980) cite dozens of studies (but only a few in developing countries) which demonstrate that changes in these hospital practices lead to changes in breastfeeding practice. The Jelliffes (1982) report that rooming-in, as part of the Brazilian National Breast Feeding promotion campaigns, produced higher rates of breastfeeding, at least at the time mothers left the hospital. However it may be difficult to know whether these improvements reflect only the physiological effects of hospital practice. It may be that psychological support by hospital staff for breastfeeding easily read by mothers from changed practice is also important. In opposition to the purely physiological explanation, it appears that among rural women in Vemury's surveys, quite long periods typically elapse before breastfeeding is instituted (from 16-60 hours) and infants are customarily given some pre-lacteal feed

(often sugar water) before being put to the breast. While these practices seem to be even more extreme than those common in hospitals, breastfeeding is successfully introduced and maintained among these rural women for many months. In fact the Jelliffes also note that in Brazil the "common length of breastfeeding in urban areas appears to be about sixteen days" (p. 22), which suggests that for most urban women the end of breastfeeding comes well after leaving the hospital. Hospital practice thus may contribute to breastfeeding failure. It may make the first steps to establishing suckling and the mother's milk supply more difficult. When the mother is then turned out into an environment which does not make breastfeeding easy, the shift to supplemental and then exclusive bottlefeeding may occur more readily. However the improvement of hospital practice in isolation may not produce a great addition to the number of women breastfeeding for long periods of time.

Attacks on the infant formula marketing industry are widespread and a major concern of international conferences. There can be no doubt that particular sales practices work against the best interests of mothers and their children, and that much of formula advertising is morally offensive. What is unclear is how major a force such advertising is in desertion of breastfeeding. Some recent evidence suggests skepticism.

There is the curious report from the Soviet Union, where such marketing is non-existent but breastfeeding declines steadily (Wall Street Journal, 1983).

There is the lack of reports of any substantial halt in breastfeeding decline in some countries where direct marketing activities have been substantially restricted. There is the already mentioned fact that women do not appear to justify the use of formula on the grounds that it is as good for the babies as breastmilk, but rather on the grounds that they had "insufficient milk". None of these are consistent with a claim that formula advertising is a major cause of breastfeeding decline. In any case as the result of the passage of the WHO code, direct advertising of formula to mothers seems to be a thing of the past in at least some countries (Post, 1983). Indirect marketing through health professionals and point-of-sale displays remains common, although Nestle Company, the world's largest formula marketer, has agreed to modify these practices in early 1984.

What is no doubt true -- even tautological -- is the fact that availability of infant formula affects the probability of its use, and that a strategy of restricting formula availability would reduce its use. However whether such restrictions would encourage breastfeeding or reliance on even less useful products, such as evaporated milk or cows' milk, is less obvious.

Another hypothesis -- that breastfeeding decline is the result of women's increasing work roles -- is not consistent with existing findings. Only a very small percentage of women across a large number of studies reported that work demands explained early weaning (Van Esterik and Greiner, 1981).

A substantial theme of current analysis relates the reports of insufficient milk to a victory of urban stress and social dislocation over maternal self-confidence. This explanation is consistent with the sharp urban/rural differences in breastfeeding practice, and with the physiologically unlikely, but widely claimed milk insufficiency.

According to the Jelliffes this assumption underlies the Brazilian breastfeeding campaign, and justifies information campaigns directed both towards mothers directly and towards health professionals so that they are better able to cope with isolated mothers' psychological and information needs.

An alternate view is also consistent with the data, if somewhat less promising for advocates of breastfeeding. It falls in the category of true preference explanations. This view doesn't explain breastfeeding behavior in terms of the confidence levels of individual mothers or their specific knowledge about how to resolve problems which arise. Focussing on individual mothers and their success or failure could be misleading; it may be the case that, within a social network, certain expectations for behavior are generated, perhaps based on what is typical in that group, perhaps on other forces. Those expectations may be communicated clearly to all who hold that network as reference group -- particularly with regard to behavior which bears on the interaction of that network. If, for whatever reason, urban groups tend to disapprove of lengthy breastfeeding, individual mothers can contravene those expectations only at some cost. This hypothesis suggests that the probability of a woman's breastfeeding is best predicted by the breastfeeding behavior of her five best friends.

Evidence in support of this view comes most sharply from the comparison of more and less developed country experience in the past decades.

Sanghvi (1983) makes the point clearly,

At least some of the impetus and confidence among health professionals and policymakers in LDCs to take up the breastfeeding cause comes from this example. With no noticeable mitigation in urban stress, change in family support and networks, or changes in trends toward women working outside the home, and increasing budgets for formula marketing and advertising breastfeeding rates have increased and increased rapidly.

The implications of a group expectation explanation vis a vis an individual confidence and technical skill explanation for the viability of a nutrition education strategy are only somewhat clear. If norms rather than lack of skills are at the heart of the issue then an emphasis on skills transmission is not likely to produce a major increase in breastfeeding. Similarly, campaigns based on the assumption that non-breastfeeding mothers 'really' want to breastfeed, but lack the confidence may only have limited success. Their preferences may in fact be consistent with their behavior.

With regard to what should be done if group norms are predominant, two paths may be productive. From one perspective, the change of group norms is viewed as a long term problem, not likely to be affected by the thirteen-week, multi-channel extravaganza, but more appropriately the subject of a much longer program of persuasive communication. Breastfeeding must become the expected and institutionally supported behavior over the long term, with an understanding that the speed of change in rates of breastfeeding will be only gradual. A second

possible path is a campaign designed to make breastfeeding exempt from the influence of a social network. It may be that more latitude for individual choice is allowed in some types of behaviors than in others. For example, for urban, modern-aspiring women, any behavior required by the modern medical system might be exempt from social sanction. "The doctors say I have to," may justify otherwise unacceptable behavior. This might suggest that a campaign dedicated to making breastfeeding a medically prescribed behavior may permit individual women to choose it. Eventually such changes in individual behavior may reshape social norms.

Obviously, much of this is only speculation, and should be perceived as such. These several explanations may be worthy of further discussion and empirical test. However, what should be recognized is that the model of explanation for breastfeeding decline that one accepts has profound implications for what, if any, strategy for nutrition education one adopts.

Calorie consumption after weaning. There is no question that failure to breastfeed is a major nutritional problem. Its only redeeming characteristic as a nutritional problem is that it tends to skip the very poorest in most countries and, because it is not found among the poorest, children have some chance to struggle back from bottle-caused malnutrition. No such redeeming characteristic can be found for what is probably the largest problem of malnutrition -- failure to obtain an adequate diet among children from six months to four or five years. Moderate to severe malnutrition among these children is found in most

developing countries. The MINR reports suggest that the proportion of six-to-sixty month old children who reach less than 75% weight for age on the Gomez classification varies from 35% to 50%. (INCS, n.d.) The question is: how much of that is remediable given the resources within households?

Affecting this malnutrition involves three activities: recognizing its presence, knowing how to combat it, and being able to take the required action. The first two are subject to nutrition education; the third places a limit on how much change is possible. There is, however, good reason to believe that a fair amount of change can take place before that limit is reached. A wide range of explanations for this type of malnutrition have been proposed. We list each and then describe them in detail, noting their implications for educational interventions.

Explanations include:

- intra-family food distribution trades future growth of children for current energy needs of income-earners.

- Population control results of childhood malnutrition are functional. Reward to intellectual benefits of adequate nutrition are minimal.

- Decline in extended breastfeeding.

- Failure to recognize malnutrition.

-Lack of knowledge as to how to prepare nourishing foods from available sources.

-Renewed pregnancy and lack of time/energy to prepare special foods for weaned child.

-High infection rates and consequent reduced appetites and poor absorption of available nutrients.

Often it is suggested that the income-earning household members are given first preference at eating time. If there is meat or another dense protein/ energy source the income-earners are said to eat their fill with only residual portions left to others. Weaning-age children are given no preference at all. Certainly the Venury survey data reported in Table I are consistent with that conclusion. In Peru, Colombia, Tunisia and Bangladesh, more than half of the household respondents reported giving first preference to the husband, and almost no one reported giving the most valued portion of the meal to the weaning-age child.

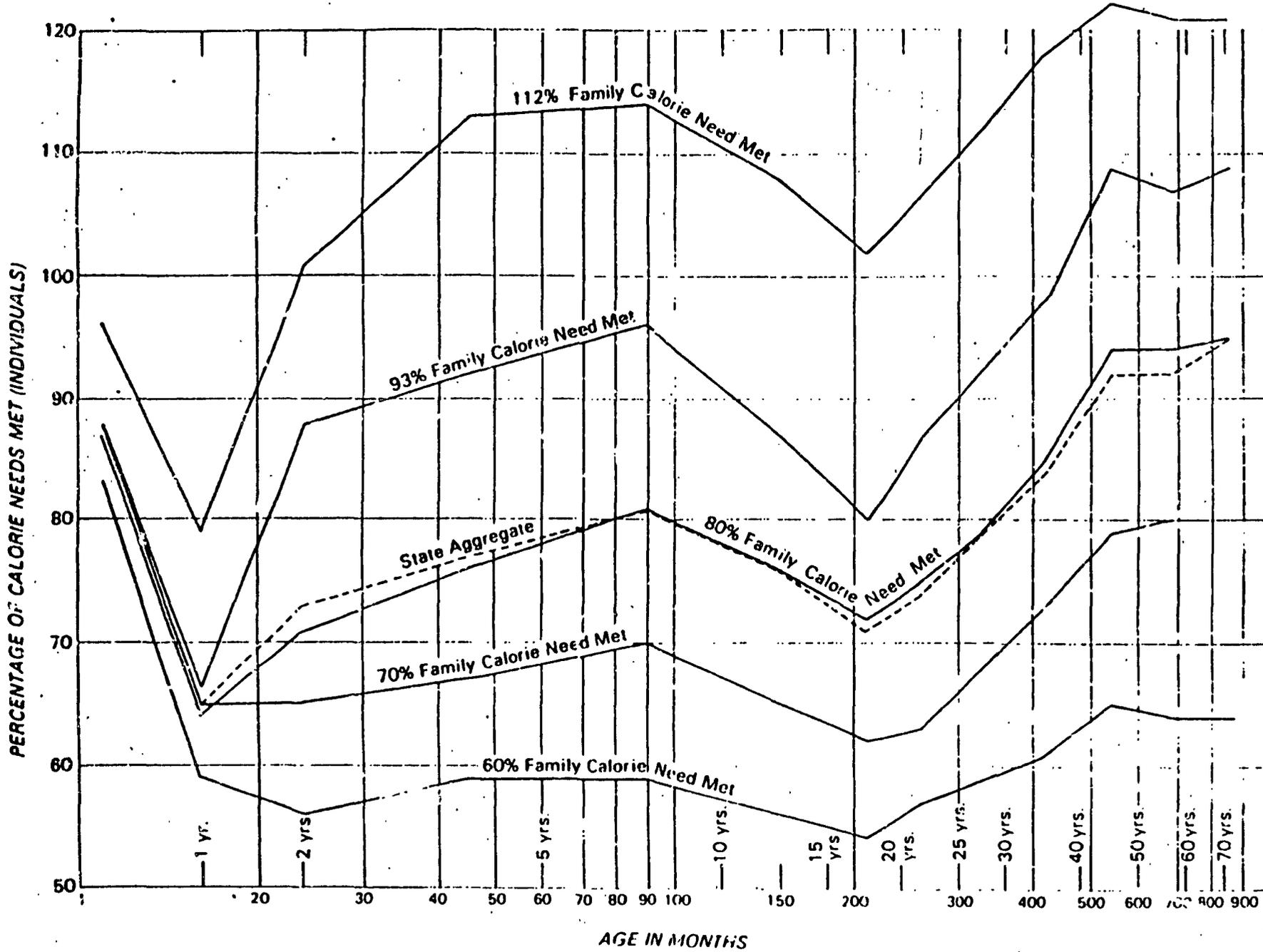
One obvious inference from such a result is that intra-family food distribution follows a reasonable economic logic. Regardless of the long-term consequences for the health and productivity of the weaning-age child, the short-term consequences of depriving the income-earner of energy required to earn that income may be extreme. As obvious an inference as that may be, it turns out not to be consistent with the data.

If a conscious trade-off of current income-earner calories against future child growth is being made, several other statements should be possible. For families whose total energy availability exceeds household requirements, there should be adequate feeding of weaning age children. Also, in energy-deficient families, underfeeding of children ought to occur at all ages up to the point when a child's ability to earn exceeds the marginal cost of providing the child with the additional calories necessary to permit the extra work activity. As noted by Zeitlin and Formacion, the findings of the Tamil Nadu Nutrition Study (Cantor and Associates, 1973) directly contradict both of those statements.

Figure I duplicates the crucial table from that study. It indicates that at one year of age, on the average, all children are ill-fed. Even those children from families with surplus calories available receive less than 60% of their energy requirements. Indeed, only among those families with less than 70% of total necessary calories available to them, is there any apparent equity of food distribution within the family, the equity of borderline starvation. It also appears that the relative inequity disappears quite rapidly by the time a child is three, long before economic productivity can provide an explanation for the larger share being obtained.

The Tamil Nadu data make it clear that income alone does not explain the malnutrition of weaning-age children. While for the poorest of the poor, children and adults fare equally (and poorly), among the relatively better off families dangerous and now inequitable feeding

FIGURE 1 Percentage of Individual Calorie Needs Fulfilled, by Age, for Five Levels of Family Calorie Adequacy.



Reproduced from Cantor Associates, 1977, Page 101.

practices for these children persist.

