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THE INTEGRATED MATERNAL AND CHILD NUTRITION PROJECT  
IN INDIA: RECOMMENDATIONS BASED ON A REVIEW OF  
PAST EXPERIENCES

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## I. INTRODUCTION

In the spring of 1979, Community Systems Foundation (CSF) was contracted by the Agency of International Development (AID) to perform a qualitative evaluation of the P.L. 480 Title II (Food-for-Peace) Program in India (Nelson, Sahn and Rogers, 1979). The evaluation was most critical of the maternal and child health (MCH) feeding projects which were providing Title II commodities to pregnant women, infants and pre-school-age children. It was suggested that the purpose of these MCH projects, to improve the nutritional status of the target population, was not being achieved due to a series of design and implementation constraints.

Among the CSF evaluation team's recommendations was that projects which involved providing a food supplement, and no other public health, education or community development components, should be upgraded to include a more integrated package of services. Projects unwilling or unable to do so should be actively discouraged.

In the wake of these recommendations, USAID/India and AID/Washington have conceived the India Integrated Maternal and Child Nutrition Project. The project is designed to assist the Government of India (GOI) and state governments in improving the type and quality of services delivered in their maternal and child health program. Efforts would focus on strengthening existing activities in the Special Nutrition Programme (SNP). The SNP is a national supplementary feeding program, first introduced in 1970-71 by the Department of Social Welfare of the GOI; presently it covers 6.7 million children in India, financed mainly by state governments. Indigenous food from India's agricultural surplus, as well as commodities supplied by CARE through the P.L. 480 Title II Program and by the World Food Programme are used in the SNP.

Widespread criticism has suggested that the SNP is generally a food dole program without sufficient screening of participants. Poor targeting of the food supplement coupled with widespread leakages of the supplement due to: (1) sharing with other family members; (2) substitution

of the supplement for other family foods; and (3) infection or parasitic infestation decreasing biological utilization, have all been suggested as possible obstacles to the SNP's nutritional impact. In addition, it has been asserted that the feeding serves solely as a palliative, fostering dependencies without contributing to the long-term welfare of the community. As such the efficacy of the SNP, and the continued programming of P.L. 480 Title II food in this effort, is questionable.

An alternative to the feeding only model which characterizes the SNP is the GOI-funded Integrated Child Development Services (ICDS) begun in October 1975. It delivers an integrated package of services, including supplementary feeding, immunization, preventative and curative health care, referral services, nutrition and health education, and non-formal education. This model has been proposed as a viable alternative to the SNP. However, many have argued that the cost effectiveness of the ICDS is controvertible; therefore, the replicability of such an effort on a national scale is dubious. Thus, questions still remain as to whether USAID's Integrated Maternal and Child Nutrition Project will attempt to emulate the ICDS scheme, some variant which might be less costly, or possibly devise a substantially different approach to an MCH feeding program designed to improve nutritional status and decrease infant and child mortality.

As a prelude to formulating the actual design of the Integrated Maternal and Child Nutrition Project, it was decided to review and examine critically the experiences of other feeding programs which have attempted to improve the health and nutritional status of women, infants and children in India. The intent is to glean guidance and information from previous endeavors, prior to outlining the design specifications for the new Integrated Nutrition Project. Both large-scale operational programs and small-scale research and demonstration projects are examined. The latter are included because they are so pervasive in the Indian setting and provide useful insight and experience; this, despite the realization that outcomes associated with such research activities are skewed due to a larger commitment of resources, experience and expertise than in large-scale operation projects.

Therefore, what follows is a discussion of salient issues specifically identified by AID, which must be addressed by the project design team. Lessons learned from past experience will also be reported as found in the literature and gathered from personal experiences in India. In addition, specific design recommendations which may be derived from this review will be provided.

## II. PROJECT DESIGN ISSUES AND CONSIDERATIONS

### A. Participant Selection and Graduation Criteria

#### 1. Reasons for Using Nutritional Criteria

Selecting the participants of an MCH feeding program is initially a function of defining project purposes and goals. If poverty and economic deprivation are of primary consideration, and redistribution of resources is seen as the only long-term and meaningful solution to the problem, then MCH feeding projects may be defined as a market intervention. In that instance targeting of the food to individuals within a family is unnecessary. Rather, the supplement is a subsidy and resource transfer; poverty alone represents the criteria for participation. Nutritional need is of little importance in determining program participation. Similarly, if human resource development through pre-school education is the major intent of the program, and provision of a food ration is assumed to encourage attendance at a nursery, well nourished and poorly nourished children would be equally appropriate beneficiaries.

In the case of the Integrated Maternal and Child Nutrition Project, the purpose of improved nutritional status with the goal of reducing infant mortality is explicitly stated. It follows, therefore, that the selection of program participants must be based on nutritional criteria; social, economic, political or similar considerations are not sufficiently precise parameters for selecting program beneficiaries.

This is not to intimate that the selection of participants from specific regions, districts, blocks, and villages is not appropriate; or that caste, economic hardship, and residence in tribal and drought prone areas are not legitimate considerations

in identifying beneficiaries. Quite to the contrary: such criteria serve as an excellent proxy for identifying clusters of potential program beneficiaries. But once a project has been initiated in a community, the distinction of socioeconomic hardship is insufficient reason for an individual's participation in the feeding component of a nutrition project. This holds true even when social and cultural norms within the village, and project regulations, limit participation to the poorer segments of a community.

The selection of participants on the basis of nutritional criteria has not been characteristic of supplemental feeding programs in India, as will be discussed later. However, the reasons for rejecting socioeconomic and geographical selection criteria as sufficient for participation in a feeding program, especially for infants and children, may be summarized as follows:

- Despite the possibility that many of the rural and urban poor represent at-risk groups and would undoubtedly profit from the receipt of a free meal, data suggest that the number of children with severe malnutrition is a fraction of those with mild and moderate malnutrition (Levinson, 1974). In fact, it is estimated that only 2-4% suffer from severe malnutrition (NIPCCD, 1978), and 8% of the pre-school children manifest severe growth retardation (MMMB, 1979). It has also been shown that feeding programs are more likely to show impact on the nutritional status of the most malnourished children (Chadha, 1979; Venkataswamy and Kabir, 1975; Kielman et al., 1978). And since the decrease in mortality rates associated with the transition from severe to mild nutrition is considerably greater than the move from mild malnutrition to normalcy (Singer, 1978), it is hard to justify not targeting resources to the most malnourished. This fact is of special significance in relationship to AID's Integrated Maternal and Child Nutrition Project,

given the goal of decreasing mortality.

- If it is accurate that among the impoverished multitudes of India there is widespread mild under-nutrition due to marginal caloric intake, the deleterious effects of the situation have yet to be sufficiently documented. Adaptive mechanisms of slightly underfed children are numerous and may not portend any serious consequence on the long-term well-being of an individual. For example, the question of whether small stature is a critical public health issue, or solely an adaptive process which results in no serious handicaps to a child, has yet to be resolved (Waterlow, 1979). In addition, the findings of anthropometric surveys which indicate widespread stunting must be seriously scrutinized. The issue of reasonable growth expectations for a country like India is still under debate. The use of traditional western reference standards in the Indian context must be viewed with caution (Seth et al., 1970).
- Similarly, the biological response to increased calorie intake among mild and moderately malnourished children is not yet understood. Hence, it is not clear what, if any, benefits will accrue from closing the nutrient gap of a slightly underfed child (Beaton and Ghassemi, 1979). For example, a biological equilibrium which might result in slightly lower anthropometric measurements with no other cognitive, emotional or physical effects may be reached. Until these issues have been more clearly resolved by the scientific community, the formulation of large-scale efforts to address these concerns would be premature.
- To feed the entire population of children defined to be below the poverty line and hence considered malnourished (since the poverty level is defined as the minimum income needed to afford

an adequate energy intake), would be prohibitively expensive, and beyond the means of any conceivable GOI or U.S. bilateral effort (Department of Social Welfare, 1979). Specifically, Dandekar and Rath (1972) estimate that about 40% and 50% of the rural and urban populations, respectively, are poor and malnourished. Likewise, the GOI Planning Commission has estimated that about 300 million Indians are below the poverty line with inadequate calorie intake (Planning Commission, 1979). Of these, 43 million are estimated to be pre-school children, of which only a small fraction are reached by the Title II Program or other GOI supplementary feeding programs. A manifold increase in program size would be necessary to reach the entire group of disadvantaged children. Such enlargement of MCH feeding efforts is considered unattainable.

- Even if resources were available to mount such a magnanimous effort, evidence suggests that the picture of an epidemic of under-nutrition affecting almost half of the Indian population painted by Planning Commission figures are grossly inflated (Sukhatme, 1980); they are based on a rather tenuous methodology concerning the ability to purchase an adequate least cost diet (Bliss and Stern, 1976; Poleman, 1979). If this be the case, the allocation of resources to a problem of questionable proportion would be a tragic waste, given the other health and development needs of India.

The above points indicate the need for screening potential beneficiaries of the food ration on the basis of nutritional status, selecting only the most malnourished. However, it is stressed that withholding a food supplement does not imply exclusion from the program and its related services. To the contrary, every effort should be made to enroll all children in a nutrition monitoring and surveillance system; complementary services of a feeding program should be available to all. But creating the expectation among villagers that there is an endless stream of

food, available for the asking, will only result in the diversion of a finite resource to those who are not in greatest need. This can only serve to create dependency and a disincentive to motivating a community to solve their own problems. The food can and should be used as an incentive for participation in other health activities and as mechanism for imparting an educational message. However, if this requires that all the children must continually receive the food, alternative methods of animating a community should be explored.

This final point of the effectiveness and legitimacy of using food as an incentive to participation in other health and educational activities has been the subject of debate. Beghin et al. (1972) suggest that nutrition education programs are doomed to failure if they emphasize food first and education second. The need to begin the educational process first, and apply the use of food as a therapeutic and educational tool is stressed. Similarly, Stevens says, "the provision of food rations reduces the likelihood that participants will be attending in order to learn better health practices, and increases the probability that they will be motivated by a desire for a free handout" (Singer, 1978).

It is therefore concluded that it is appropriate to use supplementary feeding in a targeted fashion as a reinforcement for the other project activities. This requires that specific criteria be developed to target food to those at greatest nutritional risk, in order to assure the greatest impact of the resources being devoted to the program.

Finally, it is stressed that participation criteria are like a two-edged sword. On the one edge is the issue for enrollment or initial eligibility in the program. The other edge concerns determining when a beneficiary is "un-enrolled"--what will be referred to as graduated from the program. Duration of

participation and what criteria are employed in removing someone from the list of recipients of free food is of equal importance to the initial selection criteria.

## 2. The Absence of Using Nutritional Criteria in India

In the recent P.L. 480 Title II evaluation by Community Systems Foundation (Nelson, Sahn and Rogers, 1979), it was noted that the MCH program was clearly reaching the poor and economically disadvantaged. However, it was also remarked that this did not imply that the most malnourished children of the population were the beneficiaries of the program. The lack of participation of children below three years of age, and pregnant and lactating women, and the pervasive absence of screening of participants on the basis of nutritional need was stressed. This inability to target foods to the most malnourished children, was viewed as a major obstacle to the achievement of nutritional impact.

These findings have been corroborated in a number of other documents and interviews which indicate that the vast majority of supplementary feeding projects implemented in India during the past decade have involved the ad hoc selection of beneficiaries in a village. Even in those instances where data were collected that could be used for screening (e.g., weight, height), rarely was participation based on the available information. This generalization applies to the numerous research projects which have attracted world-wide attention for their comprehensiveness and findings, as well as the large-scale operational programs which are characterized by widespread coverage and a major commitment of resources. In fact, it is only in a handful of relatively small, isolated, and to-date unrepeated projects, that there has been a concerted effort to develop and adhere to explicit participation criteria based on nutritional status.

To amplify on this issue of not formulating explicit nutritional criteria for participation, it is noteworthy that in research activities like the Tamil Nadu Nutrition Project (Cantor Associates, 1974), "all were invited to participate, not just the poor and backward." In Project Poshak (Gopaldas et al., 1975), all children between 6 and 36 months, and pregnant and lactating women who were in the study villages were encouraged to participate. Likewise, in Narangwal (Kielmann et al., 1978), all children in the villages were included in the study, and no criteria were developed for participation. In these and other similar research projects which attempt to gain insight into the process and impact of various intervention schemes on different segments of the population, the lack of specific participation criteria is justifiable.

Among the major operational projects in India, past and present, little evidence exists that participants are chosen on the basis of nutritional need, despite delineated selection criteria.

Concerning the SNP which reaches almost seven million beneficiaries, guidelines suggested that there are "high priority target groups." These include severely malnourished children, especially children 4 to 36 months, women in the last trimester of pregnancy, and nursing mothers for the first four months after child birth (Department of Social Welfare, 1979). To implement these selection criteria, continuous screening of the population to allow for the judicious utilization of limited resources is necessary. Alternatively, it has been recommended that in those SNP centers with minimal facilities, the "bangle test" or three-colored strip be used to select children on the basis of arm circumference. It is noted that besides being an easier measure, it is not dependent on the age of a child (Rajendran, 1978a).

Unfortunately, evaluation studies of the SNP indicate that there is little, if any, screening of the beneficiaries on the basis

of nutritional or any other criteria (Ilath et al., 1978; Chatterjee, 1973). The neglect of the child under three has similarly been found to be a major problem; this despite the official GOI guidance that two-thirds of the beneficiary children should belong to this group (Rajendran, 1973). Duration of participation in the program seems to be equally ad hoc, as exemplified by the finding that neither women beneficiaries nor organizers knew how long they were participating in the program. They could only surmise that the typical pattern was to be enrolled two or three months after conception, and thereafter until a child is about one year old (Ilath et al., 1978).

A similar scenario of lack of explicit participation criteria has been described in a recent evaluation of the Applied Nutrition Programme (Muthayya et al., 1973). The need was recognized for guidelines to select beneficiaries of supplementary feeding; it was argued that the lack of consistent application in the selection criteria was an impediment to project effectiveness.

A series of operational programs others than the SIIP and ANP were also reviewed. In a nutrition project in the Punjab (Government of Punjab, 1974), the target group was defined on the basis of geographic location, rather than formulating participation criteria based on the individual. Identifying malnourished individuals was considered to require elaborate and expensive methods of measurement. It was also felt that the problems in employing nutritional status criteria (i.e., dietary and anthropometric measurement) would perforce result in selection criteria based on religion, caste and income, which would have a negative effect by reinforcing these distinctions.

Therefore, a geographical area which was determined to have a high likelihood of widespread malnutrition was selected as the site for the feeding program. The entire population in this designated area was eligible for supplements. Interestingly, it was argued that those not in need would not participate in

the program because of a process of self-selection, coupled with cultural norms and peer pressures.

This type of regional or geographic approach to selecting beneficiaries was indicative of many other operational programs including the following CARE programs which were reviewed: Composite Program from Women and Pre-schoolers in Kerala; the Modified Special Nutrition Programme in Tamil Nadu; Child Health-Services Support to the Family Planning Programme, Pondicherry, Tamil Nadu; Madras City Slum Project in Tamil Nadu; and the Integrated Child Health Scheme in West Bengal (CARE, 1980). All these efforts deserve commendation due to the integration of related health and educational activities with the provision of a food ration. They demonstrate CARE's willingness to attempt innovative project designs, responsive to local conditions. However, there is not any explicit nutritional screening apparatus used in the selection and retention of beneficiaries.

Given that the ICDS has been suggested as a possible model for the new Integrated Maternal and Child Nutrition Project, it is also important to review the participant selection criteria employed. According to stated guidelines, children who are determined to be second- or third-degree malnourished are provided a supplement (second-degree being defined as below 70% of the fiftieth percentile of the Harvard Standard, and third-degree as below 60% of the Standard). In addition children 3 to 5 years of age who attend Anganwadis (day-care centers) for non-formal education and other pre-school activities take part in supplemental feeding regardless of nutritional status. Pregnant and nursing women who belong to the families of landless agricultural laborers, marginal farmers (holdings not exceeding one hectare), scheduled tribes, scheduled castes and other poor members of the community (defined as total family income not exceeding Rs. 300) are also eligible for supplementary feeding. Doctors or the paramedical worker also may enroll women not falling in the above categories, when

deemed necessary and appropriate (Dayal, 1977).

An evaluation of the application of these participation criteria indicates that, "As for the selection of beneficiaries for supplementary nutrition, on the basis of weight-for-age criteria, this was conspicuous by its absence in all the projects," with the least vulnerable children (3 to 5 years of age) receiving most of the food supplements. In addition, pregnant women have been under-represented in the ICDS. The major reason suggested for the low participation of children under three, and pregnant and lactating women, has been that implementors have formulated their own criteria for participation: reaching the most accessible and convenient group (Programme Evaluation Organization, 1978). The fact that all children attending Anganwadis were eligible clearly facilitated this bias.

Given the failure of the ICDS, SiIP, AiIP and other projects at developing and adhering to criteria for participation based on nutritional need, are there any programs which have succeeded in developing innovative approaches to selecting beneficiaries? The answer is yes.

### 3. Examples of Using Nutritional Criteria in Selecting Participants

In the Kasa Project (Shah, 1975; Shah and Corra, 1976; Shah, 1977), the nutritional criteria for participation in the feeding program was defined clearly and adhered to strictly. Specifically, in order to be eligible for food rations, the child had to be considered severely malnourished: weight for age being 65% or below the Harvard Standard fiftieth percentile. Thereafter, children remained enrolled until they have maintained a weight greater than 65% of this mean for six weeks.

It is noted that the number of children 66% to 70% of the Harvard fiftieth percentile is about two-thirds the size of the

entire group of children below the 65% level.

Thus, given the amount of supplemental food available, and the cost involved in feeding, selection criteria was set at 55% of the fiftieth percentile, in order to limit coverage to the severely malnourished.

In addition to the weight-for-age criteria, four other indicators of being "at-risk" of nutritional need were used in Kasa. They were:

- failure to gain weight for three successive months;
- loss of weight during two successive months;
- weight less than 2.5 kg at birth;
- presence of an acute illness such as measles or severe gastroenteritis.

In these instances, individuals who are kept under surveillance by the project may be given food supplements as deemed appropriate by project staff.

The provision of a food supplement to women participating in the Kasa Project was also based on an at-risk criterion. Any of the following conditions were considered sufficient reason for enrollment in feeding:

- weight was 38 kg or less prior to pregnancy; 42 kg or less at the end of the thirty-fourth week of pregnancy; or weight gain was less than one kg per month after the fifth month of pregnancy;
- height was less than 145 cm;
- had a first baby when age was less than 18 years or greater than 30 years;
- age was 25 years or older at the time of conception;
- had a still-birth or abortion during previous pregnancy;
- had a child who died within a month after birth;

- had a previous delivery which was caesarean;
- was pregnant with the fifth or later child;
- had a child previously with a birth weight of less than two kg;
- had swelling in the legs;
- had bleeding;
- had jaundice;
- had high blood pressure;
- was concerned about the possibility of having twins.

