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**COMPARATIVE ANALYSES  
OF NUTRITIONAL  
EFFECTIVENESS OF  
FOOD SUBSIDIES AND  
OTHER FOOD-RELATED  
INTERVENTIONS**

**EILEEN T. KENNEDY  
HAROLD H. ALDERMAN**

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**BY EILEEN T. KENNEDY AND HAROLD H. ALDERMAN**

**INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE  
1776 MASSACHUSETTS AVENUE, N.W.  
WASHINGTON, D.C. 20036, U.S.A.  
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## Foreword

Until the day that poverty is eliminated, malnutrition will be a fact of life in developing countries. Among the millions affected, pre-school children and pregnant and lactating women suffer the most severe consequences. In the meantime governments and international institutions try first one intervention strategy and then another in an unrelenting effort to combat malnutrition.

Most research on nutrition interventions has concentrated on the analysis of particular approaches. Very little information is available to help decisionmakers choose among a range of

possibilities. This report, which was undertaken by IFPRI for the Joint WHO/UNICEF Nutrition Support Program, funded by the Government of Italy, helps fill that gap.

The report provides guidance to policymakers wishing to select from among the many alternatives the appropriate food-related nutrition intervention. Using cost-effective analysis, the report evaluates the success of different strategies in attaining similar nutritional objectives. It provides new insights that can be used to determine the most appropriate type of program or mix of programs for a given country.

James Grant  
Executive Director  
United Nations Children's Fund

John W. Mellor  
Director  
International Food Policy  
Research Institute

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## Introduction

Malnutrition affects millions of people in developing countries; it affects preschool-aged children and pregnant and lactating women acutely. In the long run, most policymakers would agree that the elimination of poverty is the most effective way of dealing with protein-calorie malnutrition. In the short run, however, governments and international institutions have pursued a variety of intervention strategies in the hope of alleviating malnutrition.

Several recent reviews have summarized what is known to have happened as a result of the various policies that have been tried.<sup>1</sup> While these summaries have been helpful, most of this research has been focused on analysis from within the programs. What are the determinants of a successful supplementary feeding program? What is the optimum level of nutritional benefits in a food-stamp program? How can a consumer price policy be effectively directed toward — targeted to — the lowest income group? What is less apparent is what advice can be given to allow policymakers to judge the effectiveness of different types of programs in achieving policy objectives. What type of nutrition intervention or combination of approaches is most effective in a given situation?

The primary aim of the present review is to provide empirical information that can be used to guide those who must choose among alternative types of nutrition intervention.<sup>2</sup> In a recently

published manual eight criteria for selection among alternative interventions are discussed: relevance, feasibility, integration with other programs, effectiveness, ease in targeting, cost-effectiveness, ease in evaluation, and likelihood of being used for the long term.<sup>3</sup> Many of those are difficult to quantify; others, such as effectiveness and ease of targeting, can be conveniently combined with cost-effectiveness. Consequently, cost-effectiveness analysis will be used in this report to evaluate with the available data the appropriateness of different policy instruments in attaining similar nutritional objectives.

The obvious assumption underlying nutrition programs is that participation will improve health and nutritional status. Although there are a variety of indicators of health and nutritional status, changes in calorie intake, growth, and birth weight have been the ones most commonly used to assess the effects of nutrition programs. Other benefits, including improved cognition, increased activity, decreased morbidity and mortality, increased productivity, enhanced immunocompetence, and improved lactation may also be associated with nutrition interventions. Because of the limitations of the data, however, most of the studies that will be reviewed here have relied heavily on caloric intake, growth, and, to a lesser extent, neonatal outcome to evaluate the effectiveness of programs.

<sup>1</sup>Though nominally about food aid, the following report presents critical summaries of studies of a variety of feeding programs and aid projects [Food and Agriculture Organization of the United Nations, *Nutritional Implications of Food Aid*, Food and Nutrition Paper 33 (Rome: FAO, 1985)]. Also see James E. Austin and Marian F. Zeitlin, *Nutrition Intervention in Developing Countries: An Overview* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981); George Beaton and Hossein Ghassemi, "Supplementary Feeding Programs for Young Children in Developing Countries," *American Journal of Clinical Nutrition* 34, supplement (1982): 864-916; and Eileen T. Kennedy and Per Pinststrup-Andersen, *Nutrition-Related Policies and Programs: Past Performances and Research Needs* (Washington, D.C.: International Food Policy Research Institute, 1984).

<sup>2</sup>In this paper interventions aimed at increasing food consumption will be discussed. Nutritional education as such is excluded, but no assessment of the benefits of such a program is implied. Conversely, some attention is given to commercialization of agriculture, which, although rarely evaluated for its nutritional consequences, has the potential to influence food supply and consumption.

<sup>3</sup>Food and Agriculture Organization of the United Nations, *Selecting Interventions for Nutritional Improvements* (Rome: FAO, 1984).

## Food Subsidy Measures and Their Nutritional Impact: A Conceptual Overview

Many societies acknowledge that certain goods — for example, food, education, and medical care — should be consumed in greater quantities by the poor than current levels and distribution of income allow. This attitude gives impetus both to efforts aimed at increasing income — with or without changes in relative income — and to transfer programs intended to increase consumption of food and similar commodities.<sup>4</sup> The effectiveness of the latter type of program, then, is judged by the increases observed in the consumption of the targeted good and not by the total increase of all goods by the recipients of these transfers. It is intended that these programs emphasizing commodities and services will have a different effect on the consumption of specific goods from that of a simple income-transfer program of equivalent cost.

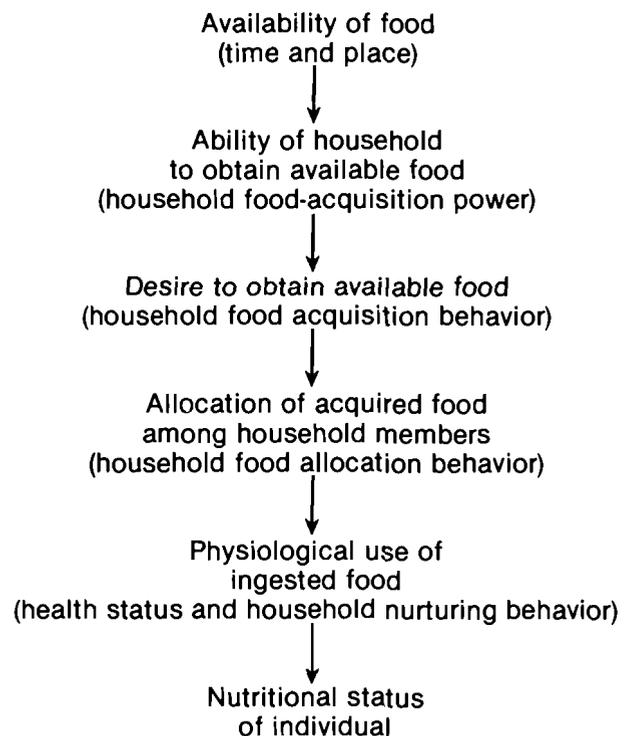
In this paper one subset of such programs aimed at increasing the consumption of specific goods and services — programs designed to increase the consumption of food — will be examined. In this particular example, increased consumption is frequently not the final goal of the program but a means toward better nutrition and health — in particular, the health of children and childbearing women. Food consumption is the primary subject, in part because governments recognize that increasing the equity of food consumption has social value, apart from its effect on health and nutrition, and in part because it is one of the inputs into the health process that are most amenable to change as a result of government policies. It is, nevertheless, important to consider such policies in the light of other factors that affect nutritional status.