This evidence presents a strange result. A clearly dysfunctional practice (if child survival and productivity are the desired ends) is maintained without appearing to produce immediate countervailing advantage with regard to the intuitively obvious alternative end, energy supply of the income earner. It suggests that this practice represents poor cultural adaptation -- people failing to obtain all that they can from meagre resources. It promises then a wide-open field for nutrition education. Yet such a conclusion can be accepted only reluctantly. Too many "irrational" practices in other fields have turned out to be sensible adaptations to prevailing economic circumstances. In particular, it would be strange to find such an "irrational" practice common across so many cultures. And, in fact, a number of scholars have suggested that this pattern of feeding has had results which, while painful, have been functional over the long run for societal survival.

Cantor Associates (1973) quotes Klein and his colleagues, "In over simplified terms, death of pre-school children due to malnutrition is de facto the most widely used method of population control" (p. 34). Nutrition policy-planning documents (cf. Knudsen, 1981) customarily make formal consideration of population growth effects part of any calculation of the consequences of a nutrition intervention. Current practices have undeniable results, and the explanation of practices in terms of their results has a strong tradition in functional theories of anthropology and sociology. Scrimshaw states the position most clearly

when she says,

When a certain level of infant mortality is 'expected' or when a child is unwanted, there may be underinvestment in some children that is manifested in their care, their feeding, and the response to their illnesses (1978).

Indirect support for this position may come from Balderston et al's (1981) examination of the data from the INCAP protein supplement experiment in Guatemala and from the economic analyses of Selowsky (1981) and Knudsen (1981). They suggest that some positive benefits of adequate nourishment have been realized only recently. Historically those benefits may not have counterbalanced population control results. The supporting logic follows.

All of these sources argue that the economic benefit of improved intellectual abilities possibly associated with better feeding of pre-school children is dependent on obtaining complementary formal education. In an earlier period of no formal schooling (nor opportunity to make use of the skills that formal education provided), the economic benefit to better nourished children may not have been very large.

The recent work of Lockheed et al (1980) extends this hypothesis. They found large increases in agricultural productivity associated with additional education but only in rapidly changing agricultural environments. In static environments, better and less well educated farmers fared equally. By analogy, if in an earlier period static agriculture was the norm, the return to enhanced intellectual

capacities associated with better nourishment may have been minimal. If so the economic benefits of improved nutrition may not have counterbalanced the population control results.(3)

Nonetheless, even were these explanations (population control and lack of reward for intellectual capacity) credible in defining the historical origins of current practice, they may no longer be useful in some places as explanations for the continuation of current practice. Materialist origins of a practice may disappear, but the residual practice may be maintained. As the environment changes, if it does, and appears to reward intellectual skills and provides alternative paths to population control, the residual behavior legitimately may be seen as maladapted. Perhaps the best evidence that current behavior is not well adapted comes from the studies which show that the dangerous feeding practices outlined in Table I are, in fact, subject to modification through educational intervention. There are several studies which show declines in malnutrition as the result of educational interventions alone -- a result simply inconsistent with a hypothesis that current practice is well adapted. We examine those studies in Part II of this review.

However if these material explanations for current behavior are inadequate, it is necessary to turn to alternative explanations. Some, but not all of these alternative explanations will suggest some potential roles for nutrition education.

Given the current decline in breastfeeding, might it be that a significant portion of weaning time malnutrition is the result of the failure to replace breastmilk with equivalent foods? This is simply not consistent with the data. Most malnutrition occurs after six months, and at that time is more rather than less likely to be found among children who still depend on breastmilk. One of the major problems associated with post-six-month malnutrition is the failure to supplement breastmilk with solid foods, and not the failure to maintain breastfeeding.

There are other possible explanations for the underfeeding of children. It appears that to some degree parents cannot recognize malnutrition, particularly when it involves weight-for-age. In Zaire 10% of a sample of mothers reported their children malnourished whereas 32 to 47% actually were malnourished (INCS:Zaire, n.d.). Zeitlin and Formacion describe a similar finding in the Philippines, where nearly 3/5 of the mothers of children suffering second- and third-degree malnutrition thought "their babies were growing and developing well" (p. 69). This is not a surprising finding, given Zeitlin and Formacion's conclusion, "the average malnourished child in the six- to twenty-four- month-age range cannot be identified without a weighing scale" (p. 68). If malnourishment is as widespread as the statistics suggest, the commonness of low weight-for-age is likely to lead parents to the conclusion that their children are at the norm.

It is possible that some portion of the failure to recognize malnutrition is in fact an unwillingness to admit, publicly, that one's

child is malnourished, especially if it is the case that resources are unavailable to do anything to remedy the problem. However, for the moment it will be reasonable to assume that recognition of malnutrition is not something that is currently accomplished. Children between 60 and 75% weight-for-age make up the bulk of seriously malnourished populations, and they may simply escape notice, despite the significant probability of long term effects on productivity (cf. Selowsky: 1981, Knudson: 1981) and on health and susceptibility to disease (Rosenberg, 1976 as quoted in Baiderston et al, 1981, Berg, 1981).

It may be that whatever the origin of poor feeding of weaning age children, a major block to current improvement of their nutritional status is lack of knowledge about how to prepare appropriate foods. Nutritionally adequate adult foods may be seen as too harsh for weaning foods and thus are withheld, but customarily used paps may lack nutritional quality -- particularly energy density. Methods of making paps nutritionally adequate or adult foods more digestible may be unknown. However failure to to prepare special foods may not be the result of inadequate knowledge alone -- a point incorporated in an explanation for malnutrition offered by Gretel Peltó (1983).

She notes that the six-to-twelve month post-birth period coincident with much malnourishment is often a time of renewed pregnancy with its sometimes debilitating side effects for a mother. Obviously this is a less than ideal moment for an infant to be demanding more of a mother's time by beginning to require specially prepared food in addition to the breast.

Another major explanation for considerable malnutrition among 6-24 month old children may not turn on underfeeding at all (cf. Chen and Scrimshaw, [ed.] 1983). Six months is the age of the onset of greater mobility and at least partial weaning of the infant from the breast. It is a time of extraordinary increase in exposure to infection. The large number of diarrheal episodes and other infections are accompanied by loss of appetite and other stress which may contribute to growth retardation. Replacing the protein and energy lost through the diarrhea, through the accompanying loss of absorptive capacity and anorexia, and stress-related protein loss means that the actual protein and energy requirements for small children will be much greater than FAO (1974) requirements. In evaluating a recent study in Indonesia, Zeitlin (1984) followed the recommendation of N. Scrimshaw and estimated that 6-24 month old children require 50% additional protein, and infants 0-6 months old require 30% additional protein above the FAO estimates in order to counteract the effects of infection. The transfer of energy and protein resources from the rest of the family in order to satisfy the growth needs of the weaning age child may need to be considerably greater than standard nutrient requirement tables would suggest.

This analysis suggests that the apparent undersupply of calories presented in the Tamil Nadu figure tells only part of the story, and that the actual percentage of necessary calories received by children in this age group is less than the 60-70% reported there. It supports the conclusion from the INCAP experiments suggesting that consumption of a full share of calories by children reduced growth retardation only

by one-third, with the rest associated with morbidity and other factors independently of energy consumption (Martorell, Habicht and Klein, 1982; Martorell, 1984).

We are left with a series of explanations for weaning age malnutrition. Part of it is explained by lack of income and poor intra-family food distribution. Part of it may be the reflection (or the residual) of societal level functions (like population control, and the lack of rewards for having rapidly growing children). If in a particular environment, these adaptations are no longer necessary, nutrition education may be appropriate in correcting residual practice. Part of it reflects anorexia associated with morbidity -- a subject to be looked at for the potential for educational intervention in the next section.

Finally there is the explanation which is the combination of the failure to recognize mild and moderate malnutrition, the lack of knowledge about suitable weaning foods and the shortage of time and energy in the family to give special attention to the needs of the weaning child. All three of these may be subject to nutrition education, although if time committed to the 6-24 month old is to be increased education may face a difficult path.

In sum what does all of this say about the potential for nutrition education with regard to infant feeding practice? Nutrition education is unlikely to be a complete solution in many contexts where income and time are particularly short. In other contexts, however, better

practice will be consistent with available resources and subject to educational interventions.

Treatment of diarrheal episodes. The third area we have chosen to examine is nutritional treatment during episodes of diarrhea. Diarrheal episodes are frequent and a major cause of malnutrition and death among children. Whether or not much can be done about incidence of diarrhea is not at issue here, although some may argue that educational interventions are potentially worthwhile. Immediate concern is with the nutritional consequences of diarrheal episodes and the potential for reducing those consequences through educational intervention. Three obvious points of intervention are worth consideration. They include: treatment of dehydration through administration of oral rehydration therapy (ORT), avoidance of deleterious practices (like purging or withdrawal of breastmilk) and positive efforts to encourage feeding in the presence of poor appetite.

The potential for education in the first of these, ORT, is by far the strongest. There is widespread medical belief that ORT is efficacious if administered; it is within the resources of almost all (particularly if a sugar/salt solution is being advocated); it is widely unknown but its preparation and administration represent a skill which can be mastered. When offered, it finds an audience of mothers who are often capable of recognizing signs of dehydration, are seeking remedies for the diarrhea they recognize as threatening to their children, and are willing to purchase even expensive treatments from pharmacies and traditional healers. (Smith, et al., 1980)

Yet there are problems too. Home-mixed ORT fluid risks toxicity if it is badly mixed, with incorrect proportions of sugar and salt or too little liquid; the latter is also a risk with packaged mixes. It has to be administered slowly, in substantial quantity, over a long period. It does not reduce but may appear to exacerbate the symptoms of diarrhea that the mother may perceive as her primary concern. While effective in the long run and at an aggregate community level, the odds that a particular treatment of diarrhea with ORT will save a life are quite small since the proportion of episodes of diarrhea which lead to death is quite small. All of these problems, while they do not negate the potential for an educational intervention, may make the task of achieving effective practice change much more difficult.

The second major point of entry is in education concerning the avoidance of deleterious practices. Most attention is given to purging as a method for treating diarrhea with its exacerbation of dehydration, and to the withdrawal of food including breastmilk during episodes, particularly if the diarrhea is accompanied by vomiting. The natural logic of both of these actions is clear, purges because they "clean the system out", and withdrawal of food and liquid because they give the digestive system a rest and reduce the diarrhea. Yet both, according to current medical opinion, are pernicious and need to be eliminated.

However, before major educational efforts are mounted, it may be worth establishing that the negative practices are in fact widespread. There is substantial ambiguity as to whether they are. Vemury found in his six country CARE survey that purging was common in general, but rare

during episodes of diarrhea. Similarly few mothers in those surveys reported withdrawal of the breast during episodes of diarrhea (Table 1). In contrast, in Honduras, Foote et al (1983) found that close to 70% of a rural sample would name a specific purgative when asked how they treated a child's most recent instance of diarrhea, and 66% reported they withheld the breast. It may be that this contradiction is merely the result of cultural differences between Honduras and the countries Vemury surveyed. However differences in the way questions were asked is a more likely explanation. If the Vemury results can be believed and generalized, a great deal of education may not be necessary on these topics. In contrast, if Foote's results are accepted in a particular context, they may justify a major educational effort.

The third point of educational entry is the taking of positive steps to insure that children suffering from diarrhea take as much nourishment as possible. Failure to feed may be the result of deliberate withholding of the breast or other foods. More commonly, underfeeding may be the result of disinterest in eating on the part of the sick child. Usual feeding practices may need to be modified, including smaller feedings at more frequent intervals and the offering of specially prepared foods. Oral rehydration therapy may have a positive effect on the child's appetite as well. The degree of interaction between diarrhea (and vomiting, when it occurs), reduced appetite, parental unwillingness to feed a child (sometimes supported by medical advice), efficacy of alternative feeding practices and parental knowledge of them, time to feed a sick child effectively, and complementary effects of rehydration is likely to be large. Obviously

educational interventions have potential only insofar as reduced appetite is not an absolute constraint, and families can reallocate time to the feeding of these children. Despite the magnitude of this problem, and some efforts to address it as part of a broader program, little detailed evidence has been reported.

The potential for beneficial change in child feeding practices during diarrheal episodes may be real and subject to education. However the lack of codified project experience makes further discussion in this review quite limited. Arguments in favor of educational potential rely on their surface logic. Stronger statements await evidence of what determines feeding practice during illness. This exploration of potential for nutrition education is perhaps less definitive than one might hope. Partly that is the result of thin research; partly it reflects the difficulty of cross-cultural generalization. That which may be open to education in one culture may be closed to it in others. However those considerations do not deny all potential for nutrition education. In the end the best evidence for potential turns out to be the successful realization of an educational program. If one was able to change nutritional status through nutrition education then there must have been the potential to do so. It is to the evidence from such realizations that we turn now.

PART TWO : ON THE POSSIBILITY OF DOING NUTRITION EDUCATION

Nutrition education is a common activity. Ninety-one percent of the 201 nutrition programs in 66 countries surveyed by the Harvard Institute for International Development (1978) reported undertaking some type of nutrition education. Even so, most nutrition education is likely to have been missed by that extensive survey since it tended to concentrate on discrete nutrition projects; likely it would have skipped the largest volume of nutrition education which is undertaken as a routine activity of health workers.

Available description and evaluation of nutrition education activity is, however, rarer than is its practice. Also, there is a likely inverse relation between the commonness of a type of nutrition education and the possibility of finding descriptions or evaluations of it. Not surprisingly, evaluations focus on novel, often small scale efforts and largely ignore ongoing routine activity. This may be a reflection of a belief that such ongoing activity has no important effects, or it may be a reflection of the nature of evaluation funding arrangements which support a discrete project focus. Thus we have a fair number of evaluations and descriptions of media-using projects, and some for projects that try to do face-to-face education in a

special way, but essentially none for the routine education undertaken by health services.

This lack is a substantial concern. There are now a reasonable number of evaluations which provide credible evidence for positive effects of nutrition education on nutritional status. What is lacking is evidence about the feasibility of reproducing that positive result routinely and on a large scale. Information about the strains of operating routine, large scale programs, now, would have helped.