Women falling in one or more of these categories were enrolled for feeding for six weeks prior to delivery and four weeks after the birth of the child (Shah, 1977). For both children and mothers, the constant, accurate, and up-to-date monitoring of nutritional status, episodes of diarrhea and measles, low birth weight babies and other at-risk factors is paramount.

One interesting note about Kasa's concept of at-riskness as a criteria for supplementation is that it was applied in communities previously receiving food under an SNP scheme. The SIIP was delivering a food ration of Sukhada to all pre-school children who attended a Balwadi. There was a fear that the proposed change in modus operandi might cause consternation among the villagers. This fear proved well founded at the outset. The Part-Time Social Workers, who were the central cog in the delivery of the integrated package of program services, were initially harrassed. As time passed, however, village leaders and the community at large developed an appreciation of the concept behind the selection process; a good rapport was developed, and community support for the effort was garnered.

In another program (Venkataswamy and Kabir, 1975) in Madurai West, Tiruppuvaram and Nathan Blocks in the Ramnad District of Tamil Nadu, children who were Grade III malnourished, as per the Gomez classification, were enrolled in supplementary feeding

at the Village Child Care Center; and thereafter if there was additional space, Grade II malnourished children were enrolled. Determination of nutritional status was made on the basis of a "Road to Health Card," prepared for each child in the community.

When the Village Child Care Center began, the average child participated for 180 to 210 days. It was subsequently determined that feeding for 90 days was sufficient time to impart the educational message to the mothers as well as improve the nutritional status of most participants. Continued supplementation beyond three months resulted in less interest in learning, and more interest in having responsibilities assumed by the Center.

The short duration of feeding coupled with the intensity of the educational effort has allowed villages, as well as individuals, to graduate from the program once all the nutritionally vulnerable children have been reached. Recuperation of the most acute cases of malnutrition, in addition to community learning from the intervention, is designed to result in long-term benefits, preventing reversion to the previous state of malnourishment. Follow-up studies have indicated that this expectation has only been partially realized. Initially, the number of Grade III and IV malnourished children was reduced by 55% (from 32.7% to 14.8%) but only a 32% reduction was maintained two years later (32.7% to 22.4%).

Despite any shortcomings of the Kasa and Village Child Care Center projects described above, the new World Bank Nutrition Project in Tamil Nadu (World Bank, 1980) has clearly adopted many of their concepts, including that of receiving a food supplement for a short interval of time. However, the Bank project will have some major differences in its selection criteria. First, the project will be directed only to children 6 to 36

months of age. Second, rather than using a static measurement of weight and an arbitrarily selected cut-off percentile point (i.e., 65% of the fiftieth percentile) as the criteria for enrollment or terminating feeding, the project will rely on the use of weight gain criteria. Specifically, children between the ages of 6 to 12 months whose weight gain is not adequate over two successive monthly weighings (or three consecutive weighings for children 1 to 3 years of age) will be eligible for supplementation.

It is expected that children will subsequently participate for 90 days; they are expected to gain 500 grams during the period. They will thereafter be discharged. If expected weight gain does not occur, beneficiaries will remain eligible for 30-day increments, up to a maximum of six months. Special nutrition education and/or medical attention will also be provided.

Permanent improvements in feeding practices are also intended to result from the intense educational efforts and related health services. It is also anticipated that the feeding program will be phased out in villages in the course of time.

Concerning eligibility criteria for pregnant and lactating women, a list of high-risk factors associated with a high likelihood of giving birth to a baby less than 2500 grams is being developed. Women falling in this category will be provided a supplement for the last trimester of pregnancy and the first four months of lactation. It is estimated that this eligibility criteria will cover approximately 30% of the women in the villages where the program is operational.

#### 4. Final Note on Measures

The Bank's decision to select inadequate weight gain as a

pre-requisite for participation, as opposed to a percentage of the mean (e.g., the Gomez classification), demands a further comment.

It could be argued that selecting for the most malnourished in a community will reduce an MCP program to a de facto nutrition rehabilitation program. This is almost certainly the case and intent if one employs the strict criteria of less than 60% or 65% of the mean of a given standard. However, by selecting the path or direction that a child's growth shows in relation to standard reference curves (e.g., the third and fiftieth percentiles of a growth chart) as the criteria for enrollment, the program really assumes a preventative posture; it will provide for the early diagnosis of faltering growth, a sure sign that malnutrition is imminent. This will be the case despite the child's weight being considerably above the percentile curves designating second- or third-degree malnutrition.

Likewise, a child suffering from Kwashiorkor may be edematous and thus recorded as having a normal weight-for-age. If the direction of weight gain is the indicator examined, an edematous child will not be mistaken for healthy, as a previous period of a downward growth pattern and weight loss would be characteristic.

Enrolling a child in a feeding program when, for two to three consecutive months, growth is not commensurate with the velocity of weight gain indicated by a standard growth chart, is therefore recommended. The provision of the supplement combined with an increased awareness on the part of the mother and village level nutrition worker could forestall continued deterioration. And if the child's condition does not show a marked improvement as indicated by an upswing in the direction of the growth curve, referral for medical attention and/or other measures is obviously necessitated.

Similarly, employing the direction of the growth curve will eliminate the participation of two groups not requiring food supplementation. The first group are those who were previously malnourished, and still have a low weight-for-age. If their growth curve is at least parallel with the reference curve, they will not develop severe malnutrition. The other group which slips through the traditional malnutrition screening net contains those children who are genetically small, and invariably get enrolled in a feeding program. There is great variability in the genetic growth potential of individuals, as a broad spectrum of weights is normally distributed among the population. Therefore, a child's position on a weight chart is much more a function of genetic potential than of nutritional status. Genetically small children who are normal or mildly malnourished will get misconstrued as severely malnourished and be enrolled in the program; likewise, those children who are genetically large (e.g., the 10% of the population distributed above the ninetieth percentile) may be seriously malnourished but maintain a weight-for-age above an arbitrarily selected cut-off point (e.g., 65% of fiftieth percentile).

Concerning the use of measures other than weight in selecting participants, it could be argued that height-related measures will be less prone to misclassifying a child as malnourished due to genetic variability or edema. However, this is not the case. Height is insensitive to a child's present nutritional status since height deficits take a long time to develop. In addition, the distribution of heights in a population is narrow; effects of small measurement errors are magnified. Heights are also much more difficult to measure than weight, and are subject to greater inaccuracies due to their lack of precision.

Concerning the use of arm circumference as a screening tool, simplicity in application and independence of age make it very attractive. However, while it is adequate for determining the

level of malnourishment in a community, it is not sufficiently discriminatory to be used for individual diagnostic purposes and will not respond rapidly enough to the immediate changes in a child's nutritional status. Therefore, arm circumference will not allow for the timely enrollment, or, of equal importance, timely discharge from the program. And furthermore, if there is any intention of assessing program performance, arm circumference is of little use in evaluating the impact of nutrition programs. Measures of linear growth (e.g., height and weight) are preferable (Martorell et al., 1980).

It is recognized that the use of height measures in conjunction with weight also presents an accurate picture of nutritional status (e.g., using such schemes as the Waterlow classification). This is indisputable. However, the difficulty of accurately measuring the height of a child in the field and the time-consuming nature of the task, preclude its widespread application.

Finally, possibly the best justification for using weight gain criteria as opposed to the alternatives is its educational potential with the mother. Weight-gain is a concept which village level workers can be expected to understand and embrace; thereafter, they can impart an educational message about a child's development and nutritional status to the parents through the use of growth charts. The intricacies of combining height-for-age and weight-for-height measures will only obfuscate and impair the learning process.

## B. Food Quantity

A range of different quantities of food have been used in supplementary feeding programs in India. The marked differences in the nutritional value, form and quantity of food used raises one's curiosity as to how and why various rations were adopted. It can be surmised that most rations are chosen on the basis of precedent, rather than consideration

of the context in which the food is being delivered.

A more methodical approach to selecting ration sizes is therefore demanded. The steps for doing so will be suggested below, and the lessons learned from the Indian context will be considered.

### 1. Determining the Size of the Nutrient Gap

The determination of the difference between the individual's nutrient intake, and nutrient requirements for restoring and/or maintaining optimal health and nutritional status should form the basis for selecting the quantity of food provided in a feeding program. This idea is conceptually simple: determine intake and subtract that figure from the recommended nutrient intake. However, in practice this procedure poses formidable obstacles.

#### a. Nutrient Intake

Once a target population has been delineated, it is incumbent upon the program planner to quantify the nutrient intake of the malnourished individuals who will receive supplements. This must be done for calories, proteins and whatever other nutrients (e.g., vitamin A, iron) are deficient in the target group's diet. Thereafter, the nutrient intake of these individuals (excluding normal or mildly malnourished children) should be averaged, according to age. This will determine the mean intake of the target group stratified by age categories.

Traditional methods for assessing dietary intake include the recall method (often for the previous 24 hours) and weighing foods which are consumed by the target individual. The accuracy of both these techniques has been questioned and shown to be far from exact.

As for the recall method, the techniques used by interviewers are often suggestive of an "appropriate" response; or likewise, the respondent will attempt to answer the question "correctly," not acknowledging feeding patterns known to be inadequate. There are also the issues of forgetfulness and unawareness. In the former case the mother may not accurately recollect what was provided to the child or eaten by herself. In the latter case a child might be given food by a sibling or neighbor, about which the mother is not aware. And finally, the daily and/or seasonal fluctuations in dietary intake may necessitate conducting diet surveys more than once a year.

As for the weighing of food to determine the quantity of food ingested, this is theoretically more accurate than the recall technique. However, drawbacks like interfering with normal consumption patterns, and the time and cost involved in such a procedure, limit its applicability.

Despite the limitations of the various methodologies described above, the determination of nutrient intake remains a necessary first step in estimating the nutrient gap. Awareness of the previously mentioned problems will help minimize their effect and enhance interpretation of the data collected.

#### b. Nutrient Needs

Once the average nutrient intake of the malnourished target population is determined, it is necessary to compare that figure with a standard which estimates the recommended dietary allowance for a child or woman in the same age group. A number of different standards exist (e.g., FAO/WHO Dietary Standard; U.S. Recommended Dietary Allowances), each indicating a different dietary requirement for the same population. However, it would seem most appropriate to use those standards

recommended by the Indian Council of Medical Research (ICMR, 1980). These are found in Table 1.

It must be cautioned, however, that these dietary standards were formulated for a healthy, well nourished population. Both malnutrition and various diseases (especially due to parasitic infestation) have been shown to increase the nutrient needs of the individual.

Conversely, it is also worth noting that the dietary standards are two standard deviations above the mean and are designed to cover 97.5% of the population. Therefore, the fact that an individual does not reach the recommended intake does not imply that he/she is malnourished. Once again, caution in applying the standard is suggested.

c. The Difference Between Needs and Intake--The Nutrient Gap

Once the two preceding procedures of determining nutrient intake and nutrient needs have been completed, taking the difference between the two will be an accurate estimate of the nutrient gap of the target population. It will thus give the program planner substantive guidance on the size of the nutrient gap for which a supplement has to compensate. Important questions such as the proportion of calories to protein desired in the supplement must also be addressed. (It is generally recommended that 10-15% of the supplement be in the form of protein.)

It is emphasized that this estimate gives the nutrition planner an indication of the amount of a supplement which has to be ingested by the average recipient in order to improve their nutritional status. This figure is very different from the amount of food which must be provided in a given ration, since there are many sources of leakages between provision of

Table 1

## ICMR Dietary Allowances for Indians

	Calories	Protein
<b>I. Women</b>		
Sedentary	1900	45
Moderate work	2200	45
Heavy work	3000	45
Second half of pregnancy	+ 300	+10
Lactating	+ 700	+20
<b>II. Infants</b>		
0 - 6 months	120/kg	1.8 - 2.3/kg
7 - 12 months	100/kg	1.5 - 1.8/kg
<b>III. Children</b>		
1 year	1200	17
2 years	1200	18
3 years	1200	20
4 - 6 years	1500	22

the ration and actual consumption; that is, there are a number of variables which impact upon what percentage of the pre-determined ration is actually received and consumed by the beneficiary. These factors will be discussed below.

## 2. Determining the Amount of Supplement Consumed

Once the size of the nutrient gap has been established, the planner will have to estimate how much food must be provided by the program to compensate for: (1) less than perfect attendance and irregularity in food distribution; and (2) various types of leakages in the system due to sharing of the ration and its substitution for family food which is withheld due to program participation.

### a. Rates of Participation

A determination of the regularity of a beneficiary's attendance at the feeding center, and how often scheduled feeding times occur at the center, will determine the rate of participation.

The attendance rates in MCH feeding programs have been variable. The highest rates were reported in the India Population Project (NIII, 1970), where 95% of the beneficiaries attended the center for 90% of the distribution days. The experience in the Punjab (Government of Punjab, 1974) was almost as good, with 80% of the children attending the centers on the days in which feeding occurred. In the Tamil Nadu Nutrition Study (Cantor Associates, 1974), the 61% attendance rate in a take-home feeding program was considered excellent, especially given that there was no attempt to follow up on the target group through home visitation.

In Project Poshak (Gopaldas, 1975), the attendance at Balwadis which provided supervised on-site feeding was 26%, 48% and 65%

for the 6 to 11, 12 to 23, and 24 to 36 month old age groups. Interestingly, during the take-home phase of Poshak, participation rates were found to be only 53%, indicating that take-home distribution is not necessarily the answer to the poor participation of the 6 to 36 month old age group.

Various ecological trends affecting the regularity with which participants collect their ration have been suggested by Gopaldas et al. (1975). They include:

- Distance: villages within three km had higher attendance.
- Landownership: the landless laborer and more prosperous farmers were less responsive.
- Working status of mother: mothers who work were less likely to attend.
- Child's sex: male children had a greater attendance.
- Village size: the smaller the village, the greater the participation.
- Enrollment of mother-child unit: when there were two participants, attendance increased.
- Number of siblings in the family: the more siblings, the more participation.
- Income: the poorer people collected food more often.
- Mother's opinion of health of child: when the child was perceived to be in poor health, attendance increased.

In another study of the SNP (Math et al., 1978), reasons for not attending on-site feeding at the center were provided. The most predominant response (by 69% of those questioned) was that the child was too young. Other explanations for poor attendance included: the location of the center; the child's mood; the child was handicapped; and big crowds at the center.

The presence of harijan children in the creche (nursery) was

the major reason for lack of participation in the Indo-Dutch Project (Devi and Pushpanma, 1978). Nevertheless, 15% of the children attended 90-97% of the time; 30% of the children participated 80-90% and 70-80% of the time; 5% attended 60-70% of the time; and 20% participated less than 60% of the time.

While attendance rates of participants at feeding centers is an important variable, so is the regularity in which feeding takes place at the centers.

This factor, like attendance, has been variable. In a program run by CARE in the slums of Calcutta, 60% of the scheduled meals were distributed to the beneficiaries. In this case, logistical problems of supplying the food were the main constraint (Chadha, 1979). According to respondents participating in the AIP (Rao et al., 1978), that program was also plagued by irregularity in the provision of food. In Kerala almost all the AIP beneficiaries said that the scheduled daily feedings took place; only 55% stated so in Orissa. In other states such as Uttar Pradesh, according to the functionaries, feeding centers operated less than 33% of the times designated.

To the contrary, other programs have reported excellent regularity in feeding. For example, an evaluation of the SNP in Karnataka indicated that 90% of the centers distributed food 95% of the time (Sastry et al., 1980a).

It can be seen that the rates of participation in programs vary widely as a function of the regularity in which the program operates and the rate of attendance at the center. It is therefore of fundamental importance that a management system is developed to maximize the regularity of feeding. Project design should also emphasize facilitating attendance at the centers. Attention to the variety of socioeconomic, ecological and physical considerations identified above is

paramount, as issues other than whether a program involves on-site or take-home feeding will influence rates of participation. And likewise, accurate expectations and estimates must be formulated to assure proper formulation of ration levels.

b. Leakages

If and when the food supplement is received by the beneficiary, and prior to being consumed, the food can be diverted to other family members. Thus sharing occurs, which will limit the amount of the supplement available to the program participant.

Similarly, the supplementary food may be consumed by the target individual. However, the family foodstuffs ordinarily earmarked for that individual may be diverted to other family members. Thus substitution occurs, which decreases the incremental increase in food ingested attributable to the program.

- Sharing is more characteristically portrayed as a problem with take-home projects rather than on-site feeding. As a result, the new World Bank project (World Bank, 1979), for example, has selected an on-site distribution system specifically designed to curtail sharing. And since they recognize how daily attendance at the center (as opposed to a weekly or bi-monthly distribution of food) poses an inconvenience and hardship for participants, feeding centers will maintain flexible hours.

However, the evidence that on-site programs eliminate sharing is not conclusive. Reports of siblings sharing food at the feeding center, as well as participants taking home all or part of the food from informally supervised on-site projects

is widespread.

The India Population Project (NIH, 1979) reported that sharing was observed in 75% of the households. In a study of the on-site SNP in Delhi (Nath et al., 1979), food was shared with siblings in 88% of the cases. This problem was also found in the SNP feeding program in Karnataka (Sastry et al., 1980a), where 86% of the slum children and 43% of the tribal children took home the food. Thereafter, the supplement was shared about 50% of the time. Indeed, if an on-site, daily distribution center is viewed as the answer to sharing, strict control must be exhibited by the center personnel over the consumption of the ration.

One other interesting consideration in attempting to minimize the sharing of the supplement is the finding that bread was shared 46% of the time, while milk was shared only 24% of the time (Sastry et al., 1980b). This indicates that the magnitude of sharing also depends on the type of food provided. The provision of milk, rather than cereals and bread, apparently is an effective way to reduce leakages in the ration.

- Substitution can be equally characteristic of both on-site and take-home programs. For example, in the recent ANP evaluation (Muthayya et al., 1978), the ration was found to substitute for 20% of the child's portion of family food, and 22% of the mother's food. In Karnataka, 13.9% and 61% of the slum and tribal mothers, respectively, who were interviewed about their child's participation in the SNP, reported they had reduced the amount of food made available to program beneficiaries from the family food supply.

In another experiment it was found that 60% of the food served as a supplement, but 40% was a substitute. The mother cut

back on the basic diet of the child by about 80 calories per day (Gopaldas et al., 1975). Similarly, Godavari, Nalvakshi and Devadas (1970) reported a 42% reduction in the normal amount of food made available to the children who were receiving a nutritional supplement, designed to provide two-thirds of their daily requirements.

Often times it is impossible to distinguish between sharing and substitution; rather it is only possible to determine the size of the caloric increment which results from a feeding program. For example, in Tamil Nadu (Cantor Associates, 1974), the combination of sharing and substitution resulted in a loss of 62% of the food. The increase in dietary intake of the program was only 18% of the size of the supplement. So, once again, it is necessary to take into account the leakages due to sharing and substitution. Otherwise the ration provided the recipients will not have its intended impact.

### 3. Selecting the Size of the Supplement

Once the magnitude of the nutrient gap has been estimated, and realistic goals and projections formulated for rates of participation and leakages due to sharing and substitution, it is appropriate to determine the size of the food supplement.<sup>1</sup>

In examining the experience of past MCH supplementary feeding programs, it was rare that the size of the calorie gap of the target population was examined or estimated. And when the calorie gap was estimated, it was on the basis of the entire population (including healthy individuals) rather than surveying the malnourished children who would be the beneficiaries of the project.