In a basic framework it must be recognized that the nutritional status of an individual is affected by the amount and kinds of food available in the market or on the farm at a given time and place, the ability of the household of which the individual is a member to obtain the food that is

available, the desire of the head of the household to obtain food to which he or she has access, allocation of the acquired food among members of the household, and the physiological use of ingested food by the malnourished individual (see Figure 1).<sup>5</sup>

Subsidy and transfer programs are typically focused on the second factor. Clearly, however, their effectiveness in achieving nutritional goals involves all of them, and the relations among them will be highlighted in subsequent sections.

Figure 1 — Schematic overview of the principal policy-related factors that affect nutritional status



<sup>4</sup>See James Tobin, "On Limiting the Domain of Inequality," *Journal of Law and Economics* 13 (1970): 263-277.

<sup>5</sup>For further discussion, see Per Pinstrup-Andersen, "Food Policy and Human Nutrition," paper presented at a workshop on the Interfaces between Agriculture, Food Science, and Human Nutrition in the Middle East, International Centre for Agricultural Research in the Dry Areas, Aleppo, Syria, February 21-25, 1982.

A brief overview of theoretical and conceptual approaches to food-oriented transfer programs, intended as background for the more detailed specific examples, will be presented in this initial section.

## HOUSEHOLD SPENDING OUT OF INCREASED INCOME

Because a simple transfer of income remains a theoretical alternative to programs designed to increase a household's ability to obtain food, such an alternative is a useful starting point of reference. Generally, a family or consumption unit will spend only a portion of an increase in income on food. The pattern is referred to as the marginal propensity to consume food (MPC). While the MPC usually ranges between zero and one, typical values for poor consumers range between 0.4 and 0.7, and values for wealthier consumers will be lower.<sup>6</sup> These values imply that the poor will spend between 40 and 70 percent of any income increment on food. Not all of that increased expenditure goes to an increase in calories or other nutrients, however. Some goes to upgrading the perceived quality of the diet, which includes the taste, status, and convenience of the food.

One way of illustrating this distinction is to express the change in expenditure for food as an income elasticity, which is defined as the percent change in food expenditures that accompany a change of 1 percent in income. Similarly, calorie elasticity is the percent change in total calories consumed with a change of 1 percent in income. Typical values of these elasticities for the poor are presented in Tables 1 and 2.<sup>7</sup> On the average, for the sample of countries covered in the tables, an increase of 10 percent in income would lead to an 8.2 percent increase in expenditures for food and a 4.8 percent increase in calorie consumption (approximately 85 calories a person a day). The difference between the two is a measure of the increase in quality and is in the neighborhood

of an increase of 3.4 percent in the cost of calories for every increase of 10 percent in income. This is somewhat less than the percentage increase in calories, but it is still substantial. The more expensive sources of calories are frequently good sources of protein and micronutrients and the elasticities for these nutrients are usually higher than the calorie elasticities.

Such measurements are important in gauging the expected effectiveness of a transfer program.<sup>8</sup> The fiscal cost of increasing the value of food consumption of a family by a transfer of income, for example, will be inversely proportional to the MPC. If the MPC is 0.67, it will cost U.S.\$1.50 to increase food consumption expenditures by one dollar, and it will cost U.S.\$2.50 if the MPC is 0.4. In theory, there are a number of ways a program can improve on the efficiency implied by such an allocation. It is this possibility that gives rise to programs that link transfers with tied purchases or with health-care systems or education programs.

## CASH VALUE OF TRANSFERS IN KIND

One approach recognizes that the value to the donor of a donated commodity may differ from that recognized by the recipient.<sup>9</sup> This may be the result of transportation costs and economies of scale in marketing, the ability of voluntary agencies to receive in-kind support from governments reluctant to grant cash support of similar value, or the existence of import quotas and marketing restrictions that make differences between local and world market prices. The ratio of domestic retail prices of foods to the cost incurred by the Food for Peace Program, for example, may range from as low as 0.26 in the case of wheat in Egypt in 1976, to 9.73 for nonfat dry milk in the Philippines in 1979.<sup>10</sup> These ratios, called alpha ( $\alpha$ ) values, typically average less than one for grains and more than one for oil and milk. The ratio indicates the amount of purchasing power the household receives for a unit of food transferred.

<sup>6</sup>A negative value is theoretically possible but would be unusual.

<sup>7</sup>See also Odin K. Knudsen and Pasquale L. Scandizzo, "The Demand for Calories in Developing Countries," *American Journal of Agricultural Economics* 64 (1982): 80-86. For a different view also see, Jere Behrman and Barbara Wolfe, "More Evidence on Nutrition Demand—Income Seems Overrated and Women's Schooling Underplayed," *Journal of Development Economics* 14 (1984): 105-128.

<sup>8</sup>Shlomo Reutlinger and Marcelo Selowsky, *Malnutrition and Poverty: Magnitude and Policy Options* (Baltimore: Johns Hopkins University Press for the World Bank, 1976); see also Marcelo Selowsky, "Target Group-Oriented Food Programs: Cost Effectiveness Comparisons," *American Journal of Agricultural Economics* 61 (1979): 988-994.

<sup>9</sup>Shlomo Reutlinger and Judith Katona-Apte, *The Nutritional Impact of Food Aid: Criterion for the Selection of Cost-Effective Foods*, Agriculture and Rural Development Department ARU Discussion Paper 12 (Washington, D.C.: World Bank, 1983). See also National Research Council, *Nutritional Analysis of PL 480 Title II Commodities*, (Washington, D.C.: National Academy Press, 1982); and Judith Katona-Apte, "A Commodity-Appropriateness Evaluation of Four WFP Projects: A Brief Exposition," in *Nutritional Aspects of Food Aid*, ed. M. Forman (Rome: United Nations Subcommittee on Nutrition/Administrative Committee on Coordination, 1986).

<sup>10</sup>National Research Council, *Nutritional Analysis*, p. 86.

Under the assumption that households can and will resell commodities to reach their preferred budget allocation, an agency that distributes commodities with high values will achieve a

greater transfer of income per unit of expenditure and will thereby increase the calorie effect per dollar without directly altering the preferences of the household.<sup>11</sup> Note also that the income effect

**Table 1 — Elasticities of food expenditure for low-income families**

Country	Urban	Rural	Regression R <sup>2</sup>
Sri Lanka	0.72	0.86	0.91
Thailand	0.62	0.65	0.77
Egypt	0.71	0.68	0.75
Sudan	0.74	0.84	0.80
Indonesia	0.88	0.98	0.87
Nigeria (Funtua)	n.a.	0.89	0.95
Nigeria (Gusau)	n.a.	1.04	0.96
Malaysia (Muda)	n.a.	0.88	0.76
Brazil <sup>a</sup>	0.83	0.83	0.99
Bangladesh <sup>a</sup>	1.06	1.06	0.99

Source: Harold Alderman, *The Effect of Food Price and Income Changes on Food Acquisition by Low-Income Households* (Washington, D.C.: International Food Policy Research Institute, 1986).