A full description of conventional nutrition education also would have helped to organize the review of experience that follows. Ideally one would have described the operation of the current typical system and then pointed out its flaws. Then those flaws -- the failures of the conventional approach -- would have served as a way of organizing the presentation of alternative strategies, each described in terms of the problem in the conventional system it was trying to solve. Indeed that approach is so attractive that we will create a conventional system by supposition, and then point out its likely problems. One can only hope that the 'straw' system so supposed does not overly distort actual practice, or at least that its productivity as a convenient stereotype justifies its use.

A Hypothetical Conventional System and its Flaws

In this system nutrition education takes place essentially within the walls of a health clinic. Mothers bring their children for curative services but on the walls are posters encouraging breastfeeding and immunizations (and a blank space where the poster supplied by the infant formula company used to be.) Professional health staff are expected to provide general health and nutrition education in response to problems that individual mothers present. The mother of a malnourished child is counseled to provide more food to that child during the few minutes that the professional is examining the child. The professional supplies other advice as he or she has time and believes it to be appropriate for particular mothers. It is drawn from the few days of classes concerning nutrition education received during medical training. Little follow-up as to the implementation of the education is undertaken. Little change in nutritional status is achieved.

The result is ineffective nutrition education, but what are the specific problems that need remedy? The list includes audience reach and time of exposure to education, quality and systematicity of education, reinforcement of messages, lack of complementary environmental change, lack of incentives for professionals, and cost.

Reach. By depending on a clinic-visiting population a nutrition education system may reach only a small proportion of the population, A

large number of people, including many of the most malnourished, may not be served by those clinics and many of those that are served may attend only irregularly. In addition, the few minutes of a professional's time in the clinic is unlikely to be enough to provide new skills even were it to have any influence on knowledge.

Quality and systematicity of education. Haphazard instruction, based on long-ago training, by professionals whose qualifications are as care providers not as educators is unlikely to prove effective. Content may not build on what others already know and do or it may advocate practices that their socio-economic circumstances do not allow them to undertake. Teaching may ignore the need to practice newly learned skills or may lack concrete recommendations.

Reinforcement of messages. Information about appropriate nutrition-related practice comes from many sources other than the clinic professional: from one's family and neighbors, from radio advertisements and from retail displays and shopkeepers. Education derived from the clinic professional at a given visit may have a limited consequence if contradictory messages are coming from other sources in the environment.

Lack of complementary environmental change. While sometimes it may be possible to affect nutritional status by education alone, that may not always be the case. In recognition of this, many programs combine education with 'real' changes such as food supplementation. Similarly, even if an educator's recommendation would be effective if adopted, it

may be necessary to combine education with other, more demanded services, if an audience is to be convinced to expose itself to the education. (That is the reason why education is so often delivered in the context of curative health services, which bring in the audiences.)

Incentives. In the first three weeks in the field, after a sufficiently enthusiastic set of lectures on the utility of nutrition education, the health worker may initiate improved nutrition education. Yet the health clinic provides few incentives to maintain that enthusiasm -- demands for time in curative medicine will be large, and nutrition education is just an add-on demand. No one will be coming around and checking on the hours of nutrition education delivered, or providing advice on how best to do it. No salary increments accrue for success in this area. It would be no surprise to see that most health workers find it difficult to maintain enthusiasm in that context.

Costs. Using highly trained health professionals for some nutrition education activities can be a very expensive use of time. Weighing and measuring children so as to teach mothers to recognize malnutrition, providing instruction in food preparation, and other mainstays of nutrition education curricula are not necessarily better done by professionals than by less highly trained personnel. The haphazardness of nutrition education in the clinic setting may itself be a reflection of the cost of reallocating expensive professional time to a task for which their training is not suitable. Any attempts to extend the reach of nutrition education or increase the time of exposure face the major obstacle of financing.

Solving Problems of the Conventional Model: Past Experience

We next turn to specific projects which have attempted to redress one of more of these failures. Descriptions of individual projects are presented as illustrations of the way they address a given problem. Many projects, of course, fit as potential solutions to more than one failure; these are described at the place in the narrative where they provide most insight. Some projects which serve parallel functions to others are not described fully to avoid redundancy.

Audience Reach and Time of Exposure

If much of the malnourished population lies outside the reach of the formal health care system, clinic-based nutrition education cannot touch them. Attempts to extend the reach of the nutrition education effort follow several strategies, sometimes in combination. They include sending outreach workers to the homes of potential clients, using mass media, and adding additional incentives for people to come to clinics -- often by distributing subsidized food.

Outreach programs. If the clients won't come to the clinic, then the clinic must reach out to the clients. The Promotora Program in Candelaria in Colombia is a representative example of the attempt to reach out from the clinic to the malnourished population. Ten young women with a minimum of five years of education were given six months

The reports of three of these projects (Hanover, Candelaria and Thailand) provide some evidence of positive effect on nutritional status and other outcome variables, although inevitably inferences are equivocal. The strongest result comes from the Hanover project, where the decline in second- and third-degree malnutrition was between 40-50% after a year of activity.

The Candelaria project evaluation provides positive short term results and ambiguous longer term evidence. The presence of the project coincided with a 25% drop in all malnutrition in the community between 1968 and 1974, despite relatively high turnover among participating families. Longer enrollment in the program was associated with even larger drops in malnutrition rates. The gains in nutritional status occurred despite erosion of family income during the period, and may have been related primarily to a reduction in incidence of diarrhea. All of this was certainly positive evidence. However, a two year follow-up study of effects struck a note of caution. The project itself had been terminated in 1974 and researchers returned in 1976 to investigate the residual effects of the program. They found that children born after the end of the program into families which had participated were no better off than children in families which had not participated. Older children seemed to show some residual effect of their participation in the program.

The Thailand project showed a substantial drop (from 22% to 9% over six months) in second- and third-degree malnutrition in one town in which nutrition surveillance and nutrition education activities were carried

out by village workers and much smaller drops in control towns and in towns where only nutrition surveillance had taken place. The study is described only briefly and possible threats to this inference (changes in measurement quality, other simultaneous activities) are not fully considered. However the results are consistent with the Hanover and Candelaria results.

The costs of realizing these projects are not provided in the relevant sources. However, they obviously vary with the use of volunteers or paid staff, the amount of training and supervision provided by health professionals, the intensity of surveillance and education actually undertaken, the focus on vulnerable segments of the audience or on all its members and the physical concentration of the families to be reached. As a solution to the problem of audience reach they must be regarded as a potential strategy, but subject to important real world limitations.

At the rate of 18 malnourished children per paid health worker, the standard from the Jamaica project, the absolute budgetary requirement can be huge, particularly in those poor countries where the malnourishment problem is largest and national budgets smallest. Even in projects like the Candelaria activity, which depended on infrequent home visits of volunteer workers, the budgetary requirements may be substantial. A volunteer-based program assumes an in-place health service infrastructure which provides both training of the volunteers and most of the necessary health care. In many countries available services are at a great distance from much of the population; in

Zaire, for example, only 25% of the population has access to the formal health care system (INCS: Zaire, 1981). There are too few health clinics from which outreach workers can reach out. Volunteer workers may also tend to turn over with some rapidity, with major cost implications for training and supervision activities.

Budgetary limits on the expansion of these outreach programs will be substantial. Nonetheless some countries may be willing to pay their cost if sufficient reduction in malnourishment can be achieved.

However there is a second type of limitation that may be even more difficult to eliminate. Both the Hanover project and the Candelaria project were attempts by outside agencies to focus highly paid energies on the development of pilot activity. Hanover relied on help from the University of the West Indies and from Cornell University Medical School. Candelaria was the field site for a number of projects from the Universidad del Valle in Cali, including a rural health teaching center. When that first novelty dissipates and it becomes time for the creation of a national, long term, routine program based on these models, they can no longer depend on that special energy. They must depend instead on internal incentives to operate effectively. We do not have evidence of effectiveness from such 'real' programs. However a comment from the authors of the Thai study is revealing in this context.

During recent years the Royal Thai Government's Ministry of Public Health has initiated many new programs to deal with infant and pre-school nutrition. These programs include: supplemental feeding programs...establishing child nutrition centers; nutrition education for mothers...promotion of breastfeeding; training in nutrition for village health volunteers and village health communicators; and limited

nutrition surveillance. However a comparison of 1977 malnutrition data with 1980 age/weight data indicates no progress has been made. (Viravaidhya et al, p. 1)

These activities, or a subset of them (surveillance and weighing), were the same activities that were undertaken in the experimental study whose positive results have already been presented. The essential difference between what had been done in the past without effect and what was being done in the evaluated project seems to have been the level of supervision and presence of the investigators from the central Ministry of Health. The contrast may suggest the difficulty of transferring an activity which can be done successfully on a small scale to a large scale national program.

One other project, the World Bank Indonesia Nutrition Education program, has much in common with these programs, and shows similar success. However it will contribute more at a later point in the narrative, and thus its presentation is delayed.

If financial and logistical obstacles constrain the possibility of solving problems of reach through outreach strategies, there are other approaches worth considering. The largest number of them make use of mass media.

Mass media alone. The magic multiplier, as advocates are fond of calling the mass media, has often seemed the ideal way of solving the immense problems of reaching large audiences. In the face-to-face outreach

system, each additional client costs the central government about as much to serve as does each previous client. In a mass-media-only system, the marginal cost to the government can be close to zero for each client after the first. Additional costs are funded directly by the client in the purchase price and energy expenditure on the privately owned radio.

Media-based nutrition education projects are legion. Of the the survey of nutrition projects previously cited (H.I.I.D., 1978), more than 25% of all projects reported using radio or television as channels for education. Thus media-based projects are common and, in some cases, evaluations of them are also available. However, not one of those evaluations makes a convincing case for the effectiveness of media in changing nutritional status. Sometimes that is because the evidence shows no effects. More often it reflects the lack of adequate evidence to make a confident judgement. It may be that results of the Mass Media Health Practices projects in Honduras and The Gambia discussed subsequently will provide such evidence, but they are not yet available. What the evaluations do provide is data relevant to determining the effectiveness of media-based education systems in solving some of the hypothetical failures of conventional systems, including evidence about reach.

From the very first efforts at using mass media for nutrition education, it was clear that audiences could be reached, if reach is taken to mean gaining attention. An early evaluated effort at media-based nutrition education occurred in the Republic of Korea in

1970 under CARE sponsorship. A year long campaign, it included twice daily radio spots and a calendar and a comic book which were produced and distributed. The main focus of the campaign was on the achievement of a balanced diet, and subsequently on the use of solid weaning foods for children more than 100 days old. The evaluation was limited to a post-campaign survey of a sample of unspecified origin, and essentially contains no useful information about effectiveness. It does suggest that the campaign gained the attention of much of the population with close to 90% of both urban and rural persons surveyed demonstrating some awareness of the existence of campaign materials. Memory of specific campaign messages was rather less (20% to 50%) and limited primarily to younger, well-educated middle class respondents (Higgins and Montague, 1972).

Similar evidence of effectiveness of reach comes from another CARE sponsored campaign -- this time over a ten week period -- in India. Multiple channels were used in this 1972 project in Uttar Pradesh and Andhra Pradesh, and its evaluation described large changes in the areas of knowledge related to weaning food practice (an increase of 59% knowledgeable before to 93% after the survey) and in general nutrition knowledge (72 to 96%) (Care, 1973; Rasmuson, 1977). Both sampling procedures and methods of questioning may have created some bias in these results, but the effectiveness of the intensive media campaign in reaching an audience is probably credible.

Additional evidence of the reach of nutrition education broadcasting comes from reports about a different use of radio, that represented by

programs in Sri Lanka, in Costa Rica and in Haiti. In all three countries government agencies developed ten- to twenty-minute health information programs relying on entertainment broadcasting formats. In each case, the radio dramas (Pahan Siluwa and Kan Kanda Theivam) of Sri Lanka, and the programs of dialogue with a knowledgeable person of Costa Rica (Platicas con Don Rafael) and Haiti (Radio Doctor) were skillfully produced programs which apparently reached wide audiences. Exact reach was never estimated for any of them in a formal survey, but on the basis of either small surveys or on the basis of the sheer volume of letters and postcards received, the assumption of large audiences is credible. However no useful information about what was learned from (never mind changes in practice or nutritional status produced by) these programs is available (Burke, et al., 1980; Clearinghouse for Development Communication, 1980).

Until quite recently, the most sophisticated efforts using mass media were three projects conducted by Richard K. Manoff International, Inc. Manoff is a U.S. advertising firm which argued that it could apply Madison Avenue advertising techniques to the change of nutrition-related behavior in developing countries. Under contract with the U.S. Agency for International Development, Manoff developed projects in Ecuador (Manoff International, n.d.) and in Nicaragua and the Philippines (Cooke and Romweber, 1977; Zeitlin and Formacion, 1981). They prepared and arranged the broadcast of commercial spots recommending a particular nutrition behavior. Each series was repeatedly broadcast, (up to 10 times per day) over as long as a twelve month period. The themes covered depended on local conditions -- in

Ecuador, they included promotion of the use of iodized salt and of boiled water; in the Philippines, the campaign focussed on the early use of weaning foods and their supplementation with oil, fish and vegetables; in Nicaragua, the project encouraged families to combat dehydration through the use of an oral rehydration formula called superlimonada.

The intensive broadcasts of well produced spots clearly attracted a large audience. In the Philippines up to 75% of the audience reported awareness of radio messages, and up to 65% of the audience reported similar awareness in Nicaragua. Some evidence of knowledge and attitude change was found in all three countries. Behavior changes related to nutritional status were not so conclusively demonstrated.