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<sup>1</sup> The only exception to using this procedure involves a project such as that reported by Venkataswamy and Kabir (1975), where the food is not viewed as a supplement; rather 800 calories are provided at the Child Care Centers for a limited duration to rehabilitate the child and educate the mothers in the use of low-cost locally available foods. As such, concern over participation and leakages are mute, as the therapeutic diet provided almost all of the child's required nutrient intake.

In addition, although there was acknowledgement of poor participation and various leakages of the ration, efforts were rarely made to adjust the ration size accordingly.

For example, according to Swaminathan (1980), the Deputy Director of the National Institute of Nutrition, the average deficit of rural children up to five years of age is 300 calories. This information resulted in setting the SIIIP ration at a level which provides 300 calories. This will not close the calorie gap of the neediest participants (second- and third-degree malnourished), who may have a 400-500 calorie deficit. And as suggested earlier, it would be fatuous to expect perfect attendance and no sharing and substitution, which would further reduce the potential benefits of the supplement.

This inadequacy was illustrated in a study of SIIIP participants in Coimbatore (Devadas, 1977a) in which caloric deficits ranged from 450 calories for the 1 to 3 year olds, to 650 calories for children between 42 and 48 months. The SIIIP ration, however, remained 300 calories per day.

The ICDS ration levels were set to conform with the SIIIP ration, seemingly for no other reason than uniformity. However, the inadequacy of the caloric value of the supplement for moderately and severely malnourished participants was acknowledged. Thus provision is supposedly made to supply a larger food ration to those in greatest need.

Another example of poor judgement in formulating the ration quantity is found in a feeding program in the Punjab (Government of Punjab, 1974). The authors note that the requirements of the infant 6 to 12 months is 800 calories and 14 grams protein. According to their own studies, more than 40% of the Punjabi infants receive less than 400 calories daily, and 80% less than 600 calories. This was largely attributed to the finding that at

age 12 months, 59% of the infants had not yet been given solid foods and 26% had not yet received liquid supplements.<sup>2</sup>

Given the decision to provide food supplementation, it is perplexing that the level of supplementation provided was 200 calories; this knowing that the gap was 400 calories for the 40% of the participants who are most in need.

The problem of the supplement not supplying a meaningful amount of calories was even more acute in the 13 to 24 month old age group. The Punjab study figures indicate that 35% of these children receive less than half of the 1060 calories which they require on a daily basis. Therefore, the deficit for this group is 530 calories per day. The ration size was only 300 calories per day, hardly enough to have a major nutritional impact, considering the diversion of the ration to unintended beneficiaries, poor rates of participation and other leakages in the system.

The need for a more careful quantification of caloric and nutrient deficits is also illustrated by Project Poshak (Gopaldas et al., 1975). Pregnant and lactating women were provided 734 calories per day in the take-home feeding program. However, studies indicated that pregnant women had a daily deficit of 100 calories, and lactating women had no deficit whatsoever. The error in this instance was providing too much food to the target group. The result was that 75% and 90% of the supplement intended for lactating and pregnant women, respectively, was shared among the rest of the family.

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<sup>2</sup> Provided this formation, one could initially question the entire concept of supplying a food ration to these infants, since the causation of inadequate intake is clearly one of delayed introduction of supplementary foods. This issue can only be effectively addressed through education; providing mothers a hand-out of food will not be the answer. However, a case could be made for the food supplement being used as an educational device, supplying an incentive for participation in a learning experience.

In another phase of Project Poshak, the opposite problem was confronted. A take-home supplement of 85-100 gm of ICSM was provided to children aged 6 to 36 months old, with a caloric value of 323 to 380 calories. Home diets of children participating in the "take-home" vs. "on-site" feeding experiment indicated deficits of 587-688 calories per child. It was therefore felt that a food supplement which provided approximately 500 calories, regardless of the delivery system, would not have a major impact on the nutritional status of the child.

In Table 2, the food types, quantity and nutritional value for the above mentioned and a variety of other programs are shown. Obviously the variation is great. For children below one year of age, the lowest value of a daily supplement is 140 calories, to be provided by the new Bank project (World Bank, 1980). The largest ration (excluding those projects where the children are being cared for throughout the day) is in the CRS program where all the children, including those below one year of age, receive a take-home ration which would provide 619 calories per day for 365 days per year. This represents more than a four-fold increase over the size of the Bank supplement.

In the case of the Bank project, which is an on-site design, it is clear that they expect excellent rates of participation and little, if any, leakages in the ration. They also intend to provide double rations to the 10% most severely malnourished. But it is obvious that with the program's high level of targeting which includes only the seriously malnourished children, the caloric deficits will be much higher than the size of the ration.

As for the CRS ration, it is surmised that this ration is provided as a family food. Otherwise, no reasonable explanation exists for supplying such a large quantity of food. In fact, if the food is completely shared among an average of three other siblings, the infant can still expect to receive over 150 additional calories per

TABLE 2

## Type, Quantity and Nutritional Value of Food Supplements

	Food Type	Quantity	Nutritional Value	
SNP	Varied, Including: BALAHAR - SFB OIL MILK BREAD	Varies according to commodity type	Below 1 year:	200 calories 8-10g protein
			Above 1 year:	300 calories 12g protein
			Pregnant & lactating:	500 calories 20g protein
CRS (CRS, 1980)	CSM OIL BULGUR	50g 16g 83g	Mothers & children:	619 calories 17.7g protein
ICDS (Dayal, 1977) (Programme Evaluation Organisation, 1978)	BALAHAR -SFB OIL and a variety of local pulses, grains, dairy products & sweeteners	Varies according to commodity type	Below 1 year:	200 calories 8-10g protein
			Above 1 year:	300 calories 15g protein (Larger rations provided for severely malnourished)
			Pregnant & lactating:	500 calories 25g protein
NARANGWAL (Kielmann et al, 1978)	Calorie Enriched Milk (morning) Porridge - like Gruel (afternoon) Made from: Crushed wheat sugar, oil & milk powder		Children:	400 calories 11g protein

TABLE 2 (continued)

	<u>Food Type</u>	<u>Quantity</u>	<u>Nutritional Value</u>
APPLIED NUTRITIONAL PROGRAM (Rao, 1978)	A variety including: CSM BULGUR WHEAT BENGAL GRAM JAGGERY	N/A	N/A
JAGGHED	Mixture of: CEREAL PULSES SUGAR OIL	50g 20g 10g 10g	N/A
POSHAK (Exploratory Phase) (Gopaldas, 1979)	ICSM	Below 3 years: 100g  Pregnant & Lactating: 200g	Below 3 years: 377 calories 19g protein  Pregnant & Lactating: 754 calories 38g protein
INDO-DUTCH (Davi et al, 1978)	A Mixture of: MILK JAGGERY GREEN LEAFY VEGETABLES PORRIDGE JOWAR FLOUR RICE DHAL GREEN GRAM	N/A	Below 3 years: 1076 - 850 calories 30.4 - 25.7 protein depending on age

TABLE 2 (continued)

	<u>Food Type</u>	<u>Quantity</u>	<u>Nutritional Value</u>	
FASA (Shah, 1977)	Groundnut and DALIYA	Children:70g Women:100g	Children:	361 calories 17.9g protein
TAMIL NADU (Castor Assoc. 1974)	CSM (80%) SUGAR(20%)	Children under 7 kilos:50g  Children above 7 kilos:100g	Children under 7 kilos:  Children above 7 kilos:	185 calories 10g protein  375 calories 20g protein
ICHS, Calcutta (Chadha, 1979)	MILK KHICHRI (made from SFB)	N/A	Below 3 years:  Above 3 years:	312 calories 18g protein  439 calories 24g protein
PUNJAB (Govt. of Punjab, 1974)	PANJURI Made from: Wheat Atta 78% jaggery 15% oil 7%	Below 3 years:50gm  Above 3 years:75gm  Pregnant & lactating: 100 gm	Below 3 years:  Above 3 years:  Pregnant & lactating:	200 calories 4.8g protein  300 calories 7.2g protein  400 calories 9.6g protein
WORLD BANK(Tamil Nadu) (World Bank, 1979)	Mixture of: RICE and PULSES with sugar, minerals & vitamins	Below 2 years:40g  Above 2 years:80g  Pregnant & lactating: 80g Double rations for 10% most severely malnourished)		140 calories  280 calories  280 calories

day as a result of participating in the program (a quantity greater than the Bank project, regardless of its efficiency). Furthermore, benefits from the CRS program will definitely accrue to other family members.

In the other programs, the ration sizes are in the range of 250 to 450 calories, depending on whether they are for women, infants or children, and on the mode of distribution. It can be concluded that this level of food supplementation has gained acceptance in India. However, more careful consideration should be given to systematically determining food quantity in the future.

### C. Food Type

A variety of types of foods have been used in supplementary feeding programs in India. Both indigenous and donated food commodities have been programmed separately, and in combination. For example, in the ICDS program priority was to be given to locally available foods. However, only 3 of 29 projects relied solely on indigenous products (PEO, 1978); the remaining 26 utilized foods donated by IFP or CARE. Of those using donated commodities, six do so in combination with local foods (e.g., Balhar made from CARE commodities with local pulses, jaggery and condiments).

Table 2 details the type of foods used in various feeding programs. In deciding what food(s) to provide the recipients in a MCH supplementary feeding program, three major considerations emerge: the acceptability and appropriateness; nutritional adequacy; and cost and source of the food. These three issues will be briefly discussed below.

#### 1. Acceptability and Appropriateness

In reviewing studies on feeding programs in India, there was never mention of a program where the food

type was not culturally or organoleptically acceptable to beneficiaries. The only complaints about the food concerned problems such as the bread being stale or not well baked (Nath et al., 1979). Both the use of indigenous and donated commodities such as Corn-Soy-Milk (CSM) and Soy-Fortified Bulgur (SFB) have gained acceptability. According to documentation and conversations with CARE and Catholic Relief Services personnel, no problems of acceptability have been encountered in programming these commodities. In fact, while the acceptance of foods such as bulgur wheat in rice-consuming areas of the South enhances the chances for program success, serious questions must be raised as to the wisdom of programming foods which are incongruent with traditional and customary tastes. Specifically, to create a demand for wheat products in rice-growing areas will portend trouble, since the availability of wheat will be limited, and its cost on the open market will be prohibitive. Similarly, in cases where processed "Western type Wonder Bread" is supplied to a population that normally consumes chapatis, not only do you introduce an expensive new product, but inevitably its nutritional value in terms of vitamin and mineral content will be lower without fortification.

It is therefore recommended that when food is supplied from outside the community, every attempt should be made to use familiar products that do not involve radical departures from traditional diets. This will not only assure short-term benefits, but preclude negative consequences in the future.

There are a variety of forms in which a food may be distributed to the recipients, which will encourage or discourage its utilization. Specifically, these food forms have been classified into three categories by Swaminathan (1980):

- Ready to eat, convenience foods;
- Foods requiring minimal cooking;

- Foods requiring regular cooking.

Clearly, the appropriateness of each food type will vary as a function of considerations such as: whether it is a take-home or on-site project; whether the project is in a remote tribal area or a crowded urban slum; and the nature of the processing, storage, and transportation infrastructure available.

According to Rao (1978), the use of ready-to-eat foods or foods requiring minimal cooking is advantageous, although they are usually expensive. A much cheaper option are blends such as Balahar (cereal, pulse, and oilseed cakes), CSM, Indian Multi-purpose food (roasted bengal gram flour, groundnut flour and vitamins and minerals) and Kerala Indigenous Food (tapioca flour, Bulgur wheat, groundnut flour). Despite the savings in cost, these products are considered less preferable because of the labor needed to cook them into an acceptable food.

The use of roasted ingredients (e.g., bengal gram, green gram) mixed with jaggery or sugar is considered an intermediate alternative which is not too expensive and easy to prepare. These types of foods can utilize both indigenous food products as well as donated commodities. Examples are Sukhada (CSM, brown sugar, hydrogenated fat) and Bajna (edible groundnut flour, green gram flour, brown sugar). The preparation of such foods is simple, and they have a reasonable shelf life. They also meet the criteria of being nutrient dense, providing about 400 calories per 100 grams.

In the selection of a food supplement, the trade-offs between the convenience of ready-to-eat foods prepared at a central location, which require high inputs of technology and more highly developed transportation and distribution infrastructure, and foods that require extensive on-site or home preparation should be carefully considered. A take-home program will lend itself to providing

raw commodities requiring some home preparation. An urban program will probably be best served by ready-to-eat food, since processing facilities will be available, the distance between central kitchen and feeding site is small, transportation costs are minimal and the constraints to on-site preparation, such as lack of space and limited availability of fire wood and fuel, are formidable.

Conversely, in a tribal or drought prone area, access from a central processing facility is tenuous. The difficulties of distributing products to these areas dictate that it be done at intermittent intervals, such as monthly or quarterly. Therefore, uncooked raw commodities, which are more easily stored for a long duration, are appropriate in that setting. The availability of, and need for, fuel and space for cooking also commends itself to local preparation in rural areas.

## 2. Nutritional Adequacy

As alluded to in the discussion of food quantity, it is essential that foods programmed for supplementary feeding programs be effective in meeting the nutritional needs of the target population. Special attention should be given to the young child who has limited digestive capacity, but the greatest nutrient needs per kilogram body weight. This problem is of added significance in regard to an on-site feeding project where limitations on the amount of food an infant or toddler can ingest will preclude consuming large amounts of nutrients (e.g., 400 calories) at one sitting. Therefore, although sharing is more likely in a take-home program, this form of distribution may provide the very young a more ample opportunity for consuming the supplement. Strong educational efforts to reinforce the concept of the ration being for the child can enhance the efficacy of such an approach.

Besides the considerable attention given to the nutritional

adequacy of a supplement in terms of fulfilling the calorie gap, further emphasis should be placed on addressing other nutrient deficiencies extant in the Indian population. According to the most recent figures (IINMB, 1979), Vitamin A deficiency is endemic among pre-school children, as is B-complex deficiency, especially riboflavin deficiency as evidenced by angular stomatitis (see Table 3).

Likewise, Gopalan (1975) has estimated that among economically disadvantaged groups in rural areas, 50% of the children between 1 and 3 years of age are anemic, as are 34% of the 3 to 5 year olds. And according to the Indian Council for Medical Research (ICMR, 1977), 50-60% of the pregnant women from low socio-economic groups are anemic during the last trimester; deficiencies in iron and folic acid are implicated, which could portend undesirable birth outcomes.

While calcium levels equal or exceed the ICMR recommended intake (400-500 mg) in 8 out of 10 states surveyed (IINMB, 1979), these mean figures may not reflect the true dimensions and repercussions of insufficient calcium intake. For example, in a recent study of food and nutrient intake of pre-school children in Andhra Pradesh (Pushpamma, Geervani and Manorama, 1980), only 25% of the calcium requirement was ingested. The other two nutrients falling grossly short of dietary requirement were vitamin C and beta-carotene. The authors assert that the greater than 75% deficit in these nutrients requires that they be given first priority in attempts to combat malnutrition, despite the fact that caloric intake was only 65% of the standard. This contention was supported by running correlations between the intake of various nutrients and growth of children; the correlation between calcium and height was the strongest, signaling the need to increase dietary calcium.

While the major focus of the Integrated Maternal and Child

TABLE 3

## Percentage Prevalence of Deficiency Signs--Pre-school Children

S T A T E	Kerala	Tamil Nadu	Karna- taka	Andhra Pradesh	Maha- rashtra	Gujarat	Madhya Pradesh	Orissa	West Bengal	Uttar Pradesh
Conj. Xerosis	0.7	1.3	0.3	0.8	-	0.5	1.6	4.3	0.6	2.9
Bitot's spots	-	3.4	2.0	4.1	0.8	1.1	-	1.3	1.5	2.7
Total vitamin 'A' deficiency	0.7	4.7	2.3	4.9	0.8	1.6	1.6	5.6	2.1	5.6
Angular stomatitis	0.7	6.6	10.2	13.0	0.8	2.4	0.5	7.2	6.2	2.5
Other B-complex deficiency	0.3	-	0.1	0.3	-	-	-	1.3	1.5	0.2
Total B-complex deficiency	1.0	6.6	10.3	13.3	0.8	2.4	0.5	8.5	7.7	2.7

Nutrition Project is reducing protein-energy malnutrition, with the intension of reducing mortality, the pervasiveness of other macro- and micro-nutrient deficiencies should influence the types of foods selected. Specifically, the utilization of milk available from USDA deserves serious consideration for programming in areas with gross calcium deficiency. Similarly, fortification with vitamins and minerals as deemed appropriate and technologically feasible is recommended. In those instances where the food supplement is not an appropriate vehicle for fortification, explicit educational efforts to encourage consumption of foods rich in iron and vitamin A are essential.

### 3. Food Source

The debate over the appropriateness of using donated foods in supplementary feeding programs is being carried out in numerous forums (Anderson et al., 1979; Deaton and Ghassemi, 1979). It is felt that this should not be one such place. The reason is simple: it is a given that the Integrated Maternal and Child Nutrition Project is a Title II initiative, which by definition means that commodities imported from the U.S. will be used. Most have argued that it is preferable to program indigenous food resources in feeding programs. Reasons such as fostering self-sufficiency, facilitating educational efforts and providing long-term solutions to the problem of food availability and poor nutrition are the justifications commonly suggested. Conversely, in the short term, if supplemental foods are being used as a preventative, therapeutic and educational tool to stem the tide of malnutrition, while other socio-economic development occurs, food from Iowa will undoubtedly have the same impact as food from Kerala. Consideration, however, should be given to facilitating the use of indigenous food to replace donated commodities.

#### D. Nutrition Education

The changing of knowledge, attitudes and behavior of participants in a supplementary feeding program represents the vital component for assuring that long-term benefits accrue to project participants. This is especially important in the context of a program geared toward pregnant and lactating women, and infants and children below three years of age, because more often than not the etiology of malnutrition is attributable to or aggravated by poor feeding and child care practices.

The need to affect infant and child feeding practices, as well as dietary intake of pregnant and lactating women has been recognized as the vital link with success of all programs reviewed. Success in changing attitudes and behavior, through increased knowledge gained from educational efforts, however, has not been easily achieved.

##### 1. Experience in India

In the ICDS program, the Anganwadi Worker (AWW) is supposed to give health and nutrition education to all women in the age group 15 to 44 years. For those mothers of malnourished or frequently ill children, special attention is provided. This includes home visits by the AWW when mothers do not attend the center. The education message is imparted through courses in the village, use of mass media and demonstrating cooking and feeding activities (Rajendran, 1978b).

The basic messages of the nutrition education efforts are as follows (PEO, 1978):

- Breastfeed as long as possible.
- Introduce semi-solid food to infants five to six months of age.
- Feed young children three to six times a day.
- Do not reduce food during illness.

- Use the health services available.
- Get children immunized.
- Keep yourself and your surrounding clean.
- Drink clean water.
- Have no more than two or three children, two to three years apart.