Note: Low income is defined as the average income of families that consume 1,750-2,000 calories per capita a day. This grouping is used as an arbitrary means of comparison between countries and is not meant to define calorie requirements or malnutrition.

n.a. means not available.

<sup>a</sup>These figures are derived from aggregate data.

**Table 2 — Elasticities of calorie expenditure for low-income families**

Country	Urban	Rural	Regression R <sup>2</sup>
Sri Lanka	0.41	0.60	0.65
Thailand	0.26	0.29	0.28
Egypt	0.20	0.34	0.31
Sudan	0.30	0.33	0.42
Indonesia	0.55	0.61	0.63
Nigeria (Funtua)	n.a.	0.94	0.72
Nigeria (Gusau)	n.a.	0.94	0.84
Malaysia (Muda)	n.a.	0.65	0.76
Brazil <sup>a</sup>	0.10	0.23	0.99
Bangladesh <sup>a</sup>	0.40	0.40	0.99
Morocco <sup>a</sup>	0.54	0.77	0.99

Source: Harold Alderman, *The Effect of Food Price and Income Changes on Food Acquisition by Low-Income Households* (Washington, D.C.: International Food Policy Research Institute, 1986).

Note: Low income is defined as the average income of families that consume 1,750-2,000 calories per capita a day. This grouping is used as an arbitrary means of comparison between countries and is not meant to define calorie requirements or malnutrition.

n.a. means not available.

<sup>a</sup>These figures are derived from aggregate data.

<sup>11</sup>Frequently, however, such resales are not possible, and the value of the commodity to the household reflects the way it substitutes for other goods and not the market price. Under such conditions, the alpha-value approach does not offer a convenient guideline to choice of commodities.

will lead to changes in consumption of all goods, not just those that are included in the transfer program.

Such an approach does not require that the family actually sell the commodity included in the program. If, before the transfer, the family purchased amounts of the transferred food in excess of the amount transferred, then it is expected that after initiation of the program the family would reduce its purchases.<sup>12</sup> Subsequent purchases would be equal to  $Q_{\text{commodity}}^{\text{original}} + \text{MPC} \times (\text{value of transfer}) - Q_{\text{transferred}}^{\text{original}}$

It is because of this tendency to substitute transferred commodities for other goods in the budget that most theoretical approaches to supplemental feeding programs and transfers in kind treat the programs as income-transfer programs. Such transfers are called *inframarginal*. A similar situation arises with food-stamp programs in which the value of the stamp is less than the original food budget, even if it is impossible to resell the coupon.

## PURCHASE REQUIREMENTS AND ON-SITE FEEDING

Recognizing this, it is often proposed that the value of food stamps be in excess of the families' original food budget. Furthermore, in order to reduce the fiscal cost of such a program, it is possible to impose a purchase requirement, or price, for the food stamp. The closer the cost of stamps is to the families' original food budget, the more effective the program will be in increasing consumption per dollar spent by the government.<sup>13</sup> If, however, the initial fee exceeds the families' original food budget, the family will not desire to participate in the program. Also, families in need frequently do not have the cash to purchase the entire allotment of stamps at one time. Consequently, there are logistical problems that detract from the theoretical advantages of purchase requirements.

Furthermore, theory does not solve the problem of resale. It is frequently proposed that resale

be reduced by designing programs as on-site feeding. Clearly, food consumed cannot be resold, although such food can still be substituted for food previously consumed at home and thus is not additional food. If the feeding program is *inframarginal*, it will be treated as a transfer of income and will increase consumption only in accord with MPC. On-site feeding programs in excess of previous consumption *plus* the income effect will, however, increase consumption over that of an equivalent transfer of income.<sup>14</sup> The advantage of such an approach is most apparent when children are being fed, because the MPC to spend on any individual child is only a fraction of the families' total propensity. The child therefore benefits only slightly from the income effect but more from a full-feeding program, that is, one that provides nearly 100 percent of the total calories and protein required.

## INCREASING MARGINAL PROPENSITIES TO CONSUME

A feeding program can also be more effective in increasing food consumption than an income transfer of similar value if participation in the program influences a family's budgetary priorities. Frequently, various forms of nutrition intervention include a component of education. As education is known to be a factor that influences patterns of consumption, this component may interact with the transfer component of the program to increase the MPC and thus the effectiveness of the program.<sup>15</sup> In fact, such realignment of preferences should affect the spending not only of the incremental income but also of the entire budget.

Similarly, there is some evidence that participation in food-oriented transfer programs increases the MPC of some families.<sup>16</sup> The evidence for this change in behavior is still mixed and the theoretical basis unexplained. A plausible explanation may be found in the dynamics of family decisionmaking. Perhaps the transfer ac-

<sup>12</sup>Beaton and Ghassemi, "Supplementary Feeding Programs."

<sup>13</sup>See Reutlinger and Selowsky, *Malnutrition and Poverty*, Chapter 4; and Selowsky, "Target Group-Oriented Food Programs." Selowsky calculates the lower limit for this price, below which the program is equivalent to an income transfer.

<sup>14</sup>Knudsen demonstrates that the point beyond which the program increases consumption is when the value of the on-site feeding is greater than  $1/(1 - \text{MPC})$  times the initial consumption. When one person participates in on-site feeding and consumes a fraction,  $w$ , of total family food increments, this point is  $1/(1 - w \times \text{MPC})$  of initial individual consumption [Odin K. Knudsen, *The Economics of Supplemental Feeding of Malnourished Children: Leakages, Costs and Benefits*, Staff Working Paper 451 (Washington, D.C.: World Bank, 1981)].

<sup>15</sup>See, for example, Behrman and Wolfe, "More Evidence on Nutrition Demand."

<sup>16</sup>See Shubh K. Kumar, *Impact of Subsidized Rice on Food Consumption and Nutrition in Kerala*, Research Report 5 (Washington, D.C.: International Food Policy Research Institute, 1979). Evidence from the U.S. Food Stamp Program is reviewed in Carlton Davis, "Linkages between Socioeconomic Characteristics, Food Expenditure Patterns, and Nutritional Status of Low Income Households: A Critical Review," *American Journal of Agricultural Economics* 64 (1982): 1017-1025.

crues to different members of the family from those who receive other income, and these members have greater propensities to spend on food.<sup>17</sup> Also plausible is the possibility that participation in a program has a moral or persuasive element that changes behavior even if the program has no explicit education component. Furthermore, the regularity and timing of such transfers may differ from those of other sources of household income. As families tend to discount future consumption and attempt to smooth out consumption from irregular flows of income, a regular transfer program can lead to greater consumption of food in relation to earned income, although not necessarily in relation to cash transfers.