In Ecuador, iodized salt replaced refined salt without iodine to a substantial degree, but no change in other recommended behaviors was apparent. In the Philippines, where the objective was to increase energy consumption at weaning time, self-reported changes in behavior did occur. For example, about one-fourth of the sample reported adding oil to lugaw, a local weaning food, after the campaign, while none had reported doing so beforehand. We will leave aside issues of the validity of self-reports of behavior which respondents knew was the 'right' behavior according to radio broadcasts. Even taken at face value, the behavior change actually reported (in terms of number of calories added to weaning food) was very small in comparison to actual deficit, even among those who were classified as adopters. Again, in Nicaragua, while there was self-reported increase in the use of the

recommended rehydration formula, evidence that it was used in sufficient quantities to affect dehydration and its consequences is lacking.

In their very full review of the Manoff Philippines project, Zeitlin and Formacion take the position that the failure to affect nutritional status was not a failure of the radio strategy per se. They suggest that if messages had been adjusted to reflect circumstances in the rural areas more closely (by recommending that oil be added to other foods than lugaw which were more commonly given to children) the program might have been effective. The need for a closer and continuing tie between producer and client so that mid-project adjustments are feasible is an issue we will take up in a subsequent section. It may be seen as the major change between these Manoff projects and the Mass Media Health Practices Project and the Manoff-implemented Indonesia project.

Large audiences may well be achieved by media alone projects. (Further supporting data come from projects in Honduras and The Gambia and the Dr. Hakim project from Tunisia (Smith, 1979)). However broadcasting does not always guarantee attention, particularly in a context where there are other competing messages. While reports of programs which failed to reach an audience tend not to appear in publicly available reports, there are some such reports available.

The Satellite Instructional Television Experiment in India, among its other efforts, tried to present nutrition education on some of its

evening broadcasts. The only available evaluation of it suggested that the audience was so small as to make evaluation of effectiveness pointless. Only 29 out of 200 women and 7 out of 289 women in sample villages viewed the telecasts whose effects the evaluators wished to estimate. A variety of explanations for the failure to view were offered (language, motivation, alternative tasks to complete, poor quality programming) but the point that an available audience does not guarantee an attending audience is clearly made (Ramadasurthy et al, 1978). Relatively small audiences have also been described for a Brazilian nutrition education program using radio and for a two-week radio campaign in Lesotho (Leslie, 1977). In another context, the Feeling Good television series, the major recent effort in the United States to provide health and nutrition education via the mass media, failed to grasp an audience altogether, even by the minimal standards of the Public Broadcasting System, and was cancelled rapidly.

There is one frequently raised objection to the assumption that radio broadcasts can reach effectively much of the rural population. Radio ownership is not universal, nor are the funds to keep radios working. In addition ownership is least likely among the poorest segment of the population who are also most likely to be subject to malnutrition.

Three responses to this objection may be offered. First, radio ownership, particularly in Latin America and much of Asia, is still more widespread than is access to health systems. Radio ownership in rural areas is typically around 50% of all households with some variation (cf. Shore in McAnany, 1980). In countries with shortwave

rather than medium wave (AM) broadcasts to rural areas, coverage may be somewhat less. (In Nepal, for example, about 10% of all families had radios [Mayo, et al., 1975].)

Secondly, there is likely to be substantial access to radio among non-owners. They may have the opportunity to listen to radios in public places or in owners' houses. (Thus only 48% owned radios but 75% respondents reported awareness of radio messages in the Manoff Philippines study.) Finally, even those who may not have an opportunity to hear messages directly are likely to hear them second hand from listeners.

Perhaps the largest single obstacle to access to radio broadcasts is not ownership of receivers, or even the cost of batteries to keep them running, but rather problems of language. In India, in much of Africa, and in the indigenously populated regions of Central and South America, where many languages are spoken, even moderate efforts at multi-lingual programming may miss large numbers of people. That may be exacerbated when women are the primary audience for broadcasts since they may be less likely than men to understand outside languages.

Another factor which may complicate easy reach of target audiences through radio is the tendency, in some cultures, for one member of the family to control use of household radios. For example, O'Sullivan (1980) reports that in Guatemala men often take radios with them to the fields during the workday.

Another problem may be the competition for the listener's attention from multiple radio stations. This is particularly severe in Latin America where the commercial character of the radio system has meant an extraordinary proliferation of radio stations (cf. Lee, 1980), and in border areas of countries whose neighbors have strong transmitters, as is the case with the Indian state of Tamil Nadu and nearby Sri Lanka broadcasts (Green, 1983), and with southern Nepal and All-India Radio (Mayo, et al, 1975).

Attention is also threatened when nationally funded radio programs are restricted to donated time from private stations, or assigned time on government-owned stations. It may turn out to be difficult to obtain much listener attention if the assigned times and frequencies are not convenient for or popular with target audiences.

There are, then, limitations to radio broadcasts (and other mass media activities) as a solution to reach-related problems, but it is possible to reach a large segment of even rural audiences through radio broadcasts. By and large, the obstacles to achieving audience attention (including radio distribution, language, time of day, competition from other stations, and poor quality programming) can be dealt with, although sometimes at a high cost. The major doubt is whether attention so purchased turns into behavior change and nutritional status change. We are, at present, without evidence that it does.

We can summarize what has been suggested thus far about the reach issue in a paragraph. Face-to-face outreach strategies promise effectiveness, at least on a pilot basis, but may be expensive and logistically difficult if expanded. They show effectiveness but not reach. Radio broadcasts, in contrast, promise reach but have not, up until now, shown the ability to produce nutritional status change. Media broadcasts and outreach from the clinics to the homes of potential clients are both strategies for extending the audience for nutrition education beyond the walls of the clinic. A third strategy is to expand the number of people who come regularly to a central location where they become an audience for education. Food supplementation programs have been the obvious opportunity for such expansion, and, indeed, next to the haphazard education offered in clinics, they are probably the most common location for nutrition education activity. However, rather than looking at those programs as an intervention to expand reach, we will hold off on their review until we come to the section on strategies for providing complementary environmental change.

Quality and Systematicity of Education

A fundamental misperception that plagues the design of many educational programs is the confusion between educational channel and educational effectiveness. While no nutrition educator (or any other sort of educator) would admit that the curriculum was less important than putting the channel in operation, that is how most programs operate de

facto. Curriculum development may be a side issue. Funds spent on prior investigation of the issue being addressed, on the shaping and pretesting of the messages to be offered, on the training, retraining and supervision of field workers and on maintenance research to permit constant adjustment of messages based on audience response are minimal in most projects. It is true that without reach effectiveness is irrelevant, but the reverse is no less the case.

While it would be foolish to suggest that none of these educational development activities have gone on in previous projects, two recent nutrition education projects provide a quantum leap with regard to these efforts. One of the projects, the Indonesian Nutrition Education program, relied primarily on village volunteers to carry its messages; the second, the Mass Media Health Practices project relied primarily on radio.

Indonesian Nutrition Education. This World Bank funded program built on a pre-existing base of village volunteers in nutrition (kaders) who were already weighing children and giving nutritional advice. The primary activities of the program were to build up the quality and intensity of nutrition education offered by these kaders, and in addition to develop and transmit brief radio programs and posters supporting these activities (Griffiths, et al, V. I,II, 1982).

The specific activities undertaken (through the collaboration of Manoff International and the Department of Health in Indonesia) began with approximately nine months of developmental investigation including

preparation and pretesting of radio messages, and continued with the training of the kaders, usually through a first training course and a refresher course during the year of the program.

The developmental investigation included meetings with community members and leaders, and, of most importance, 330 household interviews/case studies. Specially trained interviewer-investigators spent up to two weeks in each village working with ten mothers. In a two-to-three hour session with each one, they would explore a variety of possibly relevant educational themes. The interviewers would recommend a trial change in dietary practice: a recipe for weaning food or an addition to the mother's diet. The interviewer would then check on the feasibility of the proposed change in dietary practice after a few days of trial by the mother. Guidelines for what interviewers were to learn from each interview were clear but allowed flexibility with regard to question strategy. The investigators report that the information so collected was used extensively in the design of educational messages. Radio messages were developed and pretested with a sample of the mothers, and again modifications in language and format were incorporated as a result.

The specific training curricula for kaders is not extensively described, but incorporated a two stage process in which regional leaders were trained and then these leaders trained local kaders. An action poster was given to each mother which would allow her to note her compliance with a particular recommendation from the kader. Apparently the training served as substantial motivation for the

kaders. The kaders who received it reported spending about twice as much time per month in this activity (13 hours versus 7 hours) as did kaders who were not trained. The spent the extra time mostly in supplementing monthly weighings with home visits.

The results of this focused nutrition education effort were impressive. Samples were drawn from the districts receiving the intensive nutrition education (NE) treatment after the program had operated for one year, and from similar control communities which had nutrition volunteers who had not had the intensive training. There were significant differences in favor of the NE households on many variables including energy consumption and, of most importance, weight-for-age after five months.

None of the families in either experimental or control communities had significant access to supplemental food. It appears that exposure to radio messages was overall less frequent than had been expected (largely because of dependence on donated broadcast time), and in any case spilled over into control areas. They could not have produced the experimental group's advantage, although they might have reinforced the kaders' motivation or knowledge, or reinforced for the mother the message she was already receiving from the kader. It is not possible to disentangle the effects of the remaining common elements of the NE strategy, including motivation of the kaders, quantity and quality of advice the kaders gave, action posters and weighing and use of growth charts.

The Indonesian Nutrition project was essentially a curriculum and volunteer training project. Its success speaks to the value of doing education with care, rather than merely doing education. The essential incremental costs of this add on project were of two types, the developmental effort and the extra training and kader maintenance activities. The developmental effort is largely a capital cost (although as the project continues beyond one year, elements of it may need redoing to keep the activity on track), and can be divided among all recipients in a relatively homogenous area. The area of the NE project included about 50,000 children, and 2000 kaders. The largest ongoing cost is training of new kaders and refresher activities for continuing kaders. Obviously the dropout rates for kaders is a crucial determinant of ongoing costs.

The major question to be raised about the project is the same as that raised about all outreach programs. High dropout rates among kaders plagued the previous version of this program. While during the experimental year dropout was not a significant problem, whether that would continue to be true in subsequent years and if the program expanded beyond its immediate borders is an unknown. The importance of enthusiastic Indonesian leadership and foreign consultants cannot be underestimated in novel programs of this sort. Routine larger scale expansion in time and geography may suffer without those advantages. Also the possibility of replication outside of Indonesia's borders, where volunteers willing to commit 13 hours per month may be more difficult to find, is an open issue.

Mass Media Health Practices. This second project whose major innovation is in instructional design is being implemented by the Academy for Educational Development (Under U.S. Agency for International Development funding) with the Governments of Honduras and The Gambia (Smith et al, 1980). As with the Indonesian project, the most impressive aspect of the Mass Media Health Practices (MMHP) program is the amount of pre-planning investigation that went into project and message design. The following describes this work in Honduras.

Based upon an analysis of the medical problem (infant diarrhea) and the communication and instructional requirements of the media to be used, specific investigation topics were established as follows: 1) rural understanding of and response to diarrheal episodes in children under five; (2) general rural child care practices; (3) infant feeding patterns with special emphasis on breastfeeding; (4) home-based mixing trials of WHO oral therapy solution; (5) potential sources of bacterial contamination in rural homes; (6) existing distribution systems for commercial medicines; (7) health system outreach; (8) rural media habits and preferences; and (9) rural opinion leadership.

The nine-month investigation used a number of general strategies to collect information on each of these topics: the collection and analysis of existing information (statistical, anthropological, and anecdotal); individual interviews with 175 rural people; 62 focus group interviews with approximately 402 rural individuals; direct observations in 24 rural homes; visits to five rural clinics; plus interviews with pharmacy and rural store owners as well as leading physicians and nurses. (Smith, 1980, p. 4)

The investigators report that the results of the developmental investigation were "central to the design decisions...in (the) implementation plan" (p. 4)[4]

The project focusses on treatment of diarrheal episodes and in particular advocates the use of oral rehydration techniques. It incorporates intensive use of radio in a variety of formats, training of local health workers, and education of the professional health community. The curriculum derives from a highly detailed behavioral analysis of just what steps need to be undertaken in the course of treatment of diarrhea and dehydration. While radio is the central message-delivery method, in both The Gambia and Honduras a significant back up role is seen for local workers who serve without additional pay. They are the repository of proper mixing instructions for the ORT fluid in both countries, and the source of prepared packets in Honduras. Thus MMHP is not a pure example of a media-only program just as the Indonesia program extended beyond face-to-face methods.

Results of the first year of operation of the program in Honduras and The Gambia are only now becoming available but both indicate widespread self-reported adoption of ORT and other recommended practices. In The Gambia over 50% of the target population knew correct mixing instructions and reported use of the recommended water, sugar, and salt solution. Almost no one did so at the outset of the project. Information about effects on nutritional status and on mortality rates is not yet available (Foote, 1983).

The MMHP program has had extraordinary success in reaching its audience. If it also turns out to be effective in promoting change it will represent a major breakthrough in nutrition education. Then two additional questions will need to be asked.

First, will it be possible to replicate the quite expensive developmental investigation activity in subsequent projects, if in fact it turns out to be an essential component of success. Major attempts have been made to reduce the time and cost of this developmental investigation phase. Smith (1983) reports about a six week investigation effort in Ecuador meant to serve as the base for a campaign like that in Honduras. Despite the greatly reduced time frame (and reduced numbers of interviews and a shorter questionnaire), project planners have argued that their level of information was almost as good as that which they had for the Honduras campaign.

Secondly, will it be possible to duplicate the ORT success with other behaviors differently located in both material and value systems of potential beneficiaries. Is ORT an 'easy' innovation, open to radio messages in a way that other practice changes will not be? In particular, will it be possible to change infant-feeding practices with similar approaches? Further exploration of these issues awaits more detailed and definitive results from the existing projects.