In evaluating the success of the educational campaign, it was noted that "great deficiencies were noted in the quantum, content, and communication of health/nutrition education to women" (PEO, 1978, p. 34). Problems included that: home visits were negligible; little effort was made to explain the nature and purpose of the program's service inputs; and there was a shortage of play items, charts, posters and other teaching aids. Furthermore, the content of nutrition education classes in the villages did not follow the project guidelines; emphasis was placed on less important issues like constructing garbage pits and bathing a baby. In addition, it was noted that the A!!! believed that pre-school education and feeding pre-school children at the Anganwad! were of primary importance, and child care and feeding practices were not of priority.

Recent evaluations of other programs also elucidate the deficiencies of past nutrition educational efforts in India. In the Applied Nutrition Programme (Rao et al., 1979), nutrition education was provided by an array of functionaries such as Mukhyasevikas, Gramsevikas, Balsevikas and medical and para-medical personnel. The intent of the educational efforts were to deliver messages to encourage:

- Prolonged breast feeding;
- Introduction of semi-solid foods at 5-6 months;
- Continued feeding during illness;
- Frequent feeding of young children;
- Use of local health services;
- Immunizations;
- Family planning and personal hygiene.

An evaluation assessed the impact of the nutrition education component on 3508 households from AIP and non-AIP areas. Questions were designed to assess knowledge, attitudes and practices (KAP) of mothers. No significant differences were observed in KAP about child feeding and nutrition in AIP and non-AIP villages. Similarly, weaning practices were not effected by the program. The knowledge concerning the relationship between dietary intake and deficiency diseases like Kwashiorkor (characterized by edema), marasmus (wasting) and vitamin A deficiency (Bitot's spots and night blindness), was no greater in AIP than non-AIP villages. The lack of impact of the nutrition education effort was to be expected given that only a small percentage of participating villages even realized that the feeding program included an educational component.

A similar sad scenario concerning a nutrition education component has also been reported for the SIP (Department of Social Welfare, 1979; Gopaldas, 1978). In fact, in one study nutrition education was totally absent; there were not even posters displayed at the feeding centers (Hath et al., 1978). To the contrary, however, Devadas et al. (1977d) reported some success in the education component of the SIP. In that case, a single theme message (e.g., the importance of nutritious snacks or personal hygiene) was taught to mothers participating at an on-site feeding center for two consecutive days. A control group not receiving nutrition education was compared by way of a before-and-after test to determine differences in knowledge. Results indicated a statistically significant improvement in knowledge among the feeding plus education group over the feeding alone group. However, it is stressed that the difference in knowledge does not necessarily lead to changes in attitudes and behavior. Therefore, a great deal of significance should not be attached to this finding.

Regardless of whether or not there was isolated impact of the education

component of the SIIP, a number of publications do provide guidance on how to improve this aspect of the program. The report of a recent seminar (Department of Social Welfare, 1979) suggested that various grass-root level resources, including primary schools, youth clubs, Mahila Mandals, Agricultural Extension Workers and Auxillary Nurse Midwives should be mobilized to deliver the health and nutrition messages of the SIIP. It was suggested that opinion leaders and influential persons be used in planning and disseminating vital health and nutrition information in the SIIP. Sensitivity to social, cultural and religious beliefs is also recommended.

Gopaldas (1973) has advocated a "two-pronged approach: (1) program information through mass media; and (2) face-to-face group discussions covering basic nutrition messages. Concerning the basic messages, Tandon (1980) has specifically mentioned six points of practical importance which should be presented in a simple and straightforward way, that is not in conflict with the life-style of the people. They are:

- Value of prolonged breastfeeding;
- Introduction of weaning food at 4-6 months;
- Immunization;
- Monitoring of growth and development of children by weight-for-age charts;
- Proper utilization of supplementary nutrition services;
- Early use of oral-glucose electrolyte solution in the case of diarrhea;

Informal discussions are seen as the best method to get these messages across to rural women. Charts, diagrams, slides and models are also viewed as useful tools.

In the new World Bank project (World Bank, 1980), further guidance

on the design of a nutrition education project is provided.

It is suggested that in designing educational messages, consideration be given to family income constraints. It is also remarked that the Bank's educational effort would differ from past programs in that: (1) there would be a concentration on a few select points, rather than a more diffuse message; and (2) the program would stress workers' use of emotional appeals and the application of peer pressure, rather than scientific arguments.

The major messages of the nutrition project in Tamil Nadu will be:

- Early introduction of semi-solid foods to supplement breast milk;
- Continued feeding of the sick child;
- Use of home-made oral rehydration mixes;
- Improving environmental hygiene emphasizing the control of common disease vectors such as flies.

Films would originally prepare village leaders for the introduction of the project. Printed posters would then be placed around the village supporting the messages cited above. Thereafter, three separate education campaigns would take place in the project areas, each of a three-month interval separated by one month. They would consist of:

- Five-minute films to be shown at Tamil Nadu's rural movie houses;
- Short radio programs;
- Magazine and newspaper ads;
- Field-level efforts of community health and nutrition workers using flip-books, charts, posters and self-made materials.

Traditional folk theater will also be used to convey messages, and special scripts will be developed for this purpose. The troupes will go into the more remote villages which do not have access to films.

The Bank's emphasis on mass-media will result in broad population coverage. However, it is recommended that the Integrated Maternal and Child Nutrition Project concentrate on domiciliary nutrition education through community health and nutrition workers. This approach, as discussed by Shah (1978), provides education on a person-to-person or small group basis. Weight charts retained at the home, and those of previously malnourished children, are used as illustrative examples and teaching tools. As described in reference to the Kasa Project (Shah, 1977), the core of the education effort was weekly visits by Part-Time Social Workers (PTSWs) who attempted to communicate the message that weight gain was a function of food intake (including the supplement). It was impressed upon mothers that growth recorded on weight charts can be equated with the state of a child's health. In addition, other messages such as introducing semi-solid foods at 4 to 5 months and the importance of diet during pregnancy were emphasized using photographs and simple visual aids.

In order to test the effectiveness of the project in changing nutrition awareness and practices, 500 mothers and mother-substitutes were queried before, and one year after contact with the PTSWs. Among the findings was that at the outset 0.5% of the mothers were aware that soft rice was an appropriate food for a six month old infant; after one year, 25% of the mothers were familiar with the practice. Likewise, behavioral changes such as increases in the number of times per day a toddler was fed were recorded.

Similar attempts at intensive educational efforts using demonstration feeding activities and growth charts were found in the Jamkhed Project (Arole and Arole, 1975) and in Madurai (Venkataswamy, 1977). In the former case, weighing of children and pre-natal care are monthly responsibilities of the VHWs, in addition to regular demonstrations in cooking, child feeding, and cures for simple ailments using a variety of methods including

stories and puppet shows. If weight gain is inadequate, the mother receives further attention and special instruction.

In Madurai, children attend feeding centers on a daily basis. Between feeding times, Balsevikas give daily talks using posters, charts, and Road to Health growth charts of participants. This is reinforced by weekly visits of the pediatrician, nurse and nutritionists. In the evening, the Balsevika visits homes of working mothers who cannot attend the center. Consumption of green leafy vegetables to combat the high rates of xerophthalmia and earlier introduction of semi-solid food using local cereals are the main messages.

In evaluating the effectiveness of the educational aspect of this program, a marked change in awareness among the mothers participating in the program was noted. However, the practices in child feeding remained largely unaltered. It is therefore suggested that greater emphasis be placed in developing "health educator skills" during the training of village level workers (Venkataswamy and Kabir, 1975).

Finally, the success of the educational effort in the rural creche of the Indo-Dutch Project (Devi and Pushpanna, 1978) deserves comment. The program consisted of three components: use of food supplements at the creche as a tool for teaching proper feeding practices; mass education techniques by means of charts, posters, films, demonstrations, etc.; and one-on-one contact with mothers at home. The home visits were necessary because only 50% of the mothers attended classes. An evaluation of the educational campaign indicated that at the outset, none of the controls nor experimental population were aware that a child's diet should be supplemented at six months; at the post survey, this was known to 90% of the creche mothers and only 25% of the controls. Similar increases in knowledge concerning feeding during illness, providing leafy vegetables for children, pregnant

and lactating women, and the need to supplement the diet during pregnancy and lactation, were reported. Observed improvements in nutritional status and increased consumption of green leafy vegetables and family foods among creche children were interpreted to be a function of increased knowledge and behavioral change attributable to the nutrition education activities.

## 2. Conclusions

From the above review, it is clear that successes as well as failures have characterized past nutrition education efforts in conjunction with feeding programs. However, some generalizations can be drawn to help guide those designing the educational component of future programs.

A consistent need was felt to educate women concerning certain fundamental practices, which at present are major etiological factors in maternal and child malnutrition. These are:

- Introducing semi-solid food at 4 to 6 months;
- Continuing feeding during times of illness;
- Increasing frequency of feeding young children;
- Increasing use of green leafy vegetables;
- Promoting proper hygiene and cleanliness;
- Getting immunizations and utilizing health care services;
- Using oral-rehydration solutions;
- Continuing breastfeeding for at least one year.

It is suggested that all, or a subset, of these messages should form the core of the nutrition education component of the new project. An attempt should be made to prioritize the concepts that are to be imparted to participants, and concentrate on successfully getting those messages across; this approach is recommended rather than addressing a vast array of issues, which will confuse the mother as well as

project functionaries.

The experiences cited above also suggest the need for relying upon a variety of educational techniques, including mass media, visual presentations, and person-to-person contact and follow-up. The latter is especially important for those women who are in greatest need of attention and are least likely to be affected by community level media and group educational activities. In addition, the use of the growth chart by the village level nutrition worker has been shown to be an effective tool for personal instruction. As such, the surveillance of nutritional status (which should form the basis of selecting food recipients) should be closely linked with educational efforts.

Finally, there has been a propensity for measuring the success of educational efforts according to changes in knowledge, rather than behavior. Although it is more difficult to examine behavioral changes, it is stressed that increased knowledge does not necessarily translate into improved practices. It is therefore recommended that behavioral change should be emphasized in delivering a nutrition message, even at the expense of improving the mother's knowledge. In a sense, this is the idea of learning by doing. Changing traditional practices will result in improved health and welfare of the child; these improvements will in turn be perceived by the mother and provide continuing reinforcement for changes in behavior.

#### E. Improving Weaning Practices and Reaching Children 0-3 Years Old

The pervasiveness of the evidence that children between 6 and 36 months have received a disproportionately small share of benefits from the ICII feeding programs is only outdone by the decrees and directives which have emanated from program directors, conferences and publications (such as this one) which stress the importance of reaching 0 to 3 year olds. Unfortunately, the lack of success in delivering

services to this group provides little substantive guidance for those in search of an answer.

Conceptually, it is recommended that the problem of reaching the infant and young child be viewed as a two-stage process. The first is identifying which children within the community are in need of assistance and thus represent appropriate participants in the program. To date, the only seemingly effective method for achieving this goal has been the door-to-door recruitment by village level health workers such as the PTSWs in the Kasa project (Shah, 1978) or the Child Care Workers in Madurai (Venkitaswamy and Kabir, 1975). It would seem that home visitation is a pre-requisite, at least at the outset, to explain the nature of the project and capture the attention of the parents. Undoubtedly, follow-up and outreach will be demanded.

In order to encourage the continued participation of women with young children in a feeding program, and target effectively the food to that age group, a number of approaches have been tried. The development of creches (nurseries) for young children between 6 and 36 months is one such example. In this instance, mothers bring their children to the center on a daily basis. The child is left under the care of the creche. This is especially advantageous to working women in urban areas, as well as in the rural agrarian societies, where women are engaged in agricultural labor, and often leave their infants in care of older siblings.

Experience in the Chevella Block of the Indo-Dutch Project has shown creches to be well accepted by the community and effective modes for the distribution of supplementary foods to infants and young children (Butt, 1979). In addition, by encouraging active participation of mothers in running the center and preparing the food, the creche has also been effective in educating mothers about infant and child feeding practices. With mothers running the creche, personnel and overhead cost have been minimized.

Drawbacks, however, to this approach do exist. The necessity for providing more than just one meal or supplementary snack raises appreciably the cost of feeding. In addition, it is all but impossible to target food discriminately to those who are malnourished, as all who attend must be fed. So while the creche will reach the 0 to 3 year olds, it does so at the cost of providing total child care, not targeting to the malnourished, and possibly not providing sufficient motivation or social support for the attendance of unhealthy and outcast children most in need.

As an alternative to the concept of the creche, while retaining control over feeding the young children, the on-site feeding scheme has been adopted by projects like the new World Bank Scheme (World Bank, 1980) in Tamil Nadu. Since the project limits participation to children below three, coupled with intensive outreach and convenient feeding times, it is anticipated that the project will reach the intended beneficiaries; this despite the inconvenience of on-site feeding.

The use of take-home feeding rather than on-site feeding, however, is often suggested as a superior way of reaching 0 to 36 month olds. This issue was specifically studied in Project Poshak (Gopaldas et al., 1975), to determine which was a more effective method of targeting the young child. Slightly better results in supervised on-site over take-home feeding were recorded. However, the fact that the cost of an on-site program was 50% higher, was not justified on the basis of the increased impact. Other disadvantages to using the on-site scheme to reach young children were also noted. These included infrastructure and logistical problems of food preparation and supervision of feeding, the increased risks of infection spreading at centers, and the commentary that if you cannot trust a mother to feed her child at home, the problem is so fundamental as to preclude the impact of a feeding program altogether. But of greater importance than the distinction between on-site and take-home was that once again participation rates were low: 62% for the former and 51% for the latter. As such, both schemes provided unacceptable alternatives for reaching all

the children in the target age group.

While the debate of take-home vs. on-site remains unresolved (as both are riddled with problems and drawbacks), one other idea has emerged in India for targeting supplements to 6 to 36 month old children. That is to prepare blended weaning foods, and package them as special baby foods (Cantor Associates, 1974). For example, the Hyderabad Mix (jowar, bengal gram, groundnut or cowpeas and jaggery in the proportion of 4:2:2:1) developed by the Indo-Dutch project has according to its director, H. W. Butt, been successfully marketed as a supplement for young children. By teaching mothers to view the food as a medicinal product, the amount of sharing or substitution that takes place within the family is minimized. The issue of whether the self-selection process for purchase of the Hyderabad Mix, even at its nominal cost, rules out participation by the worst affected segments of the community needs to be considered.

There have been many other attempts in India to develop weaning foods to be directed at young children. For example, a working party was set up by the Indian Council of Medical Research (ICMR, 1974) initially to survey available protein-rich foods and weaning practices. Thereafter, they developed 82 suitable and acceptable recipes for weaning foods which were either:

- Easily prepared at home;
- Ready-to-eat mixtures made by mother in bulk quantities; or
- Prepared commercially by local tradesman in the form of biscuits, toffees, etc.

Other projects have similarly tested the use of indigenous as well as non-indigenous weaning foods. For example, Project Poshak (Gopaldas et al., 1975) compared the use of Instant Corn-Soy-Milk (donated by CARE) with a multimix from locally available foods. The familiar foods proved more acceptable and were better utilized. Despite the better acceptance, the locally prepared food showed no advantage

in terms of improvements in nutritional status or infant mortality.

The experiences with the Hyderabad Mix, the products developed by ICMR, and the Poshak experiment illustrate that there are few obstacles to the development and manufacture of appropriate weaning and supplementary foods. There is little doubt that a Title II food, likewise, can be the basis of an acceptable weaning mixture. The question remains, however, how to identify the at-risk child and introduce him or her to a supplementary ration. The answer has proved elusive to health and program personnel since there is not a prescribed formula which can be followed to reach the 0 to 3 age group as there is for the development of an appropriate weaning food. Well trained and motivated personnel, good management and an enthusiastic and informed community are the key ingredients to the success of outreach efforts. To date, no large-scale operational program has been sufficiently successful to use as a model.

#### F. Maternal Supplementation

Throughout this report, considerable attention has been given to the issues of MCH feeding programs in relation to infants and children. This emphasis reflects the ease of implementing a program which provides a supplement to children, general agreement on what indicators should be used to assess impact and effectiveness (i.e., anthropometric and dietary measures), and the scientifically accepted correlation between increased dietary intake of infants and children, and an improvement in their growth and development.

Pregnant women have proved more difficult to identify as a target group, and less enthusiastic about participating in a supplementary feeding program. The need to consume more nutrients while pregnant and the linkages between increased dietary intake, improved weight gain during pregnancy, higher birth weight babies, lower infant mortality and healthier children, are not only extremely difficult concepts to impart to women in developing countries, but are also the subject of continued research and scientific exploration.

While consensus exists concerning the relationship between maternal nutrition and birth weight, the question of the effects of maternal supplementation has been the subject of much recent attention. Most important has been the findings of an International Workshop in Guatemala (Lechtig et al., 1979) in which the results of eight recent studies from around the world were reviewed. They indicated that in malnourished populations, the provision of nutritional supplements during pregnancy increased birth weight. This finding was especially pronounced when supplementation was provided during the third trimester of pregnancy. In addition, data indicated that decreased perinatal and infant mortality were a result of maternal dietary supplementation.

As a result of these findings, the workshop called upon governments to identify malnourished women and implement programs immediately to improve maternal nutrition, on the basis of the existing scientific evidence. Supplementation, nutrient fortification, extension of preventive health care, development of appropriate technology and better use of local foods are the strategies suggested. Likewise, emphasis on self-sufficiency and use of locally available nutritious foods is stressed.

Given the force of these and other similar studies, it is timely that the proposed Integrated Maternal and Child Nutrition Project give added emphasis to maternal supplementation, and understanding its effects. It is also important to gain some insight into the Indian research which has looked at issues such as the relationship between weight gain and birth weight, or maternal supplementation and the health of the newborn.

The "studies" and "evaluations" of the impact of maternal dietary supplementation in the context of the feeding programs are conspicuously sparse. It was therefore necessary to concentrate on the research literature to find empirical evidence which relates improvements in the maternal diet to reductions in the incidence of low birth

weight infants.

### 1. Indian Research

Numerous studies have examined the determinants of low-birth weight infants in the Indian population. However, relatively few have attempted to relate dietary intake and weight gain during pregnancy to the infants' birth weight; of those that do examine the dietary correlates, only a few explicitly test the effects of food supplementation.

To amplify, Ghosh et al. (1977) found that factors such as parity, maternal age, and spacing between pregnancies all have marked effects on birth weight (see Table 4).

Similar findings have been reported elsewhere (Jasudason and Ambujadevi; Mukherjee & Sethna, 1970). In addition, studies have shown the effects of pre-pregnancy heights and weights on birth weights as seen in Table 5 (Khatua et al., 1979; Mukherjee and Sethna, 1970; Ghosh et al., 1977).

These tables are presented to illustrate that factors unrelated to health care or dietary intake during pregnancy have significant impact on birth weight and fetal size. This information suggests that women below 20 years of age, primiparas, and problems like maternal illnesses significantly increase the likelihood of low birth weight babies. Therefore, in selecting participants for a feeding project, the advisability of screening a population for these characteristics is obvious.

But of greater significance for designing a feeding program is the evidence which indicates that nutritional status prior to pregnancy (as measured by a woman's height and weight) has a formidable impact on the birth weight of their offspring.