## PRICE EFFECTS

The discussion so far has dealt with the effect on income of food-oriented transfer programs—cash, stamps, or in kind. In addition, price subsidies can be used to influence food consumption. Frequently in such programs only a limited quantity of food per person per family is available at subsidized prices. When quotas or rations are enforced, if the quota is less than the family would have consumed without the subsidy, the subsidy is inframarginal. In such an instance, the effect is equivalent to the income effect of the subsidy, that is, the value of the quantity of the ration times the difference between the subsidized price and the unsubsidized local market price. If the quota exceeds the presubsidy quantity, or if no quota is imposed, then the subsidy has an effect different from the income effect. In that case the marginal price of the subsidized commodity is reduced. This will lead to an increase in the quantity purchased, as well as increases in purchases of complementary products and decreases in purchases of substitute goods.<sup>18</sup> The net effect, which also includes the income effect, is generally an increase in total consumption of nutrients, although it is possible that the substitution effect will lead to a net decrease in nutrients consumed.<sup>19</sup>

When the substitution effect is a net increase in consumption, price subsidies that are not inframarginal become more cost-effective than a

transfer of income, although less effective than a food-stamp program with a purchase requirement.<sup>20</sup> This applies only to the theoretical advantages; the administrative costs and the ability of a household to take advantage of the program will be considered later. Note, for example, that it is difficult to target a price subsidy. Even if ration cards and membership in fair-price shops are restricted to a subset of a population, unless resale of commodities can be effectively prohibited, the family has the option of selling the good on the open market at a price that is above the subsidized price. The value of the good to the household, therefore, is the value of the potential sale and not the subsidized purchase price. Such a subsidy is equivalent to an income-transfer program. Similarly, the indirect effect of a subsidy on the incomes of producers needs to be calculated in terms of the marginal sales price that a farmer is capable of receiving, whether or not the household actually chooses to make a sale.

## OPPORTUNITY COSTS

Evaluations of the effectiveness of a transfer program should not neglect the costs of resources other than cash. Just as it has been pointed out that it is not the subsidized price paid by a family but the price for which the family could sell the item that determines its budget allocation, the proper valuation of all components of a system is the opportunity cost of alternative uses. There are a number of examples in which the opportunity cost differs from the fiscal cost of a program. Suppose, for example, that a country procures grain at below-market rates from producers or obtains it at concessional rates from foreign donors. A program that provides the grain to some consumers at cost may incur no fiscal cost but represents a loss of potential revenues equal to the value of the difference between the below-market sale price and the cost of importing grain if the country is a net importer, or the export price for an exporting country. Similarly, when a teacher or administrator must spend time organizing a food-transfer program, the economy incurs a cost that is equivalent to the value of the other tasks the in-

<sup>17</sup>Joan Guyer, "Household Budgets and Women's Income," Boston University African Studies Center, Boston, 1980 (mimeographed); and David Sahn and Harold Alderman, "Testing for Differences in the Marginal Propensities to Consume from Income Earned by Women and Men," International Food Policy Research Institute, Washington, D.C., 1984 (mimeographed).

<sup>18</sup>If there is a quota, this is true only over a limited range of purchases.

<sup>19</sup>Examples are presented in Selowsky, "Target Group-Oriented Food Programs," and Cheryl Williamson-Gray, *Food Consumption Parameters for Brazil and Their Application to Food Policy*, Research Report 32 (Washington, D.C.: International Food Policy Research Institute, 1982).

<sup>20</sup>Reutlinger and Selowsky, *Malnutrition and Poverty*.

dividual must leave undone, even if the project entails no increases in salaries.

There are also opportunity costs that reduce the net benefits to the recipient families. The time spent in obtaining the food or benefits represents time not available for other tasks. Even if these tasks do not generate wages, they produce goods and services to the household and therefore have a value to the family. This is true of the activities of many children as well as of those of adults. A program that requires repeated visits, then, imposes recurring costs on the family that may affect the benefits of the project and lead the family to drop out of the project. Conversely, a program that is available in proximity to other services, either public or private, may create an economy of scale that leads the family to participate in both types of service even if neither program is seen individually as providing benefits greater than the cost of attendance. An example, which will be discussed later, might be attendance in schools with feeding programs or combined health and nutrition centers. Similarly, placement of program outlets or clinics near market facilities entails different opportunity costs from those incurred through attending isolated clinics.

Another cost to the household is the social stigma of participation. In some societies, receiving public assistance, particularly targeted assistance, is cause for embarrassment or, perhaps, jealousy. In either case, it is a cost that dissuades some participants. In that case, reducing the visibility or the embarrassment at the hands of administrators can be considered as reducing the costs of participation to the household.<sup>21</sup>

The value of time is also relevant in another context. Expenditures on food-oriented transfer programs compete with expenditures on other government programs or with reductions in deficits or taxes. While the macroeconomic consequences of the alternative fiscal strategies are outside the scope of this review, it is useful to make a distinction between the value of current consumption and that of future consumption. Not only may the evaluation of investment strategies require consideration of the trade-off between strategies of rapid overall economic growth and those of slower growth that is aimed

at poorer regions or sectors with less infrastructure, it may also require consideration of intertemporal and intergenerational distribution of benefits. For standard calculations of the benefit-cost ratio calculations, a future stream of income is discounted by the interest rate.<sup>22</sup> This is for market evaluation of future earnings. From the standpoint of the poor, whose willingness to pay interest at rates higher than bank rates for short-term loans is evidence of an inability to postpone their already low levels of consumption, the discount rate may be sufficiently high that few investments would offer them returns greater than the value of current consumption. A long-run option may not be viable.

## TARGETING AND LEAKAGE

Regardless of the vehicle chosen for transfers of food and subsidies, their effectiveness is influenced by the way in which eligibility is determined. Here, as with the approaches introduced earlier, the form and effectiveness of the project management largely determines the effect of the targeting and is the subject of the examples that will be cited later. It may be useful to include a brief discussion of leakage here, however, because it is relevant to much of what follows.

Commonly, the difference between the value of the food or cash transfer and the value of the net increment in food consumption of the at-risk population is called leakage. In actuality, leakages are of various forms, some of greater consequence for the design of programs than others. A distinction is made between leakages of expenditures into items other than food and the leakage of targeted food expenditures into food consumption by nontarget groups. The former type is equal to  $1 - MPC$  and is therefore reduced by measures that increase the MPC, as discussed earlier. Note, however, that to the degree that expenditures other than for food go toward items for which society also has a target level of consumption, such as housing, these expenditures are not in the fullest sense leakages.<sup>23</sup>

Leakages may also reflect the distribution of food within the family. Beaton and Ghassemi point out that leakage from one sibling to another is not necessarily without value or necessarily a

<sup>21</sup>An economic approach to measuring this cost is given by Sylvia Lane, J. Kushman, and Christine Ranney, "Food Stamp Program Participation: An Explanatory Analysis," *Western Journal of Agricultural Economics* (1983): 13-26.

<sup>22</sup>One unit of consumption obtained a year from now is worth  $1/(1 + \text{interest rate})$  of a unit of current consumption.

<sup>23</sup>The social value of private consumption of certain basic goods has been the subject of much economic analysis. See, for example, Pasquale Scandizzo and Odin K. Knudsen, "The Evaluation of the Benefits of Basic Needs Policies," *American Journal of Agricultural Economics* 62 (1980): 46-57, and Arnold Harberger, "On the Use of Distributional Weights in Social Cost-Benefit Analysis," *Journal of Political Economy* 86 (supplement, 1978): 87-120.

loss to the program.<sup>24</sup> It reflects the definition of the beneficiaries of the program: the broader the definition, the less leakage, although in general the greater the costs of the program.