In sum, recent projects have gone a long way toward making the message development process more effective. The resources invested in finding out about the audience complements the energy expended in actually producing and distributing the educational product. The results, at least as reflected in the Indonesian NE project, and the Honduran and The Gambian MMHP projects suggest such investments are worthwhile. Nonetheless the resources required for such message development are considerable; they may be, in absolute terms, well beyond what

governments expect to spend for nutrition education. If such resources are to be committed, they may demand significant policy decisions, including a shift of resources from provision of curative services to preventive programs.

Reinforcement of Messages

The logic favoring use of many channels reinforcing one another rather than just a single channel for delivery of educational messages is incontrovertible. If the health system and the radio and extension workers and posters and community leadership are all saying the same thing ("Breastfeed" or "Use Oral Rehydration Therapy") the advantages are unmistakable.

-- There are less likely to be contradictory messages in the environment, and thus the achievement of the appearance of a broad, institutionally accepted norm may be possible.

-- Members of the audience are likely to hear the message from more than one source.

-- Each channel, if used optimally, is likely to reinforce the message in a distinct way, or serve a different function in the diffusion process.

-- Each channel will have access to some members of the audience that other channels may not.

No project planner can help but see the advantages, and indeed many serious nutrition education projects include multiple channels as a matter of course. Some of the projects previously described as emphasizing a particular channel were, in fact, broader. The Indonesian Nutrition Education program complemented nutrition volunteers with radio broadcasts and action posters. The Mass Media Health Practices Project gives local health workers a significant (but different) role in Honduras and The Gambia. In Honduras, project staff allocated a good deal of time and effort to working with the health professional community to gain their acceptance of ORT.

The Brazilian national breastfeeding campaign incorporated education of health professionals with direct outreach to mothers through radio, in-hospital encouragement, healthworker talks and mothers' groups (Jelliffe and Jelliffe, 1982). Colombia's Integrated Nutrition Improvement Project has planned or implemented many of the same educational activities. Other examples abound (cf. Zeitlin and Formacion, 1981).

Perhaps the Tamil Nadu Nutrition Project (World Bank, 1980b) goes the furthest, if number of channels is the criterion. Its planning document suggests the use of eight different channels for reaching the target audience directly (community nutrition workers, radio, films,

newspapers, wall paintings, posters, flip books, and folk theater), and four additional channels for training field workers (trainers, manuals, news bulletins and filmstrips.) Whether all of these will be used in practice remains to be seen. The traditional folk theater has already been eliminated on grounds of cost (Green, 1983).

Other projects have used individually distributed flyers, comic books, fotonovelas, arm tapes and weight charts, tape recordings, school instructional materials, television, point-of-sale displays, and group meetings in addition to those already mentioned. Further search would no doubt turn up additional strategies.

However for all the long lists of potential educational channels, estimates of the efficacy of each channel alone or in combination remains a matter of judgement rather than of empirical evidence. This reflects both the lack of evaluation and the difficulty of disentangling the effects of one channel in a multi-faceted operational program.

While the logic favoring more channels over fewer is powerful in the abstract, in practice the logic may break down. Additional channels add additional costs. Producing materials to be distributed through many channels is likely to affect inversely the quality of materials produced for each channel. Managing multiple distribution systems may tie up so much of a project's energy so as to leave little energy for the production of quality materials. To the extent that one channel depends on the simultaneous operation of a second channel, the

possibility of failure increases. Thus the decision to use additional channels is often (or ought to be) a closely calibrated decision balancing what is gained and what is lost. The lack of empirical evidence is painful in this respect. Nonetheless a logical framework for the analysis of such decisions may be helpful, even if not definitive.

Choice of the mix of channels, at best, reflects experience and judgement about the match between the characteristics of a given channel and the functions that it needs to serve. A list of eight such functions follows. Some of the descriptions for each function repeat comments made elsewhere, and some are merely restatements of common sense notions. The complete list is presented in the hope that it will serve as a framework in examining the utility of a particular mix of channels. Four elements of the list describe characteristics of a distribution system associated with a channel, and three focus on the content that a channel is capable of delivering.

Accessibility. Some channels are more likely to be seen or heard than others. Restrictions on access reflect inadequacy of the distribution system (television and health workers may not reach out into rural areas; flyers require a distribution agent), the cost to the consumer (radios require expensive batteries and group meetings compete with other demands on time), and the intrinsic characteristics of the channel (newspapers may require some family literacy and flyers may require visual decoding.)

Having declared that channels are likely to vary in accessibility, and that a designer needs to be cognizant of such variation, little more of a general nature can be said. Judgement about access to a specific channel will vary with the national context - literacy and batteries may be lacking in one place but not in others, available government support for local nutrition workers may give that channel wide access in some countries, although probably not in most. Estimates of how many people, how often, and at what cost to whom are reached by a specific channel are crucial to the decision to depend on it, but must rely on locally gathered data.

Such estimates should reduce the number of pilot projects whose costs per person reached will never allow widespread expansion. They should also lessen the tendency for a mismatch between target audience and audience actually reached.

For example, school nutrition education is often justified on the grounds that children may influence their parents and will one day be nutrition decision-makers themselves. Advocates argue for the potential of school-based nutrition education but seem to be skeptical about the value of current curricula. They argue that school nutrition education is worth doing well (Van der Vynckt, 1983; Valdivia, 1983). Nonetheless the commonness of school programs, now, seems to outweigh their utility, and at the risk of sounding churlish, one must wonder whether the sheer accessibility of school children doesn't explain their role as audience.

Similarly, careful balancing of reach and cost may reduce the pressures on program managers to use scarce resources inappropriately. Programs in Zaire (Barnes-Kalunda, 1981) and in Costa Rica (Burke et al., 1980) faced major pressures to produce television programs although their high costs and minimal reach to malnourished populations did not justify them.

Some distinction between apparent access and realizable access may be worth emphasis. In general, any channel that requires repeated physical delivery of materials is at risk of failure. Educational systems that rely on the use of cassette tape recordings may founder on the problem of regular exchange of tapes even if tape recorders were available locally. Stories are legion of posters or flyers sitting stored in warehouses never seen by their intended audience. Radio broadcasts may never reach listeners if they are relegated to unpopular times, or if broadcasters fail to comply with schedules.

In general the choice of a particular mix of channels creates varying demands on a managerial system if access is to be realized. The existence of, or the ability to build, such managerial capacity (whether it be for the supervision and retraining of field workers, for the monitoring and evaluation of a radio system, or for the regular delivery of comic books) must precede the decision to make use of a particular channel.

Repetition and intensity. A channel which allows a message to be repeated is in most cases to be preferred to one which does not provide

that capacity. Neither the practice of complex skills (like mixing of oral rehydration fluids) nor the acceptance of new norms are likely to result from a single exposure to a message. There are some exceptions ('jobs available - come Monday') but they are not likely to include most nutrition education themes. The slide-tape to be played for mothers attending a health clinic irregularly may not be able to count on repeated exposure. Lectures to groups of mothers by visiting extension workers may face sporadic attendance by both mothers and extension workers. Repeated exposure to messages may be inconsistent, and occur only over long intervals.

Radio commercials, played regularly, do offer the promise of frequent and repeated exposure. Television programs, while potentially offering repetition, rarely do so in fact. While most governments justify the initiation of broadcasting systems on the grounds of their educational potential, and promise many educational programs, entertainment and the satisfaction of the demands of urban elites quickly takes a primary role. Television hours become too valuable a commodity to be 'wasted' on rural education, even were rural communities to be reached.

Still some "non-repeating" channels may play a role in an educational program which requires repetition if they repeat the messages available through other channels. Many countries have mobilized a large number of channels over a relatively short period to try and create massive practice change. Brazil (Jelliffe and Jelliffe, 1982) and Colombia (Valdivia, 1982) both chose breastfeeding as the goal of massive multi-channel campaigns. China has repeatedly made use of national

campaigns for various national goals (cf. Chu, 1977). Perhaps the Tanzanian campaigns ("Man is Health" and "Food is Life") reflect this mobilization strategy most clearly.

The Tanzanian campaigns were massive enterprises, closely linked to the existing political structure. Typically, eighteen months of planning preceded a ten- to twelve-week campaign. Weekly radio broadcasts, widely distributed study guides, and the organization of 75,000 study groups and the training of group leaders for each group were part of the major campaigns. Materials were said to be extensively pretested, and local activities built on the base of pre-existing literacy groups and the local cells of the TANU, the single political party of Tanzania. Substantial attention from all levels of government, particularly from President Nyerere, surrounded each campaign.

The 1975 "Food is Life" campaign was conducted to increase knowledge about nutrition and the use of available foods, low-cost balanced diets, the elimination of various food taboos, and the encouragement of better food storage and preservation techniques, better farming methods and cooperative activities. Estimates were that as many as 1.5 million Tanzanians participated, despite some difficulties with leader training, distribution of printed materials, and access to radio broadcasts. (Mahai and others, 1976; Mahai, 1976; Mbunda, 1976).

No evaluation of the campaign has been published, but evidence from the previous "Man is Health" campaign suggested substantial short term effects. The evaluators concluded that among other health-related

changes, over 700,000 latrines were built as the result of campaign activities (Hall and Dodds, 1977). Follow-up studies of the extent of latrine use after they were built (or of the maintenance of other new practices) are not available.

Achieving repetitive exposure through the use of multiple channels over a brier period has advantages. It allows the use of some resources that would be unavailable over a longer period; for example the radio study groups tended to lose members as the campaigns went beyond ten weeks. Explicit public attention by political leaders can only be commanded for brier periods. The sheer intensity of attention may galvanize change that a dribble of messages over a longer period cannot obtain. Mobilization campaigns are less likely than other educational efforts to be lost in the surrounding noise.

On the other hand, mobilization campaigns contain risks. In some contexts they may not be feasible, particularly if the pre-existing group structure for localizing radio messages and for organizing the immediate realization of recommended behaviors is non-existent. Budgets for eighteen months of planning, for training large numbers of group leaders, and for coordinating the activities of many institutions may be impossible for some countries. Also the short term nature of the Tanzanian campaigns does not allow very much readjustment of messages if problems arise. Once dissipated in the period of the campaign, local energy may be insufficient to encourage practice of new skills and reinforcement of changed beliefs and behaviors and assure their maintenance over time. The dismantling of the educational

structure after the campaign may leave no useful way of providing follow-up materials.

Retention. A new nutritional concept or practice has to be retained if it is to be used. Healthworker talks, radio broadcasts and slide-tapes in clinics, when given to non-literate consumers, all share a dependence on memory as a means of retention. If forgetting or distortion of messages is not to be a great problem, some more permanent memory device may be helpful. Flyers, weight charts, posters for home use, newspapers, comic books and even cassette tapes hold that potential.

There is good reason to believe that such materials will be retained over time. Early fears that mothers would lose their childrens' weight and immunization charts turned out to be groundless (Griffiths, 1981). Action posters distributed by the Indonesian Nutrition Education Program were to be seen on the walls of many homes well after they were distributed. Montague and Higgins (1972) found that printed materials distributed by the CARE Korean project were still in recipients hands many months after the campaign's termination. In rural homes where little other printed matter is to be found, materials distributed may be treated with special care.

However, visual materials may not serve as memory devices unless they complement other primary channels. Zeitlin and Formacion (1981) cite a study by Fussell and Haaland that is telling. They found that in four

of five villages in Nepal no one could interpret a crude poster describing the transmission of tuberculosis, but in the fifth village many could explain what the poster meant. Only in the fifth village had a medical team visited five months before and explained the poster, suggesting that even crude visual materials may serve as memory devices, but only if some direct instruction precedes their use.

Spain (1984) found a similar interaction between prior training and ability to decode visual materials in their effects on understanding of a complex flyer. Her study in The Gambia compared women with more and less general visual decoding skill. For those women with little skill, the direct training they got through radio or from a health worker was a determinant of their ability to decode an oral rehydration flyer. For those women with greater visual skills, their understanding of the flyer was independent of the training they received.

Activity/Passivity. Some educational systems depend on the motivation of potential clients to seek out education. They make information available but do not actively reach out to the audience. Other systems do not work so passively. The obvious contrast is between professionals in health clinics educating patients who happen to come in to the clinic and outreach systems (like Indonesia's Nutrition Education program) which send volunteers to the homes of community members to encourage their participation.

The activity/passivity is as much a reflection of how a channel is used as it is of its intrinsic character. For example, a radio spot

announcement strategy is an active use of the radio channel; it seeks to reach audience members while they listen in an ordinary way to favorite radio programs. In contrast the broadcast of longer programs on unpopular stations is a passive use of radio since it depends on the willingness of the audience to seek out information.

In general, it is likely to be less complex and less expensive to manage passive educational systems, but they depend on pre-existing motivation of the audience. If people are actively looking for solutions to a given problem, then a reasonably accessible but essentially passive channel may be all that is required. It appears that diarrhea is seen as life threatening for children by many parents (Smith, 1980) and that they anxiously look for solutions. A relatively passive educational strategy may be appropriate in that circumstance. A weighing program, in a context when parents do not recognize malnutrition, may require much more active efforts if malnourishment is to be avoided.

Combining active and passive channels in a multi-channel system may be particularly productive. The Mass Media Health Practices implementation in The Gambia combined an active use of radio with a passive role for village midwives (or other local workers) in the diffusion of ORT. The radio broadcasts provided information encouraging the use of a sugar-salt solution and detailed instruction in its appropriate use. They also mentioned that in each village there was to be found a person with a red flag outside her home who could provide additional information. Each of these persons had been trained

in the proper mixing and administration of ORT, and thus served as a secondary source of information for those who had heard and accepted the radio message. Because they were passive educators, the time they would need to spend in teaching was sharply reduced, as was the need for extensive training in outreach methods and for continuing supervision by a central organization.