It could thus be suggested that the strength of the relationship

Table 4

Relationships Between Birth Weight, and Parity,  
Maternal Age and Child Spacing

Parity	% Newborns < 2000 gm	Maternal Age	% Newborns < 2000 gm	Spacing	% Newborns < 2000 gm
1	4.3	20	6.2	2 yrs	6.2
2	2.6	20-30	2.6	2-3 yrs	2.6
3	1.6	30-40	1.7	3-4 yrs	3.1
4	2.2			4+ yrs	3.0
5	3.1				

From: Ghosh et al., 1977

Table 5

Relationships Between Birth Weight, and Maternal Weight and Height

Maternal Weight	Mean Birth Weight
< 45.5 kg	2654
> 45.4 kg	2866

Maternal Height	Mean Birth Weight
113 - 140 cm	2609
141 - 150 cm	2677
151 - 164 cm	2778

From: Mukherjee and Sethna, 1970

Maternal Weight	% Birth Weight < 2500 gm
< 35 kg	42.9
> 55 kg	12.9

From: Ghosh et al., 1977

between pre-pregnancy weight and birth outcome dictates measures to increase dietary intake of low weight fecund women (e.g., below 40 kg) during periods of high fertility. More specifically, consideration should be given to screening women for participation in a feeding program on the basis of nutritional status (either determined by dietary or anthropometric measures), regardless of whether or not they are pregnant. No empirical evidence exists to substantiate the benefits of such an approach. It therefore commends itself to a small-scale research effort.

The relationship between income, dietary intake during pregnancy, weight gain and birth weight is also well documented. For example, Vijayalakshmi and Devak (1976) found that low income women consumed about 400 calories less per day than middle income women, and their difference in weight gain during pregnancy was about 0.5 kg. This resulted in average birth weights of 2.47 kg and 2.75 kg for babies of low- and middle-income women, respectively (see Table 6).

Other studies have followed this relationship one step further, examining the effects of dietary intake not only on weight gain and birth weights, but on the growth and development of the infant. For example, Devadas, Vijayalakshmi and Vanitha (1978) found that well fed women consuming 2408 calories per day had infants that weighed 0.2-0.3 kg more than poorly fed women. However, while the infants of poorly fed women were initially smaller, the size of the difference decreased over the first six months of life, until it was negligible.

Concerning the actual effects of maternal supplementation in a feeding program, Devadas, Shenlugivalla and Vijayalakshmi (1970) also found a significant impact of the Applied Nutrition Programme (ANP), which provided pregnant women with 42.6 gm of milk daily and one egg for three days per week, over a period of six months. Women in ANP villages gave birth to infants almost a half a kilogram heavier (see Table 7).

Table 6

Relationships Between Weight of Newborns and Maternal  
Caloric Intake, Protein Intake and Weight Gain

	Caloric Intake	Protein Intake	Weight Gain	Birth Weight
Low Income	1666	41	6.23 kg	2.47
Middle Income	2036	59	6.76 kg	2.76

From: Vijayalakshmi and Devak, 1976

Table 7

Impact of Maternal Supplementation in the ANP on  
Weight Gain and Birth Weight

	Caloric Intake	Protein Intake	Weight Gain	Birth Weight
ANP Women	2114	65	6.19 kg	2.68
Non-ANP Women	1913	51	4.65 kg	2.22

From: Devalas, Shenlugivalla and Vijayalakshmi, 1970

Table 8

Impact of Three Types of Maternal Supplementation  
on Weight Gain and Birth Weight

	Weight Gain from 20th Week to Term	Birth Weights
Group I	2.9 ± 1.9	2.78
Group II	3.9 ± 2.2	3.32
Group III	—	2.51

From: Qureshi et al., 1973

In another study by Qureshi et al. (1973), 76 mothers of a similar low socioeconomic group in rural Hyderabad District were divided into three groups: Group I was provided 60 mg iron and 0.5 mg of folic acid on a daily basis; Group II was given the same plus 500 calories and 20 gm of protein; and Group III was the control. Results indicated that there was a significant effect due to iron and folate supplementation alone, but the provision of a calorie/protein supplement resulted in even greater birth weights (see Table 8).

Similar positive effects of maternal supplementation have been reported elsewhere. For example, Srikantia and Iyengar (1972) documented that increasing daily intakes by 900 calories resulted in birth weights being 0.3 kg greater. The use of a high protein food with the same amount of calories showed no further effect.

## 2. Conclusions

It can be concluded that the scientific evidence from India substantiates the hypothesis that both nutritional status prior to pregnancy as well as dietary intake during pregnancy (of a range of nutrients including calories, iron and folate) will have a significant impact on birth weight. As such supplementation of fecund and pregnant women is a scientifically sound approach to increasing birth weights. However, while it is apparent that increased caloric consumption during pregnancy increases birth weights, the size of the increment in intake did not present any predictable correlation with the magnitude of increased birth weight. In one study, 200 additional calories resulted in almost 0.5 kg higher birth weight; in another, a 900-calorie supplement resulted in an increase of only 0.3 kg. Clearly, the multiplicity of factors which affect birth weight (e.g., pre-pregnancy weight, infection and disease, hypertension, parity) make it very difficult to select an appropriate size for a ration.

And finally, although the research is convincing that increased dietary intake will result in larger babies, there is a shortage of empirical evidence concerning the cut-off point of an infant's birth weight, below which his health and survival are threatened. The traditional application of 2500 gm has been questioned by Indian health professionals. It is therefore suggested that prior to embarking on a massive effort to increase birth weights, a determination be made of what birth weight represents a genuine at-risk factor to the child's development. Thereafter, an assessment of the number of infants falling beneath this cut-off point is recommended to assess the magnitude of the problem and the most appropriate response.

#### G. Training

The success or failure of a supplementary feeding project will inevitably rest in the capability and commitment of project personnel. These two variables are a function of factors such as the amount of remuneration, the personal satisfaction from the job, and the quality of training provided to the functionaries. That last issue of training will be discussed in this section of the report.

The key responsibility for the delivery of project services rests with the village workers who implement the project at the grass-roots level. Their training and orientation is vital, especially since they usually have minimal formal education, are most deficient in required implementation skills and will therefore have the greatest difficulty in conceptualizing project activities. However, lest it be forgotten, the environment and circumstances in which community level workers operate will be affected by the guidance and expertise of supervisory personnel. As such, the adequate training of higher level functionaries is also paramount.

According to Chatterjee (1978), the critical factors in a successful training program are:

- Clarifying objectives and rationale of the program;
- Engraining a common framework to attain objectives by co-equal perception across the board among all functionaries involved in the project;
- The content and theory of learning experience;
- Providing logistic and administrative support necessary to support and operate training efforts;
- Organizing feedback to ensure the results of the training were those that were anticipated.

In addition, it is stressed that state level officers, instructors, inspectors as well as feeding center organizers need to be trained. The latter group of feeding center personnel is felt to be the most difficult to train due to their heterogeneous background and qualifications.

Other suggestions on training, especially in reference to the SIF, are provided by Gopaldas (1979). Given the limited formal education of the SNP organizers, it is suggested that the best training methods would involve:

- Demonstrating the use of equipment, materials, charts, etc. that relate directly to executing one's responsibilities on a daily basis;
- Using audio-visual tools such as short films and slides;
- Providing feeding and health demonstrations with well nourished and malnourished children from the community;
- Using simple pamphlets, books, charts and posters.

In general, theory should be eliminated from the training, as function should be stressed. And in its most rudimentary form, this effort will cost Rs. 100 per village worker for the very limited activities of the SNP.

As far as when and where to train functionaries, Halder (1980)

recommended that there be an initial period of training prior to assuming the permanent post or assignment. This would involve providing information on objectives, planning and service components of the program. Thereafter, periodic short orientation courses of three to four days should occur on an on-going basis. This approach would provide for current information on salient issues, while staying abreast of modifications in the delivery of program services. It was also recommended that training be participatory, providing an opportunity for mutual learning. Provision for group discussions, field visits and demonstrations are important. The extensive use of audio-visual aids and the reliance upon regional institutions within each state was also suggested. Evaluation of the training programs should result in their continued improvement, and an assessment of impact of the training on the functionaries should be given priority.

In a similar vein, as a result of an evaluation of the SNP (Nath et al., 1978) which found the training and orientation of administrators and functionaries sorely lacking, it was suggested that training should be oriented toward specific job tasks. For example, center organizers should receive a one-week intensive training course covering:

- Objectives of the program;
- Selection of beneficiaries;
- Organization and management of centers;
- How to keep records properly;
- Encouraging community support.

One-week orientation programs for Inspectors/Field Officers should include similar issues, as well as more extensive orientation on methods of promoting health and nutrition education, providing links with health services, and skills of supervision.

In response to many of the above suggestions the ICDS placed a good deal of emphasis on the training of its functionaries, especially the Anganwadi Worker (AWW). A training program, for example, has been

developed by IIPCCD (1979) for ICDS personnel. A manual details the training syllabus and amount of time spent on each issue. For example, the AWW's responsibilities are outlined, which is followed by a description of the four-month training course covering the following five subjects:

- General orientation about the ICDS scheme (20 hours)
- Child Development and Non-Formal Education (120 hours)
- Child Health and Nutrition (220 hours)
- Functional Literacy (60 hours)
- Community Contact and Communication (120 hours)

Similarly, the Mukhya Sevikas (Supervisors) have a three-month training course with a syllabus covering the same issues as above. In addition, however, there are 60 hours of instruction on record-keeping and supervision. The syllabus for the Child Development Project Officers (leaders of the ICDS team at the block level) is also presented and is designed to be two months in duration. While a review of this document is recommended in the formative stages of a training program, the critical comments of an evaluation of the ICDS training activities (PEO, 1978) provides informative guidance on the elements that should and should not characterize such an effort.

Specifically, in assessing the quality of the training of AWWs and other supervisory staff, it was found that the content was highly theoretical, diffuse and did not relate to the tasks that they are supposed to perform in the field. Likewise, an over-emphasis on pre-school education and social work was noted. Other criticisms included that training in foods and nutrition was considered archaic and divorced from the reality of the resources available to families in the project areas. In addition, practical issues of program planning, implementation, monitoring and evaluation were ignored. Too little time was spent in the field, and it is recommended that familiarization with work successfully being performed at a project site, be a major

emphasis of future training.

The training program for the Part-Time Social Workers (PTSWs) in the Kasa project (Shah, 1977) represents an example of an attempt to avoid the pitfalls described above. The PTSW was an indigenous, slightly educated social worker who served as the link between the Primary Health Center (PHC) staff and the recipient; they brought health and nutrition care to the homes of program participants. Specific responsibilities included surveillance of children 0 to 6 years of age and pregnant and nursing women, identifying and delivering supplements to the malnourished, basic health education and health care, and referral to the PHC.

The PTSWs were usually women, 35 to 40 years old. It was found that they had limited retention capacity and minimal education, although commitment to the task was considered the most significant ingredient for success. Therefore, it was recommended that the initial training program be short and supplemented with in-service activities in the field. Training was therefore provided to the PTSWs for 24 working days, designed to be more practical than academic. Emphasis was placed on:

- Identifying diseases, and states and types of malnutrition;
- The feeding of infants and pre-school children;
- Food taboos and beliefs which adversely affect feeding practices;
- Early signs of growth retardation;
- Determining birth rates using a Local Events Calendar;
- Weighing and recording weights of children and pregnant women;
- Detecting edema, moderate and severe anemia and severe hypovitaminosis A;
- Identifying women and children at special risk and in need of special care;
- Detecting pregnancies;
- Conducting census and collecting vital statistics;
- Conducting clinics and organizing immunization campaigns.

A similar display of practical and task-oriented training of village level workers is noted in the Child Care Centers program in Madurai (Venkataswamy and Kabir, 1975). In this instance the Balsevakis were selected from the villages in which they will work. Training takes place at the Nutrition Rehabilitation Center attached to the Government Erskine Hospital for three months. Accommodations are provided along with a Rs. 30 stipend per month. A written test is given at the end of each week to assess performance.

The teaching staff, comprised of a pediatrician, nutritionist and public health nurse, covers a range of health and nutrition issues. These include:

- The recognition of various degrees of malnutrition;
- The etiology of malnutrition;
- The recognition and treatment of fevers, diarrhea, scabies, worms, respiratory infections, etc.;
- The nutritional value of locally available foods;
- The preparation of low-cost nutritive food;
- Kitchen cleanliness;
- Child feeding practices.

Posters and pictures are provided as educational tools, and instruction in their use is given during the training period.

The idea of training local functionaries from within the villages is also viewed as vital by Butt (1979), who claims that government field workers are ineffective when left to themselves, without the assistance of village health agents. With that in mind, the "Gramasvasthikas Experiment" was begun in 1977. The goal was to train local women who had passed the fifth standard to perform simple tasks such as identifying pregnant women and malnourished children. A training course is provided close to home for a period no more than 40 days. Once field workers are posted at their jobs, a mobile monitoring and training unit regularly visits the village

to provide on-going, in-service training.

The new World Bank Project (1980) will also attempt to train Community Nutrition Workers through an initial two-month course at block headquarters, thereafter using twice monthly in-service training. The instructors will have post-graduate degrees in nutrition or home sciences. They, in turn, will receive training at the Sri Avinashilingam Home Science College, which is presently preparing a special curriculum.

What emerges from the literature is that there are two fundamental issues in training. The first is deciding what issues and skills are of importance and significance for village level workers and other project functionaries. The second is how to get the message across.

The experience in India to date suggests that concentration on practical skills and activities, rather than theoretical or abstract ideas, is essential for lower-level personnel. It is also interesting to note that other than the four-month program for ICDS Anganwadi workers, 20 to 40 days of training, at the outset, was viewed as sufficient. Thereafter, on-going field level training is suggested at regular intervals. This will not only serve to reinforce concepts already taught and expand competencies, but will also maintain a sense of being connected with a larger network which displays an interest in the local worker. This will avoid a sense of isolation and despair.

For the supervisory and block level workers, the essential aspects of training must emphasize the development of managerial skills. There was no lack of knowledge about the project design among higher-level functionaries. Rather, their inability to translate concepts into an operationally viable program suggests the need to concentrate training in the areas of implementation and management.

## H. Program Performance of Different Combinations of Services

### 1. The Concept of Integrating Feeding Programs with Other Services

The synergism which results from combining the delivery of food supplements with other services aimed at improving the health and welfare of an individual or a community has been well accepted in theory and practice. Illustrations from the Indian experience indicate that supplementary feeding is most effective when combined with health care services and child care education (Gopaldas, 1975), and that supplementary feeding must go hand and hand with improvements in health education (Singer, 1978). Likewise, access to clean water for washing and maintenance of proper hygiene and sanitation is considered fundamental to control morbidity and enhance the utilization of available nutrients (Sukhatme, 1980). In fact, the case for integrating feeding with other services has been so strongly embraced that it would be irresponsible to question the efficacy of such a strategy.

What is an appropriate area of inquiry, however, is the determination of which services, in what proportion, would best complement the delivery and utilization of a food ration to a target population. To date, programs in India have consisted of feeding with one or more of the following: (1) health and nutrition education; (2) pre-school education; (3) family planning; (4) immunizations; (5) curative medical care; (6) referral services; (7) improved access to clean water; (8) environmental sanitation including waste disposal; and (9) increased local food production schemes. While the theoretical basis for integrating nutrition with each of these efforts, singularly or in combination, is based on a solid foundation, the concept of integration is plagued by two fundamental problems: costs and operational feasibility. The main constraint involves doing too much in communities with limited infrastructure and absorptive capacity for external interventions and input.

It is therefore logical to look toward past experiences, and the knowledge gained from such ventures, to glean evidence of the efficacy and practicability of integrating any of the above services with supplementary feeding. Unfortunately, the empirical evidence about such efforts is scanty, and limited to a few research studies in the Indian context. Given the small number of impact evaluations on supplementary feeding programs in general, it is not surprising that there is a scarcity of studies which have explicitly tested the effect of providing food in combination with other services.

It would furthermore be useless to examine outcomes of programs providing a mix of services in an attempt to determine how integration affected program performance. First, to compare the impact of programs with different mixes of services is without significance unless the same methods were used to quantify impact, and the nature of the like services (e.g., family planning component) proved to be identical. Second, it would be impossible to attribute any changes of nutritional status to the presence or absence of a given service in the delivery of an integrated package of services. In other words, if feeding plus nutrition education, curative health and family planning were provided in a program, the impact of those activities in concert can be determined. However, it is impossible to assign a value to each of the components, and distinguish whether all the inputs acted synergistically, or whether delivery of one or two services would have resulted in the same impact. As such, although a decrease in malnutrition may have been recorded, 95% may have been due to the feeding and nutrition education, or alternatively, due to feeding and curative health services. Unless a research design was developed to test explicitly the contribution and synergism of separate components, the attribution of program outcomes to the presence of various services is impossible.

Given these considerations, experiences which explicitly attempted

to determine the complementarity and synergism of food supplementation and other program inputs will be the focus of the comments which follow.

## 2. Research Projects

In the Intensive Phase of Project Poshak (Gopaldas et al., 1975) an experiment was designed to test the impact of providing the following inputs to a target population:

1. Food alone
2. Child care education alone
3. Medical services alone
4. Food plus child care education
5. Food plus medical services
6. Child care education plus medical services
7. Food plus child care education plus medical services

The total package of services (#7) resulted in the most significant improvement in nutritional status. Food plus child care education (#4) and food alone (#1) were found to be the second and third most effective interventions. The unexpected finding that food plus medical services (#5) was least successful was explained by the fact that one of the two test villages dropped out of the study for "extraneous reasons," and the other made poor use of health and medical services. Generally, poor utilization of available services, and small sample sizes detract from these findings.

In a similar attempt to determine the effectiveness of a different combination of services, the Narangval Nutrition Project (Kielman et al., 1978) was undertaken in the Punjab. Pregnant women and children in four groups of villages were provided the following patterns of services:

1. Nutrition care (anthropometric surveillance, food supplements and nutrition education)
2. Medical care (health education, surveillance of morbidity, immunizations, diagnosis and treatment)
3. Nutrition care plus medical care
4. Control (no services other than emergency care and minimal symptomatic treatment).

Results indicated that children receiving nutrition care (#1), whether alone or in combination with medical care (#3), had the highest mean weight. Children just receiving medical (#2) care were next, followed by the control (#4). This was found to be the case for females, males and high and low castes. Children in supplemented villages (#1 and #3) also had significantly higher hemoglobin levels. It was also reported that mean duration of illness was markedly shorter in villages with medical care (#2 and #3) than in the nutrition (#1) and control (#4) villages (see Figure 1).

Mortality rates were also measured in the four types of villages. Results are found in Table 9. Perinatal mortality rates were lowest in nutrition and nutrition plus medical care villages, and neonatal mortality was lowered by the same amount in all experimental groups as compared to control villages. Postneonatal mortality was most affected by the presence of medical care, as was infant mortality in general. Deaths during the second year of life were similarly affected by nutrition and medical care or a combination of the services.