Restriction of beneficiaries, or targeting, then, involves a concern to reduce not only the total costs of a program but also the potential errors from targeting. There is usually a trade-off between the sensitivity of a screening process—its ability to include all those in need of intervention—and its selectivity—its ability to exclude those who will not benefit from or are not in need of a program. The broader a program, the less chance of an error of exclusion but the greater the probability of an error of inclusion.<sup>25</sup> Ideally, the target population is a subset of the entire population at-risk, itself a subset of the community. For various political and administrative

reasons, the target group may differ from the high-risk group. Furthermore, the population covered may not coincide fully with the target group, for errors in screening and limitations of resources hinder implementation.

Different program designs, then, may have different degrees of effectiveness in focusing the benefits of a program on the intended recipients. They may also differ in the degree of their reliance on market mechanisms and their attempts to link transfers of resources to programs designed to influence the propensity of families to spend on food or their patterns of internal distribution. In this review an attempt is made to generalize about the types of program and the conditions under which the nutritional objectives can most effectively be maximized.

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<sup>24</sup>Beaton and Ghassemi, "Supplementary Feeding Programs."

<sup>25</sup>R. Timmons, R. Miller, and W. Drake, "Targeting: A Means to Better Intervention," a report prepared for the U.S. Agency for International Development, Community Systems Foundation, Ann Arbor, Mich., 1983.

## Typology of Nutrition Interventions

Governments have used a variety of strategies to achieve nutrition objectives. These have ranged from broad-based trade policies to microlevel programs, such as individual child-feeding schemes. More than 20 years of experience with some of these interventions have now been accumulated, and some judgments can begin to be made about what is most effective in a given cultural and political context. The purpose of this chapter is to summarize what is known about the various types of intervention before proceeding to an across-program comparison. It is not meant to be an exhaustive review of each type of program; it is intended to highlight the principal issues and concerns related to each intervention.<sup>26</sup>

For presentation purposes, the interventions have been divided into three groups: those aimed at the individual, those aimed at the family, and those intended to serve an entire community or country. In some programs, such as applied nutrition programs, an attempt is made to link a number of interventions. While there are administrative advantages as well as disadvantages to such integration, the typologies mentioned here deal with the individual components rather than the coordinated efforts. The underlying assumption throughout this discussion is that the government has determined that there is a nutrition problem and that the problem is, at least in part, caused by inadequate availability of food, inadequate consumption, or both. What is known about the nutritional effectiveness of each intervention will be examined, as well as factors that enhance or detract from its ability to improve nutritional status.

### INTERVENTIONS AIMED AT THE INDIVIDUAL

#### Supplementary Feeding Programs

Supplementary feeding programs are one of the most common types of nutrition intervention in developing countries. Supplementation schemes provide supplementary food either on site or to be taken home by specific groups within the community. Nutrition rehabilitation centers represent a special category of supplementation program in which children are fed enough to supply their total requirements for energy and other nutrients in a residential setting. Although supplementation schemes have been implemented for the entire family, these programs are typically attempts to reach certain individuals within the household. Infants, children, pregnant and lactating women, and, to a much lesser extent, the elderly, are the intended audience.

In several recent reviews the effects of supplementation from more than 200 programs in developing countries have been summarized.<sup>27</sup> The results from these studies indicate that participation in supplemental feeding is sometimes associated with positive effects observed in pregnant women and children who participated. In studies conducted in Guatemala, India, Colombia, Canada, and the United States, supplementation during pregnancy was associated with greater birth weight, a lesser incidence of infants of low birth weight, and decreased neonatal mortality.<sup>28</sup> In Narangwal, India, supplemental feeding of undernourished women during

<sup>26</sup>For a more detailed discussion of each type of program, the reader is referred to the bibliography.

<sup>27</sup>See George Beaton and Hossein Ghassemi, *Supplementary Feeding Programs for Young Children in Developing Countries* (New York: United Nations Children's Fund, 1979); and Mary Ann Anderson et al., *Nutrition Intervention in Developing Countries, Study I: Supplementary Feeding* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981).

<sup>28</sup>See Aaron Lechtig et al., "Effect of Food Supplementation during Pregnancy on Birth Weight," *Pediatrics* 56 (October 1975): 508-520; Arnfried A. Kielmann et al., "The Narangwal Nutrition Study: A Summary Review," *American Journal of Clinical Nutrition* 31 (November 1978): 2040-2052; J. O. Mora et al., "Nutritional Supplementation and the Outcome of Pregnancy," *American Journal of Clinical Nutrition* 32 (March 1979): 455-462; Agnes Higgins et al., "Nutrition and the Outcome of Pregnancy," in *Endocrinology*, ed. R. O. Scow (Amsterdam: Excerpta Medica, 1973): 1071-1077; Eileen T. Kennedy et al., "Evaluation of the Effect of WIC Supplemental Feeding on Birth Weight," *Journal of the American Dietetic Association* 80 (March 1982): 220-227; and Leela Iyenger, "Effect of Dietary Supplementation Late in Pregnancy on the Expectant Mother and Her Newborn," *Indian Journal of Medical Research* 55 (1967): 85-89.

pregnancy was the most cost-effective means of decreasing perinatal and neonatal mortality.<sup>29</sup> Similarly, studies of infants and children have shown that participation in supplementary feeding is often associated with enhanced growth, decreased morbidity, or improved cognitive development.<sup>30</sup>

These studies suggest that supplementation can be an effective means of improving health and nutritional status. For each study in which a positive and significant effect is suggested, however, there is an equal or greater number of studies to indicate that the effects of supplementation are not significant. In addition, critics of supplementation have argued that even where there are significant effects associated with supplementation, they tend to be small and expensive in relation to the benefits produced.

The ambiguity of findings from the various supplementation evaluations is related, in part, to the diversity of circumstances under which the supplementation schemes are implemented. There are several key elements that tend to differentiate a successful feeding program from an unsuccessful one.

#### **Determinants of Successful Supplementary Feeding Programs**

The success of a feeding program depends on the amount of food that is delivered to the beneficiaries, the duration of feeding, the timing of supplementation, the nutritional status of entrants, and the degree of targeting of the food program. All these factors except targeting will be discussed here. Because targeting is so important to the success of a program and to all types of interventions, it will be discussed separately.

**Amount of Food.** Programs have varied in the amount of food that has been distributed to participants. Typically, some baseline measure of dietary intake is used to determine the deficits of calories and nutrients in the population. On the basis of this information, the supplementation to be provided by the food ration is determined. Since the size of the ration is based solely on average deficits, however, the amount of food

that is distributed is too little for some and may be more than is needed by other recipients. The food package is rarely tailored to individual calorie needs, mainly because of the administrative burden that would be entailed thereby.

In addition, for most programs it is assumed that only the existing calorie deficit needs to be filled by the ration; no allowance is made for any leakage in the food supplement. It is likely, however, that some of the ration food will be substituted for food in the normal diet; likewise, recipients will probably share the food with other members of their households. In Project Poshak in India, for example, it was found that sharing decreased by 50 percent the amount of the ration consumed by a child.<sup>31</sup> CARE, in a review of four feeding programs, found that only 62-83 percent of the energy gap was filled by the calories provided in the supplemental food.<sup>32</sup> This allowance for leakage is rarely taken into consideration, however, and as a result, the ration provided fills only a portion of the calorie gaps.