Accuracy. The more human links a message must pass through before reaching its intended audience, the more risk of its being substantially distorted. A nutrition education system which depends on the flow from an originator of a message to a supervisor to a local trainer to a local health worker to a client may find that what a client hears is distant from what was intended. Sometimes that may be a minor danger: pro-breastfeeding messages may be relatively immune from worrisome distortion. On the other hand, home mixed ORT is subject to such distortion since changes in the proportions of sugar and salt, in the amount of water, or in the amount fed to a child in a given period may affect the utility (and toxicity) of ORT.

Radio broadcasts, and other direct channels, hold at least a superficial advantage in their potential for accurate delivery of information. Even so, failure to pretest materials sufficiently may risk transmission of information which has a different meaning for sender and receiver. Accuracy of direct transmission may then only be illusory.

Responsiveness. A channel may be responsive in two ways: in its timeliness, and in its ability to adjust its messages to individual needs. Each month a new group of mothers becomes interested in messages about the care of their children. A short-lived educational campaign, unless it contrives to leave some residual traces in a community, may be effective with one cohort of mothers but leave subsequent cohorts untouched. Telling in this regard was the follow-up study of the Candelaria project in Colombia, already described. Children born into participating families after the project had terminated were no better off than newborn children in non-participating families.

A channel is to be preferred if it allows mothers to seek information when they need it, or, at the least, assures a continuous flow of appropriate information until it is substantially accepted in a community. At that point informal diffusion processes may be expected to assure further spread.

Common sense dictates a preference for a channel capable of delivering a timely message. A parallel logic argues for a channel which is capable of adjusting messages to individual needs. Inevitably, when an individual is presented with a novel recommended practice, there will be doubts to be resolved, further information to be sought, and social support to be gathered. It takes no great logical power to argue that a knowledgeable, skilled, sensitive change agent would be ideal in such circumstances. No radio broadcast is likely to serve that need so well.

Having said this, however, it becomes time to ask about feasibility. Obviously if a country has the resources and the capacity to pay for and manage a complete field structure, it is to be preferred. That seems to be the direction that the Tamil Nadu Nutrition Project has chosen to take with plans to hire one local nutrition worker and one assistant for every 1500 people. Whether this plan (or the expansion of the Indonesia nutrition volunteer program) will be feasible on a large scale, time will tell, although history has not given much ground for optimism. For most countries, however, the issue is whether such responsiveness can be approximated without depending on the a vast network of sensitive change agents.

Three mechanisms provide such approximate responsiveness. The passive agent who can be sought out by a person considering change, may allow both resolution of doubts and provide some level of social support for change. Next, even if no paid or formally organized network of agents is available, and only broadcasts provide nutrition education, it is a mistake to believe that individuals are being left to make changes in isolation. A great deal of social theory and some empirical studies argue that people turn to social networks to support change whether or not such networks are formally organized. It is assumed that decisions to change are taken with careful regard for the expectations of others. A natural corollary is that credible messages about nutrition practice will stimulate the operation of such social support processes. Whether those informal social processes will support change or support no change is surely context specific.

A third mechanism for providing responsiveness involves following a sample of the audience closely. It assumes that individual needs are not so particular, and that minimum damage is done if needs are defined and categorized in an aggregate fashion. If that aggregate picture of individual needs then determines what messages are to be sent out, there may be reasonable responsiveness in channels that originate at some distance. An effective monitoring and evaluation program should be able to locate, dynamically, the doubts that exist in an audience, and permit effective response. While some individual problems may not be addressed, the largest number should be dealt with.

Independence. An ideal model of nutrition education might involve a smoothly organized set of mutually dependent channels, each taking part of the educational burden in accord with its character. Radio might be relied on for reach and accuracy, face-to-face channels for responsiveness and social support, and printed materials for long term retention. In such a system each channel would not be expected to be effective in isolation but only in concert with the others. Such a system might be theoretically ideal, but as a practical matter it is unlikely to be realized.

In Indonesia the radio broadcasts appeared to reach fewer people than expected because of unpopular broadcast times and poor reception in some regions (Manorf et al., 1983). In the national Colombian program, coordination between centrally sponsored education (particularly media programs) and local activity was a problem reflecting lack of personnel and institutional stresses (Valdivia, 1983).

These examples and many others suggest that channels should be designed to work independently of one another, so that the failure of one will not eliminate all. Inevitable failures of timing, of institutional coordination and of funding may reduce the number of sources repeating the same message, but they should not mean that education is incomplete. To the extent possible, a channel ought to be used with the expectation that no other channel will function adequately.

Ideally a nutrition education system should incorporate a mix of channels which allow maximization of all of these seven characteristics: accessibility, repetition and intensity, retention, activity, accuracy, responsiveness and independence. Yet financial limitations and management constraints will make that unlikely. Nonetheless educational system design may both make positive outcomes more probable and allow designers a more realistic estimate of what the weaknesses in a particular design are likely to be.

Education as Complement to Material Inputs

Nutrition education is an anomalous activity. It requires throwing symbols (words or pictures) at malnutrition, a problem which is defined by lack of material resources. Since it provides no new resources, only providing ideas about organizing available resources, it makes the central assumption that current resources are inefficiently used for desired ends.

In contrast, when education complements newly available resources its logic may be more persuasive. A change in resources available to a family (through distribution of subsidized food, entry into local stores of a new product or rapid changes in the prices of staple foods) permits or requires adaptation in dietary practice. In some case that adaptation will be easy -- for example if the the relative prices of two commonly used staple foods were to shift, adjustments in consumption would likely follow shortly. Investment in education to ease that adaptation would have little return. However in other circumstances education may ease the transition.

In much of Latin America, after a child is weaned he or she is fed the liquid from bean soup. Unfortunately it is the solid portion that contains much of what is nutritional in the soup. It is said that mothers resist feeding their children the beans themselves because they are said to cause flatulence. Attempting to persuade mothers to change this practice may prove difficult. An alternative approach would be to

develop an enzyme "sprinkle" which when used in small quantities would break down the solids, eliminate the flatulence problem, and improve the nutritive value of what the children consume. This solution would combine the production and distribution of the "sprinkle" with efforts to convince mothers to make use of it (Rutman, 1975).

Food chemists, time and time again, have invented marvelous sprinkles or synthesized foods only to find that the products do not reach intended audiences. It would be simplistic and misleading to say that if only they could have joined their products to effective use of communication all would have been well. Problems of product distribution, of cost, of utility and of acceptability all loom large. On the other hand if the advantages are not obvious, the probability of acceptance may be raised by an effective education program.

The combination of education and material resources has a persuasive logic. Fortunately there also a few realized programs for which credible evaluations are available.

Nutrition Education and Food Supplements. There are a number of evaluated programs which combined education with the distribution of subsidized food, but do not separate the two components in their evaluations. Four of these are summarized in a review by Gwatkin and his colleagues (1980).

The Imesi, Nigeria project reported greater child growth and lessened infant and child mortality in a project area relative to a comparable

community as the result of an extensive nutrition education, medical care and nutrition supplement intervention. A similar project in Jamkhed, India reported parallel results.

The Narangwal, India project combined nutrition education and supplementation as one of the treatments it offered. When villages with that treatment were compared to control villages they showed important advantages in growth and mortality. Very similar results were produced in the early 1960's in a five-year experiment in Guatemala by the Institute for Nutrition of Central America and Panama. Again nutrition education and supplements apparently affected growth and mortality.

These are promising results, but it is impossible to say whether their educational components were necessary for their success. It is worth noting that at least one other project summarized in the Gwatkin et al. review, in Northern Peru, showed major nutritional changes also, but as the result of nutrition supplements provided without education.

Only one evaluation, of a Moroccan program makes an attempt to separate the effects of education from that of supplements without education. Gilmore et al. (1980) report on a post hoc evaluation of a subsidized food program run by Catholic Relief Services. They compared children who were beneficiaries of a program before and after an educational component was added to the program.

The education component was a monthly 20-40 minute class offered at a center where women came to pick up a monthly food supplement. (The supplement amounted to 135 kilograms per family per year, a substantial amount.) The classes were described by the evaluators as dynamic and highly interactive, the result of a major effort to develop a nutrition education capability in Morocco. Subjects taught included nutrition, health, sanitation, hygiene and food preparation. Approximately 150,000 families (including mothers, an official beneficiary child and a sibling) were being served at a total of 300 centers. Three monitors per center served 25 women each day. The total cost per family served was about \$103 in 1979. The portion of these costs which reflect add on costs for operating the educational program may be only 1% of the total. If administrative and other costs are shared between components, the cost for education may be as much as 3% of the total.

The reported differences in nutritional status are very large between those children receiving both supplements and education in 1978 and their older brothers and sisters when they had been enrolled in the supplement-only program three years before. In one comparison, controlling for length of time in the program, among the children who received supplements only, 33% were less than 80% of weight-for-age standards. In contrast, among their younger siblings enrolled in the feeding plus education program in 1978, only 11% fell below the 80% standard. A parallel comparison, between children already in the program and children just entering the program in 1978, showed similar results.

The evaluators do not believe that the results can be explained by differences in the supplement component of the program or in longer term secular trends in Morocco. They conclude "an impressive nutritional impact was achieved with the addition of an education program" (p. 6).

The evaluation is well considered, and the results appear to be striking. One anomaly, however, which is raised but not resolved, is the apparent failure of the 1975 supplement only to have any worthwhile effects on nutritional status. Children who received the supplement but no education in 1975 were more or less comparable to children just entering the program in 1978. One would have expected that an income transfer of this magnitude, estimated to be equivalent to 5-25% of family income, would have had a noticeable stand alone effect. Its failure to show any such effect may be seen as additional confirmatory evidence for the conclusion drawn by Cantor Associates from Figure I, and discussed previously. Underfeeding of young children is not income-determined.

While the results are impressive, there remain issues of great concern, largely to do with cost and the feasibility of expansion. The authors estimate that only 11% of all the malnourished children in Morocco were reached through this mechanism. Costs of expansion to all of the malnourished population will be high. While mothers do pay a fee (about \$6.50 annually), the rest of the cost per family is paid by the Government of Morocco (\$33) and through international aid programs (\$64). If the Moroccan government, had to finance the project on its

own without international aid and purchase food stuffs locally the costs would be even higher. It was estimated to be about \$19,000,000 (with \$1,000,000 of that contributed by mothers.) That would be the equivalent of \$126 per family served.

If the program were to reach the entire malnourished population (instead of the 11% currently served), a low estimate for the total, under complete Government of Morocco financing, would be \$175,000,000 per year at 1979 prices. Also, it may be that the cost per center would rise as less accessible portions of the malnourished population were reached. Also the inflationary effects on prices of such a huge governmental demand for food would affect both the costs of the program and the ability of target families to purchase food besides the ration provided.

This program may have to be viewed as a special case. In situations where subsidized food is being provided to a population, organized education as a complement to the supplementation may markedly improve nutritional consequences. However as a method for reaching entire malnourished populations, it faces obvious financial obstacles. Add-on costs of education are minimal and, apparently, add-on effects are quite large. But if the \$1.00 educational component can only be effective once the \$125 nutrition supplement is delivered, few countries will be willing or able to finance that level of income transfer.

As a final note about this important project, while detailed information about the nature of the educational program is not provided in the evaluation, its authors say that the effort reflects careful planning and execution. There is no reason to believe that many other food supplementation programs which provide education in a much more haphazardous way gain equal success (cf. Anderson, 1977).

Social Marketing Projects. Four other projects also complement new resources with education, but they are somewhat distinct from the previously described set. They all can be called social marketing campaigns -- making new products available and providing appropriate education, but without expecting to subsidize the new products permanently. The smallest of these was the Yapese coconut campaign.

In Micronesia, a campaign to promote the drinking of green coconut "water" instead of imported and expensive soft drinks was initiated and carried out for two years by the Yap District Health Department (Rody, 1978). Yap District is a group of 17 inhabited islands. The project used a comic book, in-store posters and some direct lobbying to encourage stores to stock and people to buy "drinking coconuts". The only newspapers on the island published a photograph of coconuts with a caption that indicated they were the "real thing" and a well-known soft drink the artificial thing. Most young Yapese adults are literate and the slogans soon became popular catch phrases around the district, according to the evaluator. Also a series of cartoons, not originated by the nutrition project, appeared in the paper showing a canned soft

drink representing unpopular foreign influence and a coconut character representing Yapse sentiment. Arrangements were made to assure local stores an adequate coconut supply.

As a result of the campaign, most stores on the four main islands began keeping cold coconuts in their refrigerators and selling them for half the price of soft drinks. Several individual stores reported average sales of 1000 coconuts weekly per store on the main island, even though the total population is less than 4000. Based on district tax receipts, imports of soft drinks to Yap decreased to less than half their previous level after the campaign (Rody, 1978).

Two small projects and one larger one made attempts to increase the dietary use of soybeans, a food of high nutritional value. It may be no surprise, given some earlier discussions, that the small projects report signs of success but the larger one is rather less optimistic.

A small-scale program was conducted by Community Systems Foundation (1976) in Colombia and was directed toward educating communities to increase the utilization of soy protein in diets. They used an innovative approach, that of opening a small self-supporting shop, a tombolita, which was staffed by local women who prepared and sold soy products like milk and cheese. The women also conducted in-store and in-home education. A survey found that 60% of the families in the test city, Villa Rica, had received instruction in soy utilization. A store survey found that of the 37 stores in Villa Rica, seven were selling soy and millet in quantities sufficient to close the average protein

gap in the community by ten percent.

A second small-scale experiment was conducted in two Brazilian villages (Wright et al., 1982). In both villages a brief period of free soybean distribution was followed by a four month period of availability at a subsidized price. In both of the villages education was carried out either for groups or individually with regard to methods of preparation and nutritional advantage to be gained from consumption of soybeans. Before the campaign, no mothers reported soybean use in their 24 hour recall. At the end of the campaign about 25% of the women in both villages reported soybean consumption in the previous 24 hours. (This had fallen from a high of 50% in one village during the period of free soybean distribution.)