Among the conclusions reached was that the most cost-effective intervention measured by dollars per perinatal death averted involved the provision of "prenatal child care" in either the nutrition, nutrition plus medical care or medical care groups. The lowest service costs per infant death averted involved the medical care group, with the nutrition and medical care plus nutrition groups having about the same performance. This indicated

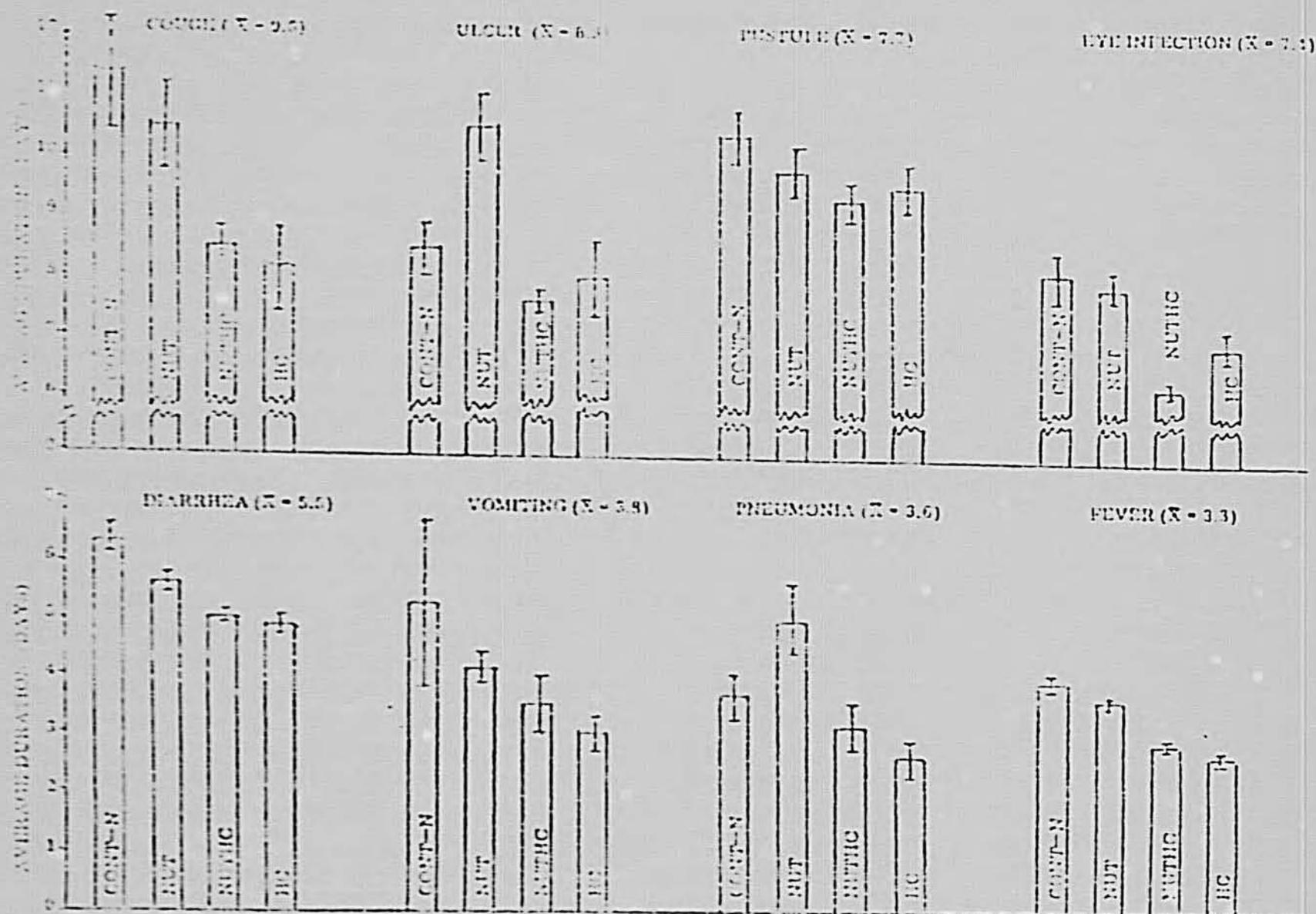
Table 9  
Mortality Rates of Narangwal Children  
by Experimental Groups

Age-Specific Mortality	Control Villages *	Nutrition Supplementation	Medical Care	Nutrition and Medical Care
	Births: 805 1-3 yr: 1398	Births: 352 1-3 yr: 634	Births: 343 1-3 yr: 635	Births: 654 1-3 yr: 1285
Perinatal (b)	104	61	81	63
Neonatal (c)	78	46	47	47
Postneonatal (c)	51	43	23	34
Infant mortality rate	129	89	70	81
1 - 3 Mortality (d)	19	10	11	13

\* Includes four villages of a parallel population study.  
 (b) per 1000 live and stillbirths.  
 (c) per 1000 live births.  
 (d) per 100 children 1 to 3 years old.

From: Keilman et al., 1978

MORBIDITY DURATION BY EXPERIMENTAL GROUP



- CONT-N - Control cohort; no services other than emergency care
- NUT - Nutrition supplementation only
- NUTHC - Nutrition supplementation and health care

From: Taylor, 1980.

that the benefit of the nutrition intervention during the first year of life was minimal, and medical care was much more significant.

As for deaths averted in the 1 to 3 year old age group, the provision of health care was more than twice as cost-effective as nutrition services (see Figure 2).

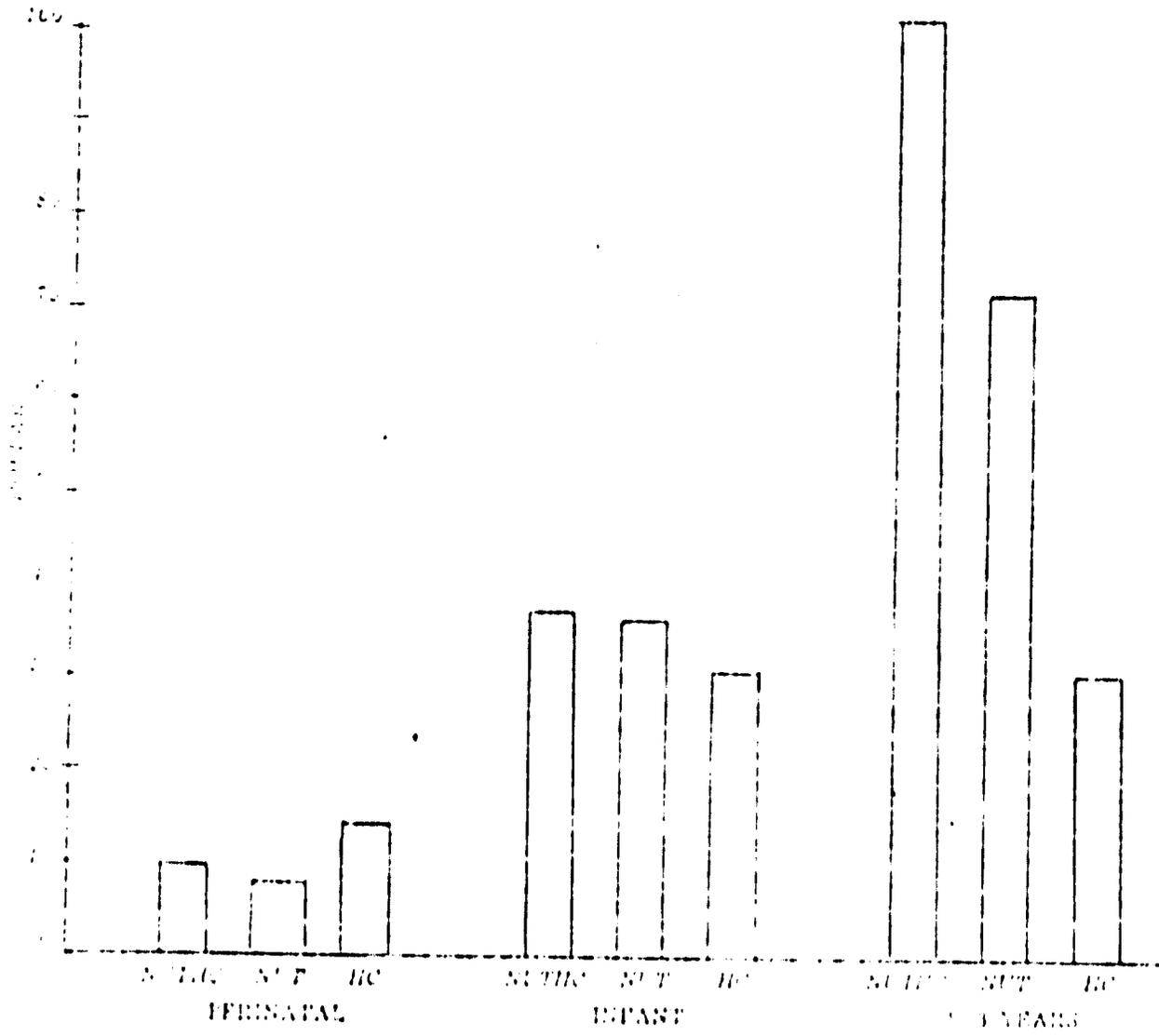
Finally, it was remarked that no synergism in impact on the target group resulted from the combining of different services: although an increased efficiency was noted when more than one service was delivered.

### 3. Conclusions

The limited availability of research studies which examine the value of combining various services with the delivery of a supplementary feeding makes it all but impossible to come to any definitive statement concerning what combination would have the greatest impact. However, certain important concepts can be suggested for the future decisions concerning what mix of activities should be incorporated into an MCH feeding program.

Fundamentally, in assessing the magnitude of the nutrition problem in a community, it is paramount that a diagnosis of the etiology of malnutrition be made in order to plan for its eradication. For example, the widespread problem of late introduction of solid foods as a major cause of infant mortality, demands educational efforts be given priority. Undoubtedly, local food production activities or provision of potable water will have only limited impact unless a reorientation in infant feeding practices is undertaken. Similarly, it would be foolish to commit a large amount of resources to pre-school education (as in the ICDS) before there is assurance of prenatal care.

Figure 2  
COST PER CHILD DEATH AVERTED



From: Taylor, 1980

In another circumstance, environmental sanitation and/or provision of health care measures would clearly take priority in a village where dietary intakes were near normal, but parasitic and bacterial infection were widespread, affecting the biological utilization of the ingested food, and therefore nutritional status.

It can be recommended that services not be indiscriminately added one to another in a quest to provide an integrated delivery system. If that is done, the results will probably be as in Narangwal, where the synergism was negligible, as individual components could effectively address the problem. Likewise, it must be remembered that the Department of Social Welfare, through whom this program will be implemented, does not maintain primary responsibility for health care (which lies within the Ministry of Health). If the problem of infant mortality, for example, is not directly related to poor food practices and consumption (as in Narangwal), but rather to the lack of health and medical care, a "nutrition program" is the wrong forum to address the problem. Instead, various other types of health and child care services may be emphasized as a more cost-effective means of reducing child mortality. This is not to suggest that coordination of various delivery systems should be discouraged. Quite to the contrary; however, it is to caution against unnecessarily overburdening a program or delivery system without a demonstrative need. This is especially germane if that need is better met through a different program and infrastructure.

In conclusion, there has been a zealous quest for integrated development programs in general, and nutrition programs in specific. However, little empirical evidence exists to demand a large mix of services be attached to a nutrition program. Nutrition and child care education concerning infant feeding practices (especially the need for introduction of semi-solid foods at four months and encouraging prolonged breastfeeding), food

preparation, basic hygiene, monitoring of growth and development with the growth chart, and rehydration through the use of oral glucose-electrolyte solutions prepared in the home, are imperative. But other than nutrition education, care should be exhibited in adding an array of activities which will raise costs, increase the difficulty in discerning the impact of the nutrition component, and encumber the delivery of services and implementation of the program. The translation of grandiose designs into operational programs has been the greatest obstacle to successful interventions.

Finally, the use of the feeding program as a link to the delivery of basic health and educational services is always appropriate. The facilitation of immunization campaigns, the referral of health cases to the appropriate clinic, the periodic attendance of health care personnel at feeding centers, and so on, is all to be encouraged. The difference between forming linkages with other programs and incorporating these activities into the mainstream of a nutrition program must be emphasized.

#### 1. Community Involvement

The involvement of local communities in the planning and implementation of supplementary feeding programs is advocated by all, but understood and realized by few. In fact, the range of considerations that define the concept of community involvement indicates a lack of consensus on what this unmeasurable and contextual ideal represents. The literature reviewed, however, was suggestive of different levels of community involvement.

At one extreme, there is a general lack of interest and a low rate of participation in the project activities. A higher degree of community involvement is when individuals regularly avail themselves of project services, but receive the food from an outside organization (e.g., CARE, GOI) in a passive manner. In this case, the external

agency would supply all the inputs and impetus for the project.

A greater amount of community involvement is when the provision of all inputs, such as food, still emanate from outside the community, but the villagers play some active role in the project design and/or implementation. Another example of considerable community involvement is when local leaders are integrally involved in project-development along with external agency personnel.

Finally, there is the ideal when a community animator, whether from within or without the village helps facilitate the identification of felt-needs, and directs the energy generated by the community to muster locally available resources to resolve the identified nutrition problem. Self-reliance is the theme of this type of community involvement, which makes the greatest demands on the community, and undoubtedly accrues the most benefits.

In considering the range of community involvement in feeding programs in India, it is worthwhile giving some concrete examples which may have implications for the design of future endeavors.

At the one extreme are those programs with a minimum of interaction between the project and the community. Most disconcerting is that evaluations of the two largest MCH feeding projects which have been implemented on a national scale, the SNIP and the Applied Nutrition Programme (ANP), indicate a conspicuous absence of community involvement (Muthayya et al., 1978; Rajendran, 1978; Nath et al., 1978). According to statistics supplied by Nath et al., a survey of SNIP beneficiaries indicated that only 6.1% had reported assisting or participating in the functioning of the center and only 15% indicated that there was any community participation in the program at all. Of the community leaders questioned, only 33% said that the community assisted in the feeding center operations. It was therefore concluded that no effort was made by program operators to enlist the assistance or involvement of the parents of beneficiaries, and the community at large.

Similarly, an evaluation of the SNP in Karnataka (Sastry et al., 1980a) reported that the community contribution to the program seems to be absent. Ninety-six percent of the respondents reported that they did not extend any help in organizing or running the program.

At the other end of the spectrum are instances when the project and community are so integrally involved, as to be indistinguishable from each other. One such project which has received international attention (and acclaim) is the Jamkhed Comprehensive Rural Health Project (CRHP) in Maharashtra (Arole and Arole, 1975; Mahadevan, 1980). Three of the guiding principles of the Jamkhed project have been that: (1) villagers must be motivated to play the key role in deciding how a health and nutrition program should be implemented, so as to gain a sense of "ownership" and responsibility; (2) grass-root planning which is responsive to local conditions is paramount; and (3) the use of local resources (e.g., buildings, manpower, agricultural products) is encouraged.

This philosophy resulted in a health and nutrition program in which local leaders work as a liaison between villagers and the project staff. A working group of local leaders from various castes and political parties guides the project and responds to the demands and needs of the people they represent. As such, food and water were identified as a most pressing concern within the community. Hence, "the felt need for food was translated into the development of a nutrition programme" (Arole and Arole, 1975, p. 76).

Since the use of donated food was deemed inappropriate, villagers organized to dig wells for farmers, who, in turn, donated land for the production of the food used in the supplementary feeding aspect of the CRHP. Likewise, a village health worker was chosen from within the community to supervise feeding, provide basic health and nutrition education, collect vital statistics, do home visiting and make referrals. These workers have proved acceptable to the community and well motivated, with job satisfaction being the major incentive. The

villages also provide the buildings for health clinics, volunteers for preparing food, and any other infrastructure development, like road construction which allows mobile health teams to visit the village. Similarly, a small fee is paid for curative health services, which assists in the provision of other project services such as supplementary feeding.

Some have argued that experiences such as Jamkhed represent the only long-term solutions and have contended that programs must be based on self-reliance (Sukhatme, 1980). The Indira Community Kitchen and Kitketwadi village programs were provided by Sukhatme as other examples of innovative, self-motivated feeding programs in which communities were the active participants in making the project work, rather than passive, even if enthusiastic recipients.

Likewise, H. W. Butt of the Indo-Dutch Project for Child Welfare (1979) emphasizes that community involvement in planning and operating the program is essential. To encourage such effective participation, a "sharing" of costs by the participants is mandatory. A nominal fee (50 paise) is charged to families who participate in the program on a monthly basis, although in-kind payments in grain or the work of a mother at the creche or balwadi is equally acceptable. It is felt that this approach which eliminates much of the "charity" character of the program, will also have long-term benefits and not foster dependence on external input.

In the Kasa project (Shah, 1975; Shah and Corra, 1976), the necessity was also recognized for involving local people in the project. If not, comprehension and appreciation of the objectives of the project among the villagers would be impaired. Therefore, it was decided to hold meetings with members of the Panchayats, teachers and local community leaders to explain the objectives and functioning of the program. Other ways in which Kasa enlisted community involvement were: the provision of storage space for the food supplements; giving lunch to workers involved in delivering immunizations; and assisting in identifying the Part-Time Social Workers.

Similarly, the Integrated Child Development Services (ICDS) Programme aims at selecting an Anganwadi worker from within the local community to be the focal point for delivering the integrated package of health and nutrition services. The ICDS also envisages that local bodies, voluntary organizations, panchayati-raj institutions and the like should run the Anganwadis (Dayal, 1977).

The Composite Program for Women and Preschoolers, presently operated by CARE in the State of Kerala, involves the feeding of pre-school children at Balwadis (day-care centers). It is another laudable example of involving the community in the feeding program. The Mahila Samajams (village women's clubs) are given the responsibility for implementing the program, maintaining the Balwadi, and ensuring that the building is used for its designated purpose. Furthermore, the land on which the Balwadi is constructed must be owned outright by the Mahila Samajams, and the resources from AID, CARE, Government of Kerala as well as the Mahila Samajams all contribute to the effort. According to CARE, this expanding project has been in operation for four years, and "has been received with enthusiasm by local people who have eagerly participated in project implementation by contributing funds as well as services" (CARE, 1980).

In a slightly different vein, a feeding and health project was introduced in Tamil Nadu which emphasized community involvement. Nutrition education, treatment of common illness, immunizations and feeding for all Grade III and some Grade II malnourished individuals were provided through a Child Care Center, which was also the residence of the Child Care Worker. Mothers come to the center to attend cooking demonstrations, assist in food preparation and the actual feeding. But more important was that during the initiation of the Center in the community, the Panchayat Union Commissioner, the Chairman of the Panchayat Union and the President of Village Panchayats gathered to discuss the concept of the project. It was made explicit that food is distributed only temporarily, until the nutritional status of the child has improved. Films on malnutrition were also shown to community leaders and any of the villagers who

were interested in attending. The usual result was that enthusiasm for the Center was generated by these meetings. Thereafter, the community made provision for the Center by donating or constructing a building. Publicity about the Centers was also emphasized through a variety of visual displays throughout the community (Venkataswamy and Kabir, 1975).