It is worth noting that even with these significant leakages, the marginal propensity to consume calories from the supplement is apparently greater than would have been predicted from purely an income effect.

In some programs in Latin America an attempt has been made to circumvent the sharing problem by supplementing the entire family.<sup>33</sup> The sale of food and the reduction of food purchases by members of the households, however, drastically decreased the amount of food that was ultimately consumed.

A problem not often discussed with regard to leakages is that of the child who is physically unable to consume all of the supplement at the specified time. A preschooler may feel satisfied even though his or her nutritional needs have not been met. Evidence from India suggests that this may be true; Gopaldas reports that community workers were able to teach mothers to feed children in smaller but more frequent meals.<sup>34</sup> In addition to more frequent meals, the weaning food may be made less viscous.

In addition, results from an evaluation of a milk subsidy program in Mexico City indicate that 39 percent of preschoolers whose intake of calories was inadequate came from families who met

<sup>29</sup>Arnfried Kielmann et al., "The Narangwal Nutrition Study."

<sup>30</sup>Tara Gopaldas et al., *Project Poshak*, vol. 1 (New Delhi: CARE, 1975); H. E. Freeman et al., "Nutrition and Cognitive Development Among Rural Guatemalan Children," *American Journal of Public Health* 70 (December 1980): 1277-1285.

<sup>31</sup>Gopaldas et al., *Project Poshak*.

<sup>32</sup>Anderson et al., *Nutrition Intervention, Study I*.

<sup>33</sup>Mora et al., "Nutritional Supplementation."

<sup>34</sup>Tara Gopaldas, "A Review of the Impact of Selected Programs, Projects and Policies on Malnutrition in India," a paper prepared for the International Food Policy Research Institute, Washington, D.C., 1981 (mimeographed).

more than 100 percent of their energy requirement.<sup>35</sup> Overall availability of food did not appear to be the primary constraint to the growth of preschoolers. Although more empirical evidence is needed to support this satiety theory, it is one plausible explanation for the finding that malnourished children are sometimes found in households with adequate food supplies.

There are two other possible explanations. The preschoolers may feel satisfied even though their biological needs have not been met because of a physiological adaptation to diets that are chronically low in calories. Further, malnutrition in preschoolers may not be caused by inadequate intake of calories. Patterns of growth in young children with chronic infectious morbidity, particularly diarrheal diseases, are typically inadequate. Illness, rather than a dietary deficiency, is the primary reason for retarded growth.

In the introduction to the chapter it was clearly stated that nutrition interventions are based on the premise that malnutrition is caused, at least in part, either by inadequate food availability or by inadequate food consumption. If the etiology of a malnutrition problem is not based on food, however, then alternative interventions may be more appropriate and, in fact, more cost-effective. Simple, low-cost hygienic interventions at home to prevent diarrhea may be more cost-effective in improving the nutritional status of children than supplementation schemes.

**Delivery Systems.** Certain types of delivery system may be effective in curtailing leakages. On-site feeding can reduce leakages caused by the sharing and selling of food. Anderson, in an evaluation of supplementary feeding in five countries, found that in on-site feeding, mothers reported that 79-86 percent of the children ate the ration.<sup>36</sup> With take-home feeding, however, mothers reported that only 50 percent of the children consumed the food. In Project Poshak, the effect of a ration of similar size on the growth of children provided through on-site feeding was compared with the effect achieved in a take-home feeding program.<sup>37</sup> The increase in the weight-for-age of preschoolers who participated in the on-site feeding was significantly greater than that of children who were enrolled in the take-home program. The effect achieved through

on-site feeding, however, was at one and one-half times the cost of the take-home feeding program. Such a cost comparison may be misleading, since on-site feeding schemes offer the opportunity for other invisible but nonquantifiable benefits. In theory, on-site feeding could provide the setting for monitoring growth, for health care, and for nutrition education, and it could be the first step toward social mobilization for child care and development.

On-site feeding programs may minimize the sharing and selling of the ration, but there is still the problem of substitution of the supplementary food for food in the normal diet. If the child with the 300-calorie gap ate the supplementary meal and at home received the normal amount of food at other meals, this method of closing the calorie deficit would work. In practice, however, the family is an economic unit that attempts to provide for the well-being of all its members. If the child is fed at a feeding center, the tendency is for the family to take this "extra" meal into account in sharing its food among its members. The malnourished child is thus likely to be given less at other meals because it has already been fed. Because of this substitution, the child's actual net increase in calorie intake may only be 50 or 100 calories, although he has been given a ration of 300 calories.

Again, using the Mexico milk subsidy example, although preschoolers in the program received a significantly greater proportion of their caloric intake from milk than nonparticipating children, there was no difference in the overall caloric intake of the two groups.<sup>38</sup> These data suggest that a large portion of the additional milk was substituted by recipients for other foods in the diet.

To overcome this substitution effect, the attempt has been made in some programs to serve food on site at times other than mealtimes. The ration is perceived as a snack rather than as replacement of a meal. In some programs, this has decreased substitution of the supplementary food. In Guatemala, for example, the supplement was served as a beverage at midmorning and midafternoon.<sup>39</sup> There is a suggestion that because the ration was not regarded as a normal meal, it was possible to increase caloric intake significantly by means of the supplement. Sup-

<sup>35</sup>Eileen T. Kennedy, "Determinants of Family and Preschooler Food Consumption," *Food and Nutrition Bulletin* 5 (No. 4, 1983): 22.

<sup>36</sup>Anderson et al., *Nutrition Intervention, Study I*.

<sup>37</sup>Gopaldas et al., *Project Poshak*.

<sup>38</sup>Catherine Overholt et al., "Case Study—Subsidized Milk Distribution in Mexico," in *Nutrition Intervention in Developing Countries, Study V: Consumer Food Price Subsidies*, ed. Beatrice L. Rogers et al. (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981), pp. 79-114.

<sup>39</sup>J. Balderston et al., *Malnourished Children of the Rural Poor* (Boston: Auburn, 1981).

plementation of an average of only 125 calories was associated with significant increments in growth.<sup>40</sup>

Another possibility for minimizing leakage is to provide a food that has the image of a child's food. In general, foods that are normally part of the family diet are more likely to be shared if they are part of the supplement. In the Mexico City milk subsidy program, 83 percent of the recipients used the milk for adult family members, thereby substantially reducing the amount of milk that was ultimately consumed by the preschoolers.<sup>41</sup>

**Duration for Feeding.** The length of time a person must participate in a supplementary feeding program to realize an improvement in nutritional status varies with the type of program and is influenced by the baseline nutritional status of the participant. Nutritional Rehabilitation Centers (NRC) in which two-thirds or more of total nutrients needed are provided in a closely supervised setting have produced significant decreases in protein-calorie malnutrition in as little as two months.<sup>42</sup> With other types of operation, however, a much longer time is required to produce similar results. One-to-two years of regular participation in take-home feeding programs is needed in order to produce sustained improvement in growth, as measured by increments in weight. On-site feeding programs require a similar amount of time to produce a significant effect. The Narangwal project, for example, provided malnourished children with two-thirds of their calorie intake in two meals a day; it took a year for these children to achieve normal weight-for-age (minimum of 80 percent of the standard) at these levels of supplementation.<sup>43</sup> Similar results have been reported from Project Poshak, suggesting that little effect is seen in the first six months of most supplementation schemes, primarily because it takes time for the child to adjust to a regular feeding pattern with the ration.<sup>44</sup> The average length of participation needed for positive effects on growth to be observed appears to be three-to-four months for NRCs and one-to-two years for take-home and on-site feeding.