Whether this rate of use was inflated since mothers were certainly aware of the investigators' expectations, and whether any use that was achieved would be maintained after subsidies were eliminated is not known. Some doubt with regard to the latter issue comes from the final project reported in this section, the Bolivia Soybean Utilization project.

The University of North Carolina School of Public Health (n.d.), working with the Bolivian Ministry of Health and USAID sponsorship, mounted an 18 month campaign to increase the use of soybeans in rural Bolivia. Soybeans were not previously consumed. The program made use of radio (one 15 minute program and 6-10 jingles per day) and an extensive program of cooking method demonstrations in target villages.

At the end of the program the evaluation suggested that information levels about soybeans was high, that over 80% of the population had tried them, and that 45% had cooked them at home. However at 18 months into the campaign real nutritional impact could only have been very small -- only 2.5% of the sample reported using them in the previous 24 hours. The evaluators attributed the relative failure of the campaign to the complex cooking procedures required, including soaking the beans on the previous day in ash water and boiling them.

Large scale social marketing programs have also been undertaken in behalf of a variety of synthesized foods -- most notably Incaparina, an umbrella term for various mixtures of vegetable protein, originally developed by the Institute for Nutrition in Central America and Panama (INCAP). Designed as a low-cost substitute for milk products, it has achieved substantial sales in Guatemala, and in related versions in many other countries. Published information does not provide great detail about the educational campaigns (or marketing campaigns) that accompanied their commercial distribution, and thus comment must be limited. However apparently the impact among the malnourished is minimal, largely because the cost of the product places it beyond their resources, even though it is far less costly than the milk products for which it substitutes (Wise, 1980).

This result suggests the fundamental question for social marketing programs of the sort reviewed here: can they be organized so as to become self-supporting yet still be of benefit to the malnourished population? The Yapese coconut project was, but its audience had

sufficient income to purchase soft drinks, and thus was not comparable to the undernourished populations of most concern. The small soybean projects do not provide evidence as to whether they could survive without subsidy or outside organizational help. The Bolivian soybean project did not survive, but financial outlay seemed less at issue in that circumstance than did the additional outlay of time required for soy preparation. The Incaparina program did survive -- enough manufacturing skill seems to have gone into its preparation to assure its appropriateness, but commercial preparation without government subsidy automatically seemed to have put the product beyond the resources of its target audience.

The issue is not educational effectiveness -- doing yet a better campaign for Incaparina-like foods may increase their use and nutritional benefit only minimally. The issue is economic feasibility. A social marketing campaign must market some product -- if the product cost is high, effective marketing may make no nutritional difference. Educational campaigns designed to enable families to make better use of foods already consumed may suffer less from such constraints.

Incentives for Educators and Clients

What is it that will keep projects going after the first and novel period? What is to keep the health workers reaching out to the clients

coming to the clinics? What is to keep the education, if it is to be delivered at hundreds or thousands or millions of sites, of high quality? The law of entropy is important here -- casually stated, if nothing is done, things tend to fall apart.

The pressures against long term maintenance of any centralized social service delivery system are large. Those pressures include: poor communication within a system, which means that failures are not detected and little is known centrally about clients; lack of funds for transportation, which lessens supervision; and allegiance of fieldworkers to their salary-paying bureaucracy, which makes them more responsive to demands from above than demands from clients.

Educational delivery systems face special problems. When the product to be diffused is education, failure to deliver it adequately may be hard to detect. If food supplements pile up in warehouses they can be seen; if expected supplements are not obtained potential recipients may be vocal in protest. In contrast poor education is unlikely to leave visible traces or generate loud complaints. It may remain undetected without quite subtle evaluation. This makes it difficult to provide incentives for educational success or remediation in the case of failure. The material rewards for doing face-to-face education well may be small. Psychological rewards, whether from the satisfaction of doing a job to the best of one's ability, or from the personal gratitude of clients may be the only incentive. That may work for some educators and for some of the time, but it may not be enough when a large, long term, routine program is to be operated.

The incentives for participation of the clients may also be weak. Mothers, the primary audience, are a group with extraordinary demands on their time already. Most projects assume that only if education accompanies food supplements or health services, or if it reaches people in their homes will people sit still for nutrition education (cf. Gilmore et al., 1980). Education is too little valued to draw an audience on its own. While that conventional wisdom may rely on experience which confounds client disinterest with poor quality of education, it still may be a reasonable operating assumption.

The problem of creating sufficient incentives over the long run has produced a number of solutions, both to maintain educational outreach and to encourage client participation. One solution with regard to educational outreach is that of mass media-based programs; they sharply reduce the number of people who require incentives to make a program effective. Even in mass media programs, however, some mechanism to maintain the link from field to studio is crucial; without it there is some temptation to reward quality of production without regard for pedagogical effectiveness.

For programs which do not eliminate face-to-face outreach altogether, a variety of approaches to create incentives for field workers have been implemented. In the Indonesia Nutrition Education project volunteers were willing to contribute thirteen hours each month, apparently with rewards of a limited sort: social approval by their communities and irregular material rewards -- some volunteers received bicycles or rabbits. Apparently volunteerism is widespread in Indonesian

communities and largely non-financial rewards may be sufficient. Generalizability past the first year and to other cultures will not be easy.

A second type of incentive is to make the nutrition educator directly responsible to the community rather than to the Ministry bureaucracy. If nutrition educators are hired and paid by the Ministry, responsiveness to the community may not be a high priority. If the community pays the salary, or at least controls hiring and firing, power over the educational system is effectively transferred. In agricultural extension there are a number of programs where extension agents are directly employed by groups of farmers, for example the Taiwan Farmer Information System and the Tiv Bams in Nigeria. These programs apparently have greater success than is typical for extension systems (Hornik, 1982). Also traditional curative health systems are directly paid for by their users. The problem with applying this model to nutrition education is that many communities cannot or will not allocate resources to employ a nutrition educator even if they were willing to do so for agricultural or curative health services.

A third approach, essentially within the social marketing approach, is to provide rewards to educators for achieving behavior change. The traditional midwife, who sells an oral rehydration mix packet, may turn out to be a much more effective diffusion agent than if she is given a small salary for undertaking free distribution. Her incentive to make sure that each potential buyer takes full advantage of and is pleased with the ORT solution is strong. The Yapese coconut campaign provided

similar incentives for storekeepers (if one can assume that their profit on coconut sales more than balanced losses from depressed soft drink sales.) The Colombia soybean shops begun by Community Systems Foundation were also designed to be self-supporting -- the more satisfied buyers of soy products and the more people who knew how to prepare it the greater the reward for the shopkeeper.

If nutrition benefit can be achieved as the result of introduction of a new product, self-supporting educational systems may be feasible. (They may also have negative effects, including a risk that education is designed to maximize sales rather than maximize nutritional benefit. For example, a trusted sales agent may recommend use of an inappropriate product because its profit margin is higher.) However, its applicability may be sharply limited. Education for breastfeeding or for improved feeding of small children, for example, do not seem amenable to such self-supporting approaches. In these areas, with some exceptions (soybeans and enzyme sprinkles were earlier examples), educational strategies are not likely to find a product on which to build a self-financing system.

Clarification of the incentives for the maintenance of individual educational activity and for continued client participation are most crucial to large projects like those in Tamil Nadu and Colombia. These depend on the actions of vast networks of field workers, whose incentives to provide nutrition education may be uncertain. While delivery of food supplements and curative services may be straightforwardly supervised, and demanded by clients, educational

services are neither easily supervised nor lustily demanded. In that context it may be difficult to assure that education actually occurs as planned without explicit and directed incentives for educational success.

Costs and Financing

How much do these projects cost and who pays for them? They cost from a few cents to more than \$100 per family reached. Tanzania put the cost of its radio campaign at \$.09 per listener for the Man is Health campaign and open broadcast programs, like those in Sri Lanka and Costa Rica, may have per listener costs of only a penny or two. The Moroccan feeding programs cost more than \$100 if the feeding component is seen as an incentive for participation in the educational program. Pilot programs, which involve expensive staff and reach small audiences, may cost even more per person reached.

These cost numbers, although they may be in "hard" dollars and cents, tell us little. First cost estimation methodologies are inconsistent. Cost elements included or excluded from a given estimate will vary from project report to project report. Shared administrative costs, the value of contributed labor and participant time, the cost of capital and of technical assistance may be added to budgeted outlays of a project or they may be ignored. Without knowing how each of these elements were treated, an observer can make no use of a given estimate.

Project reports which provide such information are rare.

The second major concern with raw cost estimates is that they are out of context. A cost estimate not associated with a specific outcome or benefit is essentially meaningless. Without effectiveness criteria, one project's costs are non-comparable to costs for any other project. However, some projects have provided both cost and effectiveness data. Those cost analyses are worth further discussion.

The Moroccan nutrition education program added \$1-3 to the cost of the food supplementation program already in operation, and apparently produced a decline from about 30% to about 10% in the proportion of children served who were below 80% weight-for-age. If we assume the cost was \$2 per family reached and \$1 per child reached if two children were helped in each family, and that about 1/5 (30%-10%) of all children served were saved from malnutrition at the criterion chosen by the evaluators, the cost per additional case avoided was about \$5. (The cost of the education+supplement would be about \$250 per case avoided.) A lower criterion of malnutrition, (e.g. 70% weight-for-age) would obviously raise the cost per case avoided considerably. A recognition that other children, besides those kept above the 80% level, would also have gained some nutritional benefit from the education would lower the cost per child helped.

The Indonesian Nutrition Education project estimated its recurring costs at about \$100,000 per year (Griffiths, 1983). With 50,000 children in the program, the cost per child was about \$2. At eighteen

months of age, approximately 17% of the children in the Nutrition Education program were below 75% weight-for-age. Among comparison children about 33% were below that criterion (Zeitlin, 1984). Thus about 16% (33%-17%) of all children avoided such malnutrition at the 75% criterion and the cost per case of malnutrition avoided would be about \$12.

The Mass Media Health Practices project put the cost of operating a parallel program to the Honduran government at around \$125,000 per year. (This includes Ministry salaries and costs of operating the project but excludes technical assistance [Smith, 1983]). The most recent evaluation report suggested that some 85% of the target population heard the ORT related messages, or about 170,000 mothers. Thirty percent report using the method, and if these reports are taken at face value, the cost per adopter would be about \$2.50. No data on effectiveness vis-a-vis mortality or nutritional status change is available at this point (Institute for Communication Research, 1983).

The Manorf Phillipines campaign in Iloilo had a potential 15,000 beneficiaries (babies from 6-15 months old who might potentially have oil added to their weaning food.) Non-experimental project costs were estimated at about \$50,000. About 5% of the audience reported adding oil daily (if in minimal amounts). If there were 750 adopting children (5% X 15,000) the cost per adopting child would be about \$20 (Zeitlin and Formacion, 1981).

Making sensible use of any of these estimates is a difficult business (cf. Jamison et al, 1978). None of the projects count the value of the time of the participants in the educational activity. But a project which takes a person away from other productive tasks (to go to a clinic for a class) has different financial implications from a project which reaches audiences in their homes and takes minimal time from other activities.

Also most of the projects for which cost estimates are available have had large foreign assistance components. A tendency to discount those costs as not representative of what such an operational project would cost is understandable. Nonetheless, if those investments are relevant to the success of a program, they need to be amortized and included in long term cost estimates. Similarly start up costs, including training of personnel and baseline research, may not be treated the same in all projects. If they represent capital expenditures whose benefits will not be played out for a number of years they also have to be amortized properly. Thus for the Manoff Philippines campaign it was at least possible to make use of available materials for other areas of the Philippines and in subsequent years in Iloilo at much lower cost per person reached than their use in the pilot year. Unfortunately the cost estimates available come from the early years of projects and long term benefits have not been estimated making the association of costs and benefits problematic.

There is also some tendency to focus on costs that governments have to pay and ignore other costs. The Indonesian Nutrition Education program

relied on the donation of 13 hours per month of village volunteers, one per 10 families in the program. The monetary value of their labor was not a cost to the government, and the previous estimate of costs for this project ignores this component. Nonetheless, they represent the largest portion of person-hours spent in the project, and if the cost of their participation is lost to cost estimates it is misleading. The appearance of comparable costs between the Indonesian and Mass Media Health Practices Project is only tenable if costs to governments are at issue.

In sum, cost effectiveness estimates are not easy to put forward with any confidence. Effectiveness criteria vary widely, as do estimates of what is or is not to be included in estimating costs. One could imagine cost estimates one-tenth as large or ten times as large as the ones reported above offered with equal credibility. While some more stability can come from more exacting estimates as they are reported by the incomplete Indonesia and Mass Media Health Practices evaluations, even those will be ambiguous since they will be estimates of short term returns on investments with a long term (but unspecified) benefit.

PART THREE: THE DIFFICULT ISSUES AND NEXT STEPS

Restatement of Findings

In the beginning of this review we asked three questions: What is the potential for educational interventions? Do such interventions as have been evaluated have any worthwhile consequences? And, is it possible to extend effective programming on a large scale? It is probably an optimistic note that for one of these questions, the second, we can generate a satisfactory and positive answer.

Despite a lengthy review of potential areas of educational intervention, few nutritional behaviors can be described as unequivocally open or closed to education. Knowledge of the determinants of particular practices is thin, although perhaps a current groundswell of research in some of these areas will remedy this situation (cf. Infant Feeding Consortium, 1983). However, there is no particular reason to believe that such determinants generalize across cultures or other differentiating circumstances.

Most authors seem to believe that aggregate household nutritional status is largely closed to non-income intervention and that intra-household food distribution and inequity of nutritional status is open to such interventions. But that consensus may reflect less unchallengable research than one might like. Nonetheless most projects seem to act on these assumptions, emphasizing breastfeeding, the feeding of weaning age children, diarrheal treatment, and special diets for pregnant and lactating women with some adding activities to improve the balance of meals and sanitary practices. That is just as well since the best evidence for the openness of these behaviors to educational interventions is likely to come from evaluations of these interventions, rather than from basic research on determinants.