A similar mode of operation, involving Community Nutrition Workers (CNW), is being planned for a new World Bank project, also in Tamil Nadu. A representative of the village will participate in the selection of the CNW. The village council will also be involved in the identification of the nutrition center. Other ways to encourage community involvement include personal and mass media contact to introduce the villagers to project objectives and activities, and encouraging local participation in child weighing, supplementation and usage of oral rehydration fluids. In addition, a newsletter will be published designed to motivate the field staff through public recognition of outstanding performance.

A final interesting example of arousing community interest is supplied by the Tamil Nadu Nutrition Project (Cantor Associates, 1974), a take-home dry distribution feeding effort. Following meetings with Block Development Officers, Panchayat Presidents in the villages, the Balasevikas (village level health worker) and various other officials, a village mass meeting was held. Music, speeches, dancing, folk-songs and other entertainment was provided as the project was explained through the use of visual aids. The meeting was attended by more than 50% of the village population, and was chaired by the Panchayat President. It is reported by the study that this proved a good method to motivate the workers and encourage community involvement. In the long run, it was partially credited with a monthly participation rate in the program that was double what had been anticipated.

The previous discussion elucidates different approaches to involving the community in a supplementary feeding project. Provision of inputs

by the community (e.g., buildings, food); training local villagers to be integrally involved in service delivery who are culturally and socially sensitive to the people in the community, and patient with and understanding of the difficulties in changing local habits and customs; contacting community leaders to gain their interest and insight in project design and implementation; enlisting the assistance of villagers in the delivery of services; concerted publicity and public relations efforts to encourage awareness about the project and hence increase participation; providing weight charts which become the responsibility of the mothers; and charging small fees for services rendered, are examples of the methods employed previously. Undoubtedly, other new and innovative methods to involve the community in a feeding project can and must be developed, to assure project success.

Characteristics of the food delivery system, the responsiveness of the program to the felt-needs of the community, the level of involvement of community leaders and members in formulating the program and subsequently implementing the services, are among the considerations that will affect program success and impact. It is suggested that fostering good relations with the community and learning from them what is the best entry point and implementation procedure is the optimal method to facilitate the long-term involvement of the target population. By doing so, self-reliance and a feeling of controlling one's own destiny can be enhanced.

While an MCH nutrition project using food donated by Title II or some other external source will do little to promote economic and social development in the community (as did Jamkhed), the MCH feeding project can prove an effective way of reducing malnutrition and infant mortality. In turn, many would argue that this improved health status will promote development. However, caution must be exhibited not to provide food to passive recipients, which can only serve to promote dependency and have deleterious impacts on the long-term welfare of the community. Rather, a partnership between project

personnel and project beneficiaries must be developed in which synchronous objectives and outcomes are identified. Thereafter, a mutually agreed upon mode of implementation with active community support and involvement is paramount. Thereby project planners can rest reasonably assured that at best the project will have a positive effect on the community's health and nutrition, and, at worse, no long-term deleterious effects will be manifest.

#### J. Evaluation and Nutrition Programs

This section of the report will outline threats to the validity of nutrition evaluation and examine selected impact evaluations of MCH feeding programs in India. The intent is to review methodologies employed, their appropriateness and reliability. Since there were no documents uncovered which related program benefits to program costs (other than Narangwal and Project Poshak, both of which are discussed in section H), it is impossible to make any insightful comments as to the benefit/cost ratio of the various programs. This is especially true given the questionable methodologies employed to quantify program impact.<sup>3</sup>

In addition, this section of the report will make brief recommendations on the monitoring and evaluation system which will play a vital role in the new Integrated Maternal and Child Nutrition Project. Fundamental principles for evaluating a large-scale operational project, as opposed to small-scale research activities, will be presented.

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<sup>3</sup> An attempt was made to provide the reader with accurate estimates of program costs. This information, found in Appendix I, was standardized as much as possible given the inconsistencies and ambiguities in the presentation of financial data. It will allow for a comparison of food costs per beneficiary, and the proportion of project costs allocated to food vs. other services.

1. Evaluating the Impact of MCH Supplementary Nutrition Programs--  
Trials and Tribulations

Evaluating the impact of a supplementary nutrition program is conceptually simple: it is a determination of whether, or to what extent, the nutritional purpose of the program was realized. This involves the measurement of the change in nutritional status, and the attribution of that change to the program.

Two major projects are encountered with impact evaluation: (1) to what extent are there rival explanations for relating measured change in nutritional status to the services provided during the period--that is, how well does the evaluation separate "background noise" of simultaneous but perhaps exogenous variables and events, and secular changes, from the project's impact on observed outcome; and (2) to what extent are the results generalizable to other environments. These factors, usually labelled threats to internal and external validity, respectively are discussed in detail in the context of evaluating nutrition programs by Sahn and Pestronk (1980) and Drake, Miller and Humphrey (1980), and in the general evaluation literature by Campbell and Stanley (1966) and Shortell and Richardson (1978). In this document, however, some of these threats will only be outlined briefly below.

a. Threats to internal and external validity of evaluation

The major threats to internal validity are as follows:

- History Effects represent events such as: (1) physical phenomena (e.g., earthquakes, measles outbreak); (2) social factors (e.g., influence of urbanization on food habits); (3) economic factors (e.g., seasonal or yearly fluctuations in selling price of crops); and (4) political considerations (e.g., the instability of a government) which transpire

outside the context of the delivery of project services and represent major determinants of nutritional status.

- Maturation Effects on participants and processes indicate that the rate of malnutrition within a community will change markedly, and in an unpredictable fashion, as the age distribution of the target group changes, regardless of whether or not there was an intervention. Similarly, variations in the design or delivery of project activities, once the project is operational, coupled with adaptation in the manner in which the target group or audience responds to the project, make it difficult to attribute changes in nutritional status to specific features of project design.
- Testing Effects recognize that if a test is taken to gather baseline data, and then again for follow-up purposes, the results of the second test might be influenced by the first test. This may be due to the learning of correct responses, or anxiety associated with taking a "test."
- Instrumentation Effects concern the propensity for measurement to be inaccurate due to poor maintenance of equipment, coupled with insufficient quality control over measurement, interviewing and transcription techniques.
- Regression Artifact Effects acknowledge that even without intervention, over a period of time some of the Grade III malnourished children will naturally recover, or at least move up to Grades II or I.
- Attrition or Addition Effects recognize that individuals can enter or drop out of a project, changing the composition of a target population, and thereby affecting its nutritional status.

Major threats to external validity included the following:

- Hawthorne and placebo effects represent changes in nutritional status not due to project design or service delivery, but rather to the presence of an intervention which altered behavior of the target group.
- Multiple intervention interference is a result of previous or concurrent interventions being applied to the same target group, which either facilitates or impedes efficacy of the project being evaluated.
- Selection--intervention interactions occur when the control groups or test groups are unrepresentative of the universe from which subjects are selected.
- Pretest-intervention interaction (including "halo" effects) refer to pretest measurements which increase or decrease a subject's responsiveness or sensitivity to the delivery of project services.

In concert, these threats to internal and external validity must be considered in assessing the findings of an evaluation study, as they represent competitive explanations to, and biases in evaluation outcomes. In addition, internal and external threats must be addressed in formulating an evaluation design. Otherwise, it is likely that evaluation results will be indeterminate and of questionable validity.

#### b. Impact Evaluation Methodologies

A variety of evaluation methodologies were employed in MCH supplementary feeding programs in India. Examples of different approaches used, and comments on their appropriateness, are presented below.

- Expert Judgement is the most simple but least reliable evaluation technique used in the Indian context. It involves gathering the opinions of experts through interviews, observing program activities, reviewing existing documentation, and rapidly assessing the magnitude and nature of the services being delivered to a target group in relation to the size of the nutrition problem. Specifically, cursory and preliminary calculations are designed to intimate whether the measurement of impact is precluded by the very nature of the intervention; or conversely, that the intervention has a reasonable likelihood of a demonstrable impact on nutritional status if implemented according to design specifications.

The Community Systems Foundation evaluation of the P.L. 480 Title II Program in India (Nelson, Sahn and Rogers, 1979) followed this methodology. The nutritional value of the food ration was calculated, and adjusted to account for the number of feeding days and ration dilution through factors such as intra-familial sharing and substitution. Results indicated that the supplement provided 1.2-12% of the recommended daily allowance for calories. However, the evaluation team asserted that the lower number is more realistic. Hence, a measurable nutritional impact was precluded given the small incremental increase in intake, and the advisability of carrying out further quantitative evaluation was questioned.

While such an evaluation indicates whether there exists possibility for nutritional impact, it does nothing to measure its magnitude, nor the differential impact on the various participants. Clearly the validity and precision is poor. However, this approach has utility as an initial perusal and preliminary approximation of the situation to determine

the worth of performing a more comprehensive impact evaluation.

- One-Group Before-and-After Design, often labelled Pre-test and Post-test design, is the most frequently used evaluation approach in the Indian literature. Simply, it involves measuring the nutritional status of the target group at one point in time (usually at the outset of the intervention). Thereafter, the measurement is repeated at a later point. The difference in nutritional status would then supposedly be attributable to the project.

An example of this type of design is the evaluation of the Integrated Child Health Scheme (Chadha, 1980). Weights and heights of children were recorded at the outset, as were prevalence of clinical deficiency signs and illness. After nine months, the same children were re-examined; changes in status were assessed. The author concluded that program participation resulted in a significant improvement in weight (according to the Gomez classification) and height-for-weight status, although no changes in height-for-age were reported. A marked decrease in the incidence of vitamins A and C deficiency and all illnesses except fever and conjunctivitis also occurred.

A similar approach was used in evaluating the impact of the Kasa Project (Shah and Corra, 1976). In this case, the improvement in weight-for-age was examined six months and one year after the intervention. After six months in the program, 56.6% of the Grade IV (below 50% of the fiftieth percentile of a standard) and 38% of the Grade III (51-60% of the fiftieth percentile) malnourished children improved. After one year, these figures were 71% and 54% respectively.

Likewise, Venkataswamy and Kabir (1975) depended on the

before-and-after measurement of nutritional status not only to judge program effectiveness, but also to determine how long it is necessary to maintain a child in a program. It was found that after three months of enrollment, the number of third-degree malnourished children decreased by 52%, while the number of first-degree increased fourfold. Prevalence of night blindness went from 57 children to four children, conjunctive xerosis from 588 to 119, and Bitot's Spots from 80 to 28 children in three months.

Unfortunately, the validity and reliability of the results of one group before-and-after designs are minimal. Attribution of observed outcomes to program services is tenuous, since numerous competing explanations could account for observed changes in nutritional status of the target population.

To amplify, the "background noise" of simultaneous but exogenous variables and events, and secular changes within a community will inevitably exert an equal or greater influence on observed outcomes than the program services. This problem falls in the domain of historical threats to evaluation validity, discussed above. For example, Venkataswamy and Kabir (1975) note a bad monsoon during the period that the program was operational. This could markedly influence evaluation outcomes.

Maturation effects also plague this evaluation design. To illustrate, Chadha (1980) suggests that the ICHS Project had a positive impact on the nutritional status of participants, especially those children who were 18 to 24 months at enrollment. Considering that these children were remeasured after their second birthday, these evaluation findings should come as no surprise since the 18 to 24 month old child who was recently weaned, would be more likely malnourished than the 30 to 36 month old child. In fact, this issue of older

children being better nourished has prompted Drake<sup>4</sup> to propose the concept of the "least-cost intervention," in which no services are provided and children are simply allowed to get older. As a result, measurement in the same cohort indicates improved nutritional status.

Another threat to evaluation validity in the one group before-and-after design is found in the Kasa project, or any similar effort that focuses on the most severely malnourished children. In these instances, regression artifacts are expected to occur. Likewise, most of the other internal and external threats discussed previously are not controlled for with this approach.

Non-Equivalent Comparison Groups, whether it be in cross-sectional or longitudinal studies, is a third methodology. It involves comparing the effects of a program on a group that received program services with a matched control group, selected to be characteristically similar. The greater the ability to match the two groups, the greater the confidence which can be placed on the results of the evaluation design.

It is important to distinguish this approach from an experimental design (to be discussed later) in which participants and non-participants are selected at random. In addition, a distinction must be made between those comparison group evaluations that are cross-sectional, collecting data at one point in time, and those that are longitudinal, tracing and comparing the changes of comparison groups over time.

An example of the cross-sectional comparison group design is the recent evaluation of the SHIP (Sastry et al., 1980a). The lack of baseline data on the beneficiaries precluded

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<sup>4</sup> Personal communication with William D. Drake, Community Systems Foundation.

making comparisons of their present status with that of an earlier point in time. Therefore, the methodology adopted was to make comparisons between two groups: one that was covered by the program, and one that was not. The two groups chosen lived in the same area. Among the problems encountered was the realization that the controls, often siblings of the experimental group or former participants, did not represent an appropriate comparison group. Hence, statistics collected by NNMB in the region of the program were also employed as a control.

The Gomez classification was chosen to quantify changes in grade of malnutrition, in addition to prevalence of clinical signs being used to assess impact. Findings included that: (1) there was a significantly lower prevalence of clinical deficiency signs in beneficiaries than the NNMB group; and that (2) weight according to the Gomez classification was greater for the beneficiaries than non-beneficiaries and NNMB group.

The authors remained apprehensive about these findings because of the weakness of the controls. As a result, a follow-up study in the urban slums of Bangalore was initiated (Sastry et al., 1980b). Children in seven feeding centers were compared with children from slums without the SNP. The groups were matched on the basis of occupation of head of household, age, location and size of the slum. Information was collected in a cross-sectional survey. Results of weight-for-age data, clinical assessments and dietary data all indicated improvement in the nutritional status of the population.

Another impact study of the SNP in tribal areas of Andhra Pradesh (Rao et al., 1975), using the same non-equivalent comparison group, also yielded positive results; while an

ANP evaluation following the same methodology generally found no program impact (Rao, 1978).

Once again, however, caution in interpreting these results is demanded. First, it takes a great leap of faith to believe that the nutritional status in the communities were identical before the program began. Furthermore, the history and maturation effects have inevitably affected the experimental and control groups differently. Therefore, without baseline data to substantiate the similarity of experimental and control groups, and the nature of events which have intervened subsequently, it is presumptuous to consider the villages adequately matched. Likewise, the use of survey data, such as that collected on a regional basis by IIMB is equally inappropriate for similar reasons.

In an attempt to improve upon the use of before-and-after comparisons as described above in the Kasa and ICHS projects, and the cross-sectional matched control approach used for the SNP and ANP studies, other evaluations have combined these two techniques. In this case longitudinal data are collected on a matched experimental group and a control group. Not only is there an attempt to match the two groups at the outset, but a comparison of the change in status of the groups, before and after the intervention, is used to determine project impact.

The Evaluation of the Indo-Dutch Rural Creche (Devi and Pushpanna, 1978) utilized this approach. Weight, height, head circumference, chest circumference and mid-arm circumference were measured on the program participants and a control group from another village. Children were selected from the same socioeconomic groups. In addition, data on clinical signs of nutritional deficiencies, dietary intake and prevalence on non-nutritional disorders were collected.

Results indicated a positive impact of the program on weight, height, mid-arm circumference, prevalence of dietary deficiencies and nutrient intake.

While this approach is more reliable than those mentioned previously, there remains an additional threat to validity as of yet not discussed: that is the problem of participation bias, which falls in the domain of selection-intervention interactions mentioned earlier. Although it is feasible to match villages on the basis of demographic and other important variables, it must be recalled that there is a motivational and selectivity factor in the decision to enroll in the program. If the participants are self-selected or selected for some distinguishing characteristics by program functionaries, it is erroneous to believe that a control group from another village will have the same characteristics or represent an identical stratum of the population.

In addition, one must always be aware that even when changes of nutritional status do occur, that it is not valid to assume that these changes are due to tangible or visible aspects of the intervention. For example, the awareness of treatment groups that they are participating in an experiment may cause them to alter their behavior in a way as to facilitate impact (the "Hawthorne Effect"). While true changes in the population may have occurred, they may in fact be a result of factors unrelated to the nature and content of the services provided.

- Experimental Design is another evaluative methodology exemplified by the longitudinal investigations in Project Poshak. Most important was that feeding and non-feeding villages were selected on a random basis. The use of randomization markedly reduces the possibility of bias in the selection of experimental and control

groups, which characterized the Indo-Dutch evaluation.

- The experimental design approach is acknowledged to provide the most accurate and reliable information on the impact of a nutrition project. It controls for most of the threats to evaluation validity. It is reasonable to assume that the treatment and control groups are similar in most characteristics, other than the delivery of services associated with the project. The effects of confounding variables and rival explanations for observed effects are minimized. As such it is a most reliable and unbiased evaluative research design.

In Poshak, once again weight-for-age was the measure used to assess impact. And as could be predicted, the authors conclude that there was significant evidence of improved nutritional status in the experimental group.

In this study, however, as in all those previously cited, questions can be raised as to the validity of the conclusions which are drawn from the data, regardless of the soundness of the methodology used to collect the data. Therefore, it is worth scrutinizing the arbitrary nature of the analysis of project Poshak in an illustrative vein, since it represents the most valid and carefully planned evaluation design reviewed. It must be kept in mind that the criticisms below could be applied to almost every evaluation examined.

The authors of Poshak based their conclusion of nutritional impact on the data presented in Tables 10 and 11, which follow.

Concerning Table 10, the authors assert that "it is evident that the experimental or intervened group of children demonstrates a clear growth benefit over their control

Table 10

Weight Comparison of Experimental and Control  
Groups of Children by a Percentile Classification  
(Extensive Phase)

Percentile classes of weights of control group	Control group (N = 73)	Experimental Group	
		PHD (N = 244)	SHC (N = 244)
20th and below	15 (20.5)	34 (18.9)	49 (16.4)
21st - 40th	15 (20.5)	96 (21.6)	60 (24.6)
41st - 60th	15 (20.5)	90 (20.3)	43 (17.6)
61st and above	28 (38.5)	174 (39.2)	101 (41.4)

N denotes sample size.

Figures in parentheses indicate percentages.

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Source: Gopaldas et al., *Project Poshak*

Table 11

Comparison of Mean Final Weights of Experimental  
 (Having Collected 60 Per Cent and Above of  
 Targeted 'Take-Home' Food)  
 and Control Groups  
 (Extensive Phase)

<u>Age in months</u>		<u>Control Group</u>		<u>Experimental Group</u>	
<u>Initial stage of Intervention</u>	<u>Final stage of intervention</u>	<u>Mean wt. in kg.</u>	<u>S.D.</u>	<u>Mean wt. in kg.</u>	<u>S.D.</u>
6-11	18-23	8.01	1.13(12)	8.11	1.20 ( 62)
12-23	24-35	9.17	1.24(32)	10.71*	0.54 (110)
24-36	36 and above	11.07	1.77(23)	12.63*	0.89 (173)

\* Significantly different from control group ( $p > 0.05$ ).

Figures in parentheses denote sample sizes.

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Source: Gopaldas et al., *Project Poshak*

counterparts." In reality, that conclusion is tenuous when you consider that 59%, 59.5% and 59% of the control group, the PHC experimental group and SHC experimental group, respectively, are above the forty-first percentile weight-for-age. That hardly seems like a clear demonstration of impact.