It is also important to keep in mind that the minimum amount of time needed to produce an effect will be influenced by the child's initial nutritional status. A substantial improvement in nutritional status (as measured by growth) can be achieved through NRCs in a short time, in part because the very malnourished are selected for inclusion in the program.

In addition to minimum length of participation, however, there may also be a maximum length of time for participation beyond which no effect is observed. Catholic Relief Service data from Ghana indicate that three- to four-year-old children who were in a supplemental feeding program from the time they were one-year old were doing no better nutritionally than children of the same age who had been in the program for only one year.<sup>45</sup> The implication is that there may be a maximum length of time of participation beyond which no measurable benefit is produced. The supplementation programs, however, may be serving a preventive, rather than a therapeutic, function. The program allows the child's growth to be maintained at a certain level. The preventive function has been difficult to document.

A principal concern of many programs is that once a child has recuperated and "graduated" from the program, he may quickly revert to a malnourished condition. Anderson et al. have summarized the few studies in which the permanency of effects of supplemental feeding programs have been examined; one to five years after participation in an NRC, the nutritional status of 52-75 percent of preschoolers had been maintained or improved.<sup>46</sup> In a follow-up study of children after discharge from NRCs in Guatemala, it was found that there was no further improvement in growth. In Haiti, however, the experimental children were significantly better off than the control group at follow-up.<sup>47</sup> These studies also indicated that the two principal criteria for long-term successful rehabilitation appear to be education of the mothers and adequate household income.

**Timing of Supplementation.** The time at which food is provided may influence the effectiveness of supplementation. Some studies indicate that it

<sup>40</sup>Ibid. This is the average consumption over the course of the study.

<sup>41</sup>Overholt et al., "Subsidized Milk Distribution in Mexico."

<sup>42</sup>Anderson et al., *Nutrition Intervention, Study I*.

<sup>43</sup>Kielmann et al., "The Narangwal Nutrition Study."

<sup>44</sup>Gopaldas et al., *Project Poshak*.

<sup>45</sup>Anderson et al., *Nutrition Intervention, Study 1*.

<sup>46</sup>Ibid.

<sup>47</sup>Micheline Beaudry-Darisse and Michael C. Latham, "Nutrition Rehabilitation Centers—An Evaluation of their Performance," *Environmental Child Health* 19 (September 1973): 299.

is the last trimester of pregnancy that is critical for supplementation;<sup>48</sup> this is the period of the most rapid weight increase of the fetus.

In a study of mass undernutrition in Holland during World War II, those women who were exposed to famine during the first 27 weeks of pregnancy, but for whom the diet improved during the last 8 weeks, had babies whose mean birth weights were greater than the weights of infants born shortly after the onset of the famine.<sup>49</sup> By contrast, median weights decreased in instances in which famine affected the last trimester of pregnancy. This would seem to suggest that inadequate nutrition has its severest effect on fetal growth in late gestation.

Mora and others reported that supplementation during the last 13 weeks or more of pregnancy significantly increased birth weight whereas supplementation at less than 13 weeks did not.<sup>50</sup> In the Hyderabad study, it was found that a statistically significant increase in birth weight could be produced by providing a daily supplement of 700 kilocalories and 20 grams of protein in conjunction with rest in a hospital during the last month of pregnancy.<sup>51</sup>

For children, the weaning period between 6 and 36 months is the time that they are most vulnerable nutritionally and in greatest need of supplemental feeding. It is during this period that the child is either taken off breast milk and given a less nutritious substitute or breast feeding is prolonged too long without the addition of the needed complementary foods. In Guatemala, it was found that the greatest positive effect was in children born to supplemented mothers who received supplementation up to 36 months of age.<sup>52</sup>

**Nutritional Status of Participants.** The nutritional status of individuals at point of entry into the program will influence the effectiveness of food supplementation in improving growth or birth outcome. A greater effect of supplementation will be seen in the most malnourished people. Stein et al., in a review of prenatal supplementation, found that the greatest increment

in birth weight was in the offspring of women who were undernourished before and during pregnancy.<sup>53</sup> Similarly, Beaton and Ghassemi, in their review, found that children with the greatest deficit in weight or height at point of entry into the program seemed to show the greatest benefit.<sup>54</sup> In Project Poshak, it was the children with second- and third-degree malnutrition who showed the most improvement.<sup>55</sup>

Given these findings, it has been suggested that cost-effectiveness can be significantly increased by using stricter criteria for entry into a program. For pregnant women, several factors have been useful in identifying high-risk prenatales; these include: low pre-pregnancy weight (less than 38 kilograms); inadequate maternal weight gain (less than 1 kilogram gained by the 20th week); an earlier infant of low birth weight (less than 2,500 grams); closely spaced pregnancies (less than 2 years); age (18 years or less); first pregnancy at 35 years or older; and high infant mortality in the household. Unfortunately, many women do not know their weight before conception or the week of gestation; therefore, poor maternal weight gain may be difficult to document. Similarly, it may be hard to use low birth weight of an earlier child as a risk indicator if mothers cannot recall the birth weights of their children. Maternal age is also a good proxy for identifying nutritionally vulnerable women, however, and may be easier to obtain with a single examination than information about other variables.

In addition, arm circumference has recently been suggested as a sensitive measure for screening high-risk women.<sup>56</sup> The method is simple and not affected by stage of pregnancy.

Programs can be aimed toward preschoolers by using a variety of measures, including low birth weight (less than 2,500 grams); high birth order (6 or more); infant death of an earlier sibling; same weight for consecutive weighings or faltering of growth at successive weighings; illnesses, such as measles, whooping cough, tuberculosis, and frequent diarrhea; and low weight for age, weight for height, or length or height for age, or

<sup>48</sup>C. A. Smith, "The Effect of Wartime Starvation in Holland upon Pregnancy and Its Product," *American Journal of Obstetrics and Gynecology* 53 (April 1947): 599-608.

<sup>49</sup>Ibid.

<sup>50</sup>Mora et al., "Nutritional Supplementation."

<sup>51</sup>Iyenger, "Dietary Supplementation Late in Pregnancy."

<sup>52</sup>Freeman et al., "Nutrition and Cognitive Development."

<sup>53</sup>Stein et al., "Prenatal Nutrition and Birth Weight: Experiments and Quasi-Experiments in the Past Decade," *Journal of Reproductive Medicine* 21 (November 1978): 287-298.

<sup>54</sup>Beaton and Ghassemi, "Supplementary Feeding Programs."

<sup>55</sup>Gopaldas et al., *Project Poshak*.

<sup>56</sup>Marian F. Zeitlin et al., *Nutrition and Population Growth: The Delicate Balance* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981).

arm circumference.<sup>57</sup> Here again, some measures, such as birth weight, may be difficult to obtain.

In summary, several factors are associated with supplementation schemes that have been demonstrated to have an effect on growth or on the outcome of pregnancy. Successful programs are more likely to have a large proportion of undernourished individuals or to provide a large ration. Programs that offer a small ration (200-300 calories) to a large number of individuals appear to have limited effectiveness.

### Nutrition in Primary Health Care

The health sector should be considered as one of the channels through which to attack nutrition problems. Indeed it has an important function, but not—traditionally—in food-subsidy schemes or in other large feeding interventions. In this respect, therefore, the function of the health sector falls outside the scope of this review. It will be dealt with here briefly, however, because of its supporting function and its potential for some forms of nutrition intervention that involve food supplementation. It serves best in localized, well-targeted activities. This is particularly true of the primary health care (PHC) approach, in view of its community-based character and its opportunities for action in many sectors.<sup>58</sup>

An area of intervention for which the PHC is eminently well suited is malnutrition in infants and young children, which, more than malnutrition in any other age group, is more often intimately related to disease and to incorrect feeding practices than to problems of the availability of food.

As a consequence of this interplay of causative factors, the focus of child nutrition activities in PHC shifts from the improvement of nutrition through the provision of food to the improvement of the nutritional status of the individual, a much broader concept that requires taking many determinants into consideration.

This translates into less specific nutrition programs, in which improvement of nutritional status is the common denominator for the inclusion of various activities that have been shown to affect it, whether directly or indirectly. In this con-

text, food-related interventions may even become less important than some of the other determinants or may assume a specific function, such as that of food as medicine.

In a project in Narangwal, India, mortality and morbidity were decreased and growth was improved through the judicious use of nutrition services and health care.<sup>59</sup> The particular component that was most cost-effective in bringing about certain changes in health and nutritional status, however, varied. Prenatal supplementation, either alone or in combination with medical care, was the most cost-effective means of decreasing perinatal mortality. Medical care was the most effective means of reducing infant mortality, and nutrition and health care were equally effective in decreasing mortality in one- to three-year-old children. Children receiving nutrition care, whether by itself or in combination with medical care, exhibited the highest mean weights.

Medical care was the most effective component of treatment in decreasing the duration of disease. The only illness the duration of which was significantly reduced by the addition of nutrition care to medical care was eye infection.

Similar findings have been reported more recently from a World Bank project in Tamil Nadu, India.<sup>60</sup> Supplemental feeding of high-risk children in combination with appropriate health care significantly reduced the number of moderately and severely malnourished preschoolers. In Project Poshak it was found that the most positive effects on the growth of children were produced by a combination of supplemental food, health care, and nutrition education.<sup>61</sup>

In Guatemala it was observed that the effect of food supplementation was greater in children who had had diarrheal diseases in the past.<sup>62</sup> The authors conclude that food aid could be an important component of the delivery of health care, but they provide few data to assess the cost-effectiveness. Their results also imply, however, that morbidity information that is available in the health-care centers could provide a means of targeting food supplementation so as to improve its effectiveness.

The effective integrated health interventions have several features in common. First, there is a strong emphasis on directing them toward nutri-

<sup>57</sup>Anderson et al., *Nutrition Intervention, Study I*.

<sup>58</sup>World Health Organization of the United Nations and United Nations Children's Fund, *Primary Health Care* (Geneva: WHO/UNICEF, 1978).

<sup>59</sup>Kielmann et al., "The Narangwal Nutrition Study."

<sup>60</sup>Alan Berg, "Nutrition Review," World Bank, Population, Health, and Nutrition Department, Washington, D.C., 1984, an internal document that is to be published in book form in 1987.

<sup>61</sup>Gopaldas et al., *Project Poshak*.

<sup>62</sup>Hernan Delgado and Victor Valverde, "Integrating Food Supplementation and Health Care Programs to Stimulate Catch-Up Growth in Developing Countries," in *Nutritional Aspects of Project Food Aid*, ed. M. Forman (Rome: United Nations Subcommittee on Nutrition/ Administrative Committee on Coordination, 1986).

tionally vulnerable persons. The programs are aimed at pregnant and lactating women and children under three years of age. In the Narangwal project the food supplements were used selectively. Only underweight women received caloric supplementation and although daily feedings were available for all children, the village health workers actively encouraged malnourished children to come to the feeding centers.<sup>63</sup> In Tamil Nadu, India, children less than three years old are screened further to identify the malnourished, and only these children receive the food supplement.<sup>64</sup> Once the preschooler's nutritional status has improved, the supplementation is stopped.

Critics of this approach have argued that when the attainment of adequate growth is used as the exit criterion, mothers will deliberately keep the child undernourished in order to stay in the program. There is no evidence to suggest that this has happened in the Tamil Nadu project.

The rationale behind the prudent use of the caloric supplements is that not everyone needs the additional foods. An inadequate intake of energy may or may not be the basis of the nutrition problem. Given that food is the principal cost in most interventions, the selective use of supplementation will minimize the cost per recipient without jeopardizing the nutritional effectiveness. The results in both the Tamil Nadu and Narangwal projects demonstrate that this can be done successfully.

The food-as-medicine approach emphasizes the appropriate use of supplementation in alleviating malnutrition. Food supplements need be only one part of the nutrition care component, however. Nutrition education and monitoring of growth should also be integrated into the package of services provided. Whereas supplementation often stresses a curative approach, nutrition education and monitoring of growth may be focused primarily on prevention.

In the Narangwal project, participation in nutrition education was associated with a two-month increase in the duration of breast feeding.<sup>65</sup> Similarly, the nutrition education project in Indonesia was associated with significant im-

provement in the growth of children.<sup>66</sup> Monitoring the growth of children has been shown to improve their growth significantly without necessitating the distribution of food.<sup>67</sup>

Although much of the attention in integrated health and nutrition projects has been focused on the preschoolers, it is worth emphasizing that the prenatal component is often the most cost-effective. As mentioned earlier, caloric supplementation of high-risk pregnant women has been associated with significant increments in birth weight and, more important, a significant decrease in the incidence of babies of low birth weight born to mothers who received supplements; health care in such programs may also increase the benefits. More effort should be made to extend supplementary feeding to women at risk, at least in the latter part of their pregnancy.

### Formulated Foods

A formulated food or blended food is a nutrient-dense dietary supplement based primarily on a mixture of a local staple and vegetable proteins. Formulated foods were originally conceived of as low-cost, commercially available processed foods that could be fed to the weanling. They exist in a variety of forms, including beverages, flours, pastas, biscuits, and cookies. Examples are Incaparina, a Guatemalan beverage; Superamine, an Algerian pasta; and Wheat Blend Flour.

The primary goal of formulated foods is to provide an inexpensive, nutritionally sound food for the child 6-36-months old. Some studies have indicated that blended foods have been effective in improving the nutritional status of preschoolers, but the results have been disappointing.<sup>68</sup> Incaparina has been one of the most successful commercial ventures in formulated food, yet its effect on the nutrition problem in Central America has been negligible.<sup>69</sup>

Cost has been the principal barrier to the regular use of formulated food. On a nutrients-per-dollar basis, blended foods are between 8 and 40 times as expensive as home-made traditional