Indeed while the great majority of nutrition education is unevaluated, and apparently (and probably reasonably) assumed to be ineffective, there are a few projects which show substantial effects on behavior and nutritional status. Education in company with food supplements in Morocco produces greater nutritional status change than does supplementation alone. In Micronesia, social marketing of coconut milk as a substitute for imported drinks led to widespread behavior change. In Indonesia, nutrition education by village volunteers, supported by radio and action posters, produced a noticeable improvement in nutritional status. Media-based projects in the Philippines, Tanzania and recently in Honduras and The Gambia have reached large audiences who display new knowledge and changed attitudes and report some practice change. For the last two projects it may be that nutritionally significant change is occurring as well.

In pointing to successful projects, one cannot suggest that they are representative, or that they show that nutrition education can be done on a large scale, as routine practice, or effectively when measured against nutritional status. The tension between reaching large audiences, which media-based programs can do, and producing nutritionally significant behavior change, which pilot outreach projects have been able to do, remains as the central problem of nutrition education.

The large scale expansion of face-to-face outreach projects remains fundamentally problematic. Recruiting and training and supervising the necessary field workers is likely to be a huge task. Paying them in cash and/or providing them with sufficient incentives to keep them working effectively over the long haul will be expensive and difficult. Agricultural institutions, with a long history of building extension systems, and with much larger budgets, have rarely succeeded in reaching the poorest farmers or in changing their practices.

(cf. Orivei, 1981; Hornik, 1982). Optimism about the probability of the health system (or a nutrition subelement) achieving that end must be limited. Few countries will be able to muster the absolute budgets, the management skill, and the long haul enthusiasm that will be required. Nonetheless, building on extended health systems, where they do reach the poorly nourished and have a preventive as well as a curative mission, will surely be welcome.

Perhaps the only way that face-to-face nutrition education will be realized effectively on a large scale will be if communities take

administrative and financial responsibility for such programs on their own, depending as little as possible on help from outside. If a community is paying for a service, they will take full advantage of it.

It appears that education can bring about change, and that the relevant educational concepts are well within the grasp of at least some members of each community. Theoretically, locally operated education is feasible. If limited equipment (e.g. weighing scales) and training were available from outside and sought by the community, effective nutrition education might be realized autonomously.

The fundamental constraint would be the willingness of and feasibility for a particular community to organize. In some cultures shared communal responsibility will be accepted with little outside stimulus. In other cultures it is less likely to appear.

The alternative route appears to be to rely essentially on mass media-based programs, complemented when it is feasible by specific face-to-face and other support activities. The central problem of media-based programs will be their tendency to become dissociated from what goes on in the field. A radio program takes up the same broadcast time, and may sound the same to the city-based ear, whether or not it is based on any close link with the field. Yet effectiveness of radio programs which are producer's products and not educator's products is likely to be a matter of chance. The core linkage is between prior investigation, instructional design, pretesting, intelligence from the audience, and responsive readjustment of messages.

Stressing instructional design and field research in media-based nutrition education has major implications for cost. Budgeting for field activities and for instructional design as well as for actual production and the purchase of media time may not be easily accepted. Absolute budgets directly allocated to nutrition education will be much higher than is customary even if cost per client reached effectively is likely to be lower. The Mass Media Health Practices program, even without its technical assistance component, cost \$125,000 annually although the cost per self-reported adopter of ORT in Honduras was only \$2.50. Yet without these relatively high central costs (for broadcast time, for materials preparation, for field data collection) effective nutrition education is not likely to be achieved.

Other questions about the usefulness of the mass media remain open. Some argue that media are likely to affect superficial knowledge or practices, but not affect behaviors which are more complex or important for an individual (cf. Rogers with Shoemaker, 1971). They suggest that the personal support of a trusted friend, given face-to-face, is necessary for change in most circumstances. However an alternative view may be plausible also. If people are actively seeking solutions for problems they will make use of any source which responds to their needs; if they are not anxious to change, face-to-face persuasion will be no more effective than mediated communication. If media-based programs have been ineffective, it does not reflect an intrinsic weakness but the scarcity of programs which have used media well. There is no evidence that sophisticated media-based programs cannot work.

Another objection to mass media-based programs is a fear that much nutrition education content is too complex to broadcast. People only give fleeting attention to radio, it is said, and cannot learn complex material. Also it may be argued that people have sharply varying needs; trying to address a heterogeneous population with a single set of broadcasts ignores real differences in prior knowledge, in personal circumstances and in possibility for change.

Both of these concerns deserve some weight. Nonetheless there is now a good deal of experience with curriculum development and programming for radio; it suggests that quite complex messages can be broadcast and that a substantial range of the intended audience will be able to take advantage of the information. The Basic Village Education program, which provided agricultural information in Guatemala (Academy for Educational Development, 1978), the Radio Mathematics project which taught primary school students, (Friend et al, 1980) and the Mass Media Health Practices projects described previously, all were successful in teaching complex material via radio to intended audiences.

Despite potential limitations, a serious look at media-based education can be justified. It may be the only realistic strategy. Any system which reduces the political, financial, and most of all logistical complexities on which projects so often founder is worth a major trial.

There is a great deal of logic and some evidence that linking nutrition education with other resource changes is promising. The logic is that whenever the old rules do not work optimally, people are likely to be

open to new information that allows them to adapt. Supplemental food supplies allow different feeding patterns; education can enable consumers to make optimum choices. Newly available foods, or new prices for previously consumed foods may, similarly, allow dietary change. Education can ease the transition.

Another set of linkages, also often recommended, is perhaps not so easy to support. The logic is straightforward. The agriculture extension agents are already in the field; it is wasteful to have single purpose agents; development is multifaceted; focusing on only one problem risks exacerbating others and is parochial; why not build on what extension agents do, and have them become nutrition agents? Nonetheless, as a practical matter, linkages with other agencies' activities are not likely to work.

Agricultural extension agents rarely get to the poorest farmers, and by definition ignore landless laborers. Yet those two groups are among the most malnourished. Women are rarely a direct audience for them. Extension agents in more sophisticated systems, like the Ben Or Training and Visit system, are fully loaded with specific agricultural tasks and would resist taking on roles as multi-purpose agents. While backyard gardens and the raising of small animals for protein may fall more directly in their purview, it may be unrealistic to expect agents to take these tasks on. In any case they are rarely the primary practices recommended in nutrition education programs. As appealing as linkage with another, richer, sector's activities may be, it does not seem that it promises great probability of success.

Next Steps for Implementation and Research

Finally, what are appropriate next steps for people concerned with nutrition education. First how should a national planner considering strategies for combatting malnutrition look on nutrition education?

The first thing to do is to stop looking at nutrition education as it has traditionally been looked at -- as a minor activity involving a few posters and irregular clinic-based advising and run out of a basement office in the Ministry of Health with no budget or status. If it is to be worthwhile at all, significant goals of behavior change for large audiences need to be adopted, and budgets and personnel commensurate with those tasks need to be allocated. A planner needs to choose something serious to do and then ask whether nutrition education is a competitive strategy for accomplishing that goal; he or she ought not be asking what improved consequence can be achieved within current minimum budgets. The answer is likely to be very little. If it is politically unrealistic to expect larger budgets for nutrition education it is substantively unrealistic to expect worthwhile consequences.

The next issue is to ask whether nutrition education, no matter how effectively implemented, is likely to affect a particular nutritional concern. In some cases, diagnostic information will eliminate education as a useful strategy. If withdrawing the breast during an episode of diarrhea is rare in a particular culture, or occurs because

of sick childrens' lack of appetite and despite mothers' attempts to feed them, it is not likely to be an appropriate target for nutrition education.

If economic circumstance precludes practice change, or a recommended change is likely to produce minimal nutritional status change, there may be little point in addressing it with education. Water boiling, both because of the demands it makes for fuel and time and because it may have little effect on infection in the face of so many other environmental sources of infection, is an example on both counts.

Assume that lack of knowledge remains a possible cause of poor practice in a given culture. The next step is to find evidence about other educational efforts. Since relatively few projects have been evaluated, and even fewer have done education as well as it might be done this will be a limited resource. Nonetheless reviews such as this one may suggest some promising areas and some areas to avoid.

Next come questions about what is feasible with regard to education. What field structures are in place and reaching the target audience? Is there a saturated network of distribution points for products? How far do agents who might take part in an active educational network reach? What incentives are likely to encourage effective delivery of education? Can backup training and supervision be implemented? Is there a network of agents who would be able to be part of a passive educational system, even if expecting effective and active outreach is

unrealistic? What proportion of the audience can be reached by radio, given language and ownership issues?

What level of community responsibility for nutritional improvement is likely to be activated. Is there a reasonable possibility of local and autonomous management of education-based change?

Given experience summarized in this monograph, the answers to these questions are likely to lead away from face-to-face active outreach education systems. That is particularly likely to be the case if one has to build a network from scratch, or depend on people whose salaries are paid by other bureaucracies, and if communities cannot be expected to take long term financial and administrative responsibility for local activity.

Answers are likely to lead either to some skepticism about the viability of educational strategies altogether because they are so difficult to implement, or to the construction of media-based education systems. They promise audience reach, logistic feasibility, and at least a reasonable potential for success.

Such systems probably need to assume that people are open to change and are looking for solutions to problems they currently or could easily recognize. The problem for media-based systems is to find appropriate educational messages, reflecting solutions that fit with the lives and preferences of audiences, and then to communicate them clearly so that they permit action. The issue is developing not cosmetic broadcasts

which give only the appearance of action, but tying media messages to knowledge of audiences. Broadcasts linked to concomitant resource or environmental change are particularly promising and such links may be crucial for some areas of practice change.

Under current circumstances national planners are best advised to be wary of face-to-face outreach education on grounds of feasibility, and may find media-based systems promising. For those in the business of developing yet more informed judgements about the utility of nutrition education, five specific research activities may produce some return.

1) Look to see what actually goes on in conventional programs. What little money goes into nutrition education in many countries may be located in such programs. Is it possible to build an effective program on the basis of what is already done, or is the structure fundamentally inappropriate, as has been assumed in this review? The tendency to start anew, while understandable, raises difficult issues with regard to long term survival. Building on existing programs, while it risks opposition from an entrenched bureaucracy, may be an easier administrative route.

2) Look at the Indonesia Nutrition Education program over the long term. Does the volunteerism continue to work and expand? Is it possible that even if the number of volunteer hours declines, that the new practices have taken hold and will diffuse in the community? Or on the contrary, does the atrophy of voluntary participation mean that even those who improved during the experimental year will backslide?

The latter is what the Candelaria evaluation suggests will occur. Long term observation may also provide further information about the possibility of face-to-face outreach on a routine, large scale.

3) Media-based projects deserve further tests. Field-based programs which emphasize instructional design may be the only way to do large-scale nutrition education in many countries. They may not be as effective as well-done face-to-face outreach, but they may be logistically feasible and thus the only game in town.

4) For both media-based and face-to-face projects, development of methods for the assessment of nutritional problems, for the pretesting of messages, for gaining constant intelligence about audience response and change would be a helpful activity. The need for precision, representativeness, insight and, at the same moment, timeliness and low cost make the methodological problems significant. They are increased if the staff of projects lack sophisticated methodological skills.

5) Nutrition education would be well-served by a far more rigorous cost and financing study than has been incorporated in these pages. Uncovering hidden costs, appropriately amortizing technical assistance and other capital expenditures, defining comparable measures of effectiveness, correctly indicating where financial burdens lie and presenting the absolute budgets likely to be part of a fully operating budget would surely help decision-making. Such information is not now available across a range of nutrition education approaches.

Endnotes

1. The term 'nutrition education' is used throughout this monograph because it is the customary term. Nonetheless, currently, this field incorporates far more than the usual notions of nutrition education. Readers of early drafts have suggested nutrition communication, or nutrition marketing as more appropriate terms to reflect the wide range of information programs meant to influence nutritional status.

2. This position is not universally accepted, however. Behrman and Wolfe (1984) organize some confounding evidence, both from their own work in Nicaragua and from others' studies. They find that for some countries and some poorly nourished groups, for each 10% increase in income there is less than a 4% increase in energy (and other nutrient) consumption. In Nicaragua they found less than 1% increase in calorie consumption with a 10% increase in income.

They hypothesize that "even in a population with substantial malnutrition... this pattern may reflect ... concern ... with taste, convenience, status conferral and time intensity -- as income increases."

They are skeptical of the impact of increasing income in reducing malnutrition. By implication they suggest that improvements in nutritional status for many are possible within current resources and that educational interventions may hold promise. They explicitly cite formal educational background as an important predictor of nutrient consumption.

These results are controversial and remain undeveloped with regard to specific nutrition educational implications. They have not been incorporated in the main argument of the monograph. However if they are confirmed, they may open substantial opportunities for educational interventions now viewed as closed by most observers.

3. Evidence for the association between mild and moderate malnutrition and intellectual capacity on which this hypothesis lies is by no means unequivocal. Certainly height predicts achievement (cf. Balderston et al, 1981) and one form of malnutrition is defined by height-for-age (cf. Griffiths, 1981). However whether those height/malnutrition and height/achievement correlations are sufficient grounds for a causal inference about the effects of malnutrition on achievement or intellectual capacity is an open question. (Habicht, 1983).

4. As a side issue, it may be worth noting that such informal investigations may not always produce parallel results to more formal surveys. One striking example comes from the comparison of one result from the developmental investigation and a parallel result from the baseline survey for the evaluation of the MMHP Honduras Project. The developmental investigation suggested that "the expected extent of purging behavior did not show up" (p. 5), but the baseline survey suggested that as much as 70% of the population may have been purging during diarrheal episodes. [Focite, 1983]

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