From Table 11, the authors once again claim that the experimental groups fared better than the controls. However, this finding has been disputed elsewhere (Singer, 1978), because although the mean weights are higher for the experimental groups, the standard deviations are all high. Therefore, when subjected to a T-test (a standard statistical test for significance), the difference between the means are not significant at the five-percent level.

Even if an analysis did find a significant difference through some other statistical test, a policy maker would be hard pressed to justify the expenditure of funds on such small differences in outcome. In fact, if the mean weights were plotted according to the Gomez scale, the differences between the control population and the experimental group are so small that both groups would remain classified as second-degree malnourished. Furthermore, it must be remembered that all the children who were enrolled in the program, but had a low rate of participation, were excluded from the analysis. Therefore, if the entire experimental population was included, the differences between them and the controls would probably be even smaller.

And finally, it is noted that in- and out-migration was substantial in the communities examined. These attrition and addition effects in the experimental and control groups can represent a major threat to the validity of an evaluation, if they are not equal in both villages. For example, if

people tended to drop out of the feeding program (or had low participation) because of illness, chances are that the results would be biased toward the program showing an impact. Conversely, if healthy children dropped out of the program because their nutritional status had improved and their parents no longer felt compelled to participate, the evaluation may indicate no impact, when in fact it was considerable.

So once again, despite the fact that Poshak represents a well designed, carefully controlled experiment, the subjective interpretation of the data has led the authors to reach conclusions which are difficult to support.

A few of the many possible designs for evaluating supplementary feeding programs have been described above. Other methodologies such as using multivariate statistical models (i.e., regression analysis) which serve as techniques for establishing statistical controls, or the recurrent institutional design in which the duration of involvement and/or the intensity of participation is used to formulate subsets of the population which are subsequently compared for program impact, have also been employed in evaluating feeding programs. However, these methodologies are subject to many of the threats to evaluation validity, which provide competitive explanations for program outcomes and make it difficult to generalize the findings of an evaluation to other settings.

It is, therefore, important to recognize the trade-offs which exist in selecting an evaluation design between: (1) the complexity and costs--that is, the level of skills and rigor; and (2) the accuracy of the evaluation results--accuracy being defined as the ability to determine the changes in nutritional status which can be attributed to the intervention. The task of selecting a design for the determination of impact can

therefore be conceptualized as an attempt to minimize the former concern of complexity and costs while maximizing the latter concern for the quality of the evaluation.

The use of randomization to determine experimental and control groups in a longitudinal study is the preferable evaluation design, with the use of well-matched treatment and control groups a close second. However, these techniques are only appropriate for research projects such as Narangwal and Project Poshak; their expense and moral and social unacceptability preclude them from widespread application. It would be unconscionable to withhold a service from a control population, or try to determine impact of a large-scale operational project at the cost of excluding needy individuals from a project.

Unfortunately, the range of alternatives are riddled with liabilities and methodological problems. Thus a redefining of evaluation is needed in the context of operational projects. Some suggests toward that end will follow a brief discussion of how the arbitrary nature of analyzing nutrition data further adds to the difficulties of determining project impact.

#### c. Selection of Measures and Analysis of Data

Two major problems are encountered in analyzing program impact: (1) selecting measures of nutritional status; and (2) interpreting data in terms of existing standards. These issues, discussed in greater detail by Sahn and Pestronk (1980), however, do merit brief comment.

First, Habicht (1980) points out that measures of nutritional status have varying utility over a range of types of malnutrition (e.g., chronic vs. acute); and that regardless of the measures selected, sensitivity varies as a function of

prevalence of malnutrition in the target group. Similarly, Martorell, Klein and Delgado (1980) discuss how certain measures are more appropriate for evaluation studies than others. So while this is not the forum to discuss selecting nutrition status measures, readers should be aware that choices thereof will effect evaluation outcomes.

Second, selecting standards and cut-off points for the designated measures will influence evaluation results. For example, Drake, Miller and Humphrey (1980) analyze weight-for-age data using two standards widely employed in India (Harvard and Gomez). In addition, two sets of cut-off points are designated (i.e., in the first, below 90%, 80% and 70% and in the second, below 85%, 75%, and 60% of the mean of the standard, represent first-, second-, and third-degree malnutrition, respectively). By varying the above parameters, the range of normal children is 33.2% to 66.6%, while the percentage of Grade III malnourishment ranges from 0.7% to 4.7% (see Table 12).

## 2. Suggestions on Evaluation

In the previous discussion of evaluation methodologies, it has been shown that there are numerous factors which make the validity of evaluation outcomes suspect. Both methodological problems in the collection of data and the subjective process of data analysis were illustrated. It was also asserted that controlled experiments in large-scale operational projects are not only difficult, but inappropriate. Therefore, a new approach to evaluation is necessitated.

Since the design and scope of the new Integrated Maternal and Child Health Project has yet to be delineated, it is impossible to make specific recommendations. However, some fundamental considerations in designing the evaluation component are as follows:

Table 12

**Nutritional Status of the Same Population, Using  
Identical Weight-for-Age Data with Different  
Standards and Cut-off Points**

		Grade III	Grade II	Grade I	Normal	Total
	Classification (%)	30-60	61-75	76-85	86+	
GOMEZ	Number	6	85	210	526	827
	Percent of Total	.7	10.3	25.4	63.6	
	Classification (%)	30-60	61-75	76-85	86+	
HARVARD	Number	10	170	176	372	828
	Percent of Total	1.2	20.5	33.3	44.9	
	Classification (%)	30-69	70-79	80-89	90+	
GOMEZ	Number	34	134	223	426	827
	Percent of Total	4.1	16.2	28.2	51.5	
	Classification (%)	30-69	70-79	80-89	90+	
HARVARD	Number	72	224	257	275	828
	Percent of Total	8.7	27.1	31.0	33.2	

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From: Drake, Miller and Humphrey, 1980

- An evaluation of a large-scale supplementary feeding program is not the appropriate forum for research and experimentation; research being defined as the formulation and testing of underlying scientific principles, with the goal of gaining generalizable knowledge into the physiological, environmental and social phenomena which constrain or facilitate improved nutritional status. Rather, it is expected that prior to initiating a project with a large expenditure of funds, that the underlying scientific principles have already been substantiated. If this is not the case, then small-scale research projects must first be undertaken.
- Once the scientific basis for a project exists, it is valid to assume that if the service is delivered, the intended outcome will result. Therefore, it is not necessary to set up large-scale impact evaluations. Instead, emphasis is to be placed on project monitoring and assuring the delivery of services.

To illustrate, it is no longer a point of contention that a 300 calorie increment will improve the nutritional status of a child suffering from protein calorie malnutrition. It is, however, questionable whether a supplementary feeding project can effectuate that incremental increase in intake. Therefore, it is logical that project evaluation and monitoring should explore the unknown--whether or not it is operationally feasible to deliver the service to the child. If so, an impact is assured and the program will inevitably achieve its purpose. If not, impact is precluded.

- Traditionally, the nutritional status of the child has been considered the primary variable to be examined in an evaluation. However, even if an indicator such as weight-for-age suggests that there has been an improvement in the nutritional status of the individual, it is virtually impossible to attribute that

observation to the program. The innumerable factors that affect nutritional status and the difficulty of controlling for the array of confounding variables makes impact evaluation difficult. Therefore, the process of service delivery must be substantiated, as a prerequisite to concluding anything about the achievement of project purposes.

- In setting up a project evaluation, emphasis can be placed on one of two concerns. The first is an evaluation design which concentrates on measuring the degree of success or failure of the project. The second approach has as its point of departure facilitating the achievement of the project goals; careful project monitoring and the collection of process data, followed by its utilization in a formative fashion to improve the chances of purpose and goal achievement is the focal point for such an effort. Although impact data may be collected and used in a formative evaluation, it is not the overriding concern. Rather, understanding and monitoring project activities and outcomes to assure improvement is stressed.
- This emphasis on an evaluation strategy which provides for constant adjustments in project services and delivery system, is based on the fact that it is extremely difficult to know in advance what will be the optimal intervention strategy. Instead, it is wise to articulate a general plan of implementation which utilizes evaluation findings to modify and shape the project into its most efficacious form. The utility of this approach is especially extant in a community-level intervention where changes in the environment and needs of the population demand a commensurate response of the project.
- If one accepts the notion of formative evaluation as being of primary importance, it follows that the involvement of local project personnel in evaluation design and data collection and analysis is paramount. First, it is only people working at

the implementation level that can accurately interpret the findings of data collected, as the ambiguities of analysis can only be suggestive of outcomes, but not a definitive statement of project effects. Furthermore, in order to encourage the accurate collection of data at the village level, without incurring major expenses, it is necessary to rely on local project personnel. Unless they sense a purpose and benefit of this effort, chances are that it will receive low priority and be done poorly or not at all.

It is therefore recommended that at the outset a theoretical model be developed which depicts the key elements of the delivery of project services and how they are intended to impact on the food and nutrition system in the community. This will indicate the essential variables to be measured by a monitoring and evaluation system.

This procedure may be conceptualized as a systematic detailing of the casual progression of events outlined in the logical framework of the project. Since the logframe represents a hierarchy of events, beginning with the provision of inputs and ending with the achievement of goals, it is only logical that the evaluation system be designed to substantiate intended outcomes throughout the system.

Finally, as suggested by Drake, Miller and Humphrey (1980), information collected by the monitoring and evaluation system should thereafter be processed rapidly, preferably in a location proximate to the project. Process and impact data should be shared with project managers and implementors to help improve their performance and delivery system. Simultaneously, possible explanations for observed impact should be formulated by the analyst, and reviewed with field staff in an attempt to isolate which of the many competing explanations were responsible for observed outcomes.

### III. CONCLUSIONS

In this review, fundamental considerations for the design of MCH supplementary feeding projects have been discussed. While a wide range of projects has been identified, two important considerations are rarely addressed which will inevitably affect the outcome of the Integrated Maternal and Child Nutrition Project.

First, it is paramount that there be a congruence at all levels concerning project purposes and goals. As has been remarked elsewhere, P.L. 480 Title II serves many constitutencies and likewise an MCH feeding project can incorporate an array of objectives.

According to AID's present Project Implementation Document, the purpose of the Integrated Maternal and Child Nutrition Project is to improve nutritional status with the goal of reducing infant mortality. This demands that project resources be funnelled to the small fraction of the population most at risk. The target group therefore represents those individuals whose life is most imminently threatened.

It should be recognized that this approach may contrast with a project whose purpose may be similar, but whose goals are, for example, human resource and community development. In that case, a strong argument could be made for cultivating the health and welfare of those women and children who are mildly malnourished, for which a feeding program in a child-care center or other community based institution could alter their status and improve their quality of life.

Although the above distinction may seem tenuous, it must be recognized that targeting to children on the precipice of death, versus those whose survival is likely and for which feeding and its related activities represent an enrichment in their lives, are philosophically very different approaches. In the former case, some have asserted that the severely malnourished children are caught up in a cycle of marginal improvement followed by a return to their dismal state. It is argued that this is inevitable

unless the social, economic and political constraints to improved health-care are overcome. Despite the strength of that position, the contrary contention that there is a moral imperative of saving lives, is equally convincing.

This Project has selected the path of reducing mortality, and thus this review has taken that perspective in critically assessing similar previous endeavors and making recommendations for future project design. It is emphasized that should the orientation of the Project change, so would the nature of the recommendations herein.

The second concluding remark involves the transferring of project plans to an operationally viable project. This document has dealt with project design considerations and falls under the auspices of a project planning activity. Similarly, almost all reports reviewed were planning and evaluation documents, discussing how the project was conceived and how it performed. It is obvious that much get lost in translating plans into projects, as the process of implementation, not design, represents the major obstacle to a project achieving stated purposes and goals.

The lack of skilled project management in the field setting is the painfully obvious difference between those projects that succeed, and those that fail. Some have said that a project demands a "saint" such as a P. M. Shah in Kasa, Venkataswamy in Madurai or Arole in Jamkhed in order to be successful; hence the failure of large-scale operational projects. It is felt that "saintliness" is not the pre-eminent ingredient of success, but rather good management over the entire process of implementation. Fundamentally, the need to assure that project inputs result in project outputs is a formidable job. A management capability from the highest levels of project operations in Delhi, down to the level of the village health worker is paramount.

It is therefore recommended that a reallocation of time and resource from the "sexy" job of planning to the "drudgery" of implementation be realized. The close consultation with institutions such as the Institute

of Management in Ahmedabad and NIPCCD in Delhi is suggested. Fundamentally, there is no shortage of design schemes. However, making plans realistic to implement, and finding the expertise to manage that process, is the major constraint which must be overcome in the new Integrated Maternal and Child Nutrition Project.

APPENDIX

PROGRAM COSTS

		C O S T    A N A L Y S I S			
	Food Per Beneficiary	Other Expenditures	% Expenditure on food	% on other expenditures	Total Cost per beneficiary
		<u>FIRST YEAR</u>			
I. PUNJAB NUTRITION DEVELOPMENT PROJECT PUNJAB  (Govt. of Punjab, 1974)	-NIL- (no feeding)	Rs.19,250/project per year	0	100	N.A.
		<u>SECOND YEAR</u>			
	N/A	Rs.50,548/project per year	42.6	57.4	N.A.
		<u>THIRD YEAR</u>			
	N/A	Rs.51,240/project per year	59.5	40.5	N.A.
		<u>FOURTH YEAR</u>			
	N/A	Rs.60,242/project per year	68.5	31.5	N.A.
		<u>FIFTH YEAR</u>			
	N/A	Rs.46,059/project per year	79.1	20.9	N.A.
II. SPECIAL NUTRITION PROGRAMME (NATH, et al., 1978)	Rs.0.18 per child per day	Rs.0.055/child per day	76.6	23.4	Rs.0.235 per child per day
	Rs.0.25 per pregnant woman per day.				

C O S T    A N A L Y S I S

Food Per beneficiary	Other Expenditures	% Expenditure on food	% on other expenditures	Total Cost per beneficiary
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III. PROJECT POSHAK  
(Gopaldas, 1975)

(A) <u>EXPLORATORY PHASE</u>	Rs.0.238/day	Rs.0.327/child per day	42.1	57.9	Rs.207.55 child per year
		Rs.120.47/child per year			Rs.0.565per child per day
(B) <u>EXTENSIVE PHASE</u>					
(1) <u>PRIMARY HEALTH CENTRE</u>	Rs.0.238/day	Rs.0.061/child per day Rs.22.98/child per year	79.1	20.9	Rs.110.06 per child per year Rs.0.301 per child per day
(2) <u>SECONDARY HEALTH CENTRE</u>	Rs.0.238/day	Rs.0.073/child per day Rs.27.38/child per year	76.1	23.9	Rs.114.46 per child per year Rs.0.313 per child per day
(C) <u>INTENSIVE PHASE</u>					
(1) "TAKE-HOME"EXPERIMENT	Rs.0.238/day	Rs.0.330/child per day Rs.120.47/child per year	41.9	58.1	Rs.207.55 per child per year Rs.0.568/per child per day
(2) <u>SUPERVISED FEEDING</u>	Rs.0.317/day	Rs.0.658/child per day Rs.240.20/child per year	35.4	64.6	Rs.327.28 per child per year Rs.0.896/per child per day

C O S T   A N A L Y S I S

	Food Per beneficiary	Other Expenditures	% Expenditure on food	% on other expenditures	Total Cost per beneficiary
IV. <u>CRS</u> (CRS, 1980)	Rs.0.456/day	Rs.0.050 per beneficiaries per day Rs.15,120,000 per project per year	89.0	11.0	Rs.0.512/day
V. <u>INDO-DUTCH PROJECT FOR CHILD WELFARE</u> (Devi & Pushpamma, 1978)	Rs.0.50/day	Rs.0.135 per beneficiary per day	78.7	21.3	Rs.0.635/day
VI. <u>ICDS</u> (Dayal, 1977)					
(1) <u>RURAL</u> *	Normal beneficiary Rs.0.25/day	Rs.424,800/project per year	65.9	34.1	N.A.
	Severely*** mal-nourished beneficiary Rs.0.60/day				
(2) <u>TRIBAL</u> **	Normal beneficiary Rs.0.25/day	Rs.244,900/project per year	68.7	31.3	N.A.
	Severely mal-nourished beneficiary Rs.0.60/day				

\* The cost is calculated for 1,00,000 population with following demographic characteristics -  
 No. of children=17%(i.e.17,000)of the total pop. of which 40%(i.e.6,800)would be covered by feeding component.  
 No. of pregnant women & nursing mothers= 7%(i.e.7,000)of ..... which 40%(i.e.2,800)would .....component.

\*\* The cost is calculated for 35,000 population with following demographic characteristics -  
 No. of children=17%(i.e.5,950)of the total pop. of which 75%(i.e.2,100)would be covered by feeding component.  
 No. of pregnant women & nursing mothers=7%(2,400)of.....which 75%(i.e.1,835) would..... component.

\*\*\* No. of severely malnourished children = 10% of the total no. of children and women identified as malnourished.

C O S T      A N A L Y S I S

Food Per beneficiary	Other Expenditures	% Expenditure on food	% on other expenditures	Total Cost per beneficiary
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VII. CHILD CARE NUTRITION CENTRE  
(Venkitaswamy & Kabir, 1975)

Rs.0.75/day      For the period 9/8/74 to 31/5/75  
Rs. 2,558/project      56.0      44.0

VIII. NUTRITION PROJECT IN TAMIL NADU  
(World Bank, 1980)

	First Year	**		
Rs.0.15 per <sup>†</sup> child (under 2 yrs) per day	Rs.9,227,556/project per year	1.3	98.7	
	Second Year	**		
Rs.0.30 per child (2-3yrs) per day	Rs.11,243,879/project per year	19.0	81.0	
Rs.0.30 per woman beneficiary per day				
	Third Year	**		
	Rs.27,310,912/project per year	24.2	75.8	
	Fourth Year	**		
	Rs.39,196,691/project per year	27.8	72.2	
	Fifth Year	**		
	Rs.40,184,025/project per year	36.5	63.5	

\* The usual ration was 40 gms for children under 2 yrs. of age; 80 gms for children aged 2-3yrs and for pregnant women, severely malnourished children (10% of beneficiaries) received double rations.

\*\* These data are only for the expenditure incurred on nutrition delivery component.

C O S T     A N A L Y S I S

Food Per beneficiary	Other Expenditures	% Expenditure on food	% on other expenditures	Total Cost per beneficiary
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VIII. (cont.)

FOR FULL FIVE YEARS\*

Rs.133,679,283 for projects per 5 yrs.	27.5	72.5	Rs.24.864** per village child per annum
			Rs.31.50** per pregnant lactating woman

IX. <u>THE KASA MCHN PROJECT</u> (Shah, 1977)	Rs.0.25/day	Rs.238,538/project per annum	21.8	78.2	Rs.5.41 per year
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\* These data are only for the expenditure incurred on nutrition delivery component.

\*\* These figures include even those children and women of the population covered by the project who do not receive supplementary food.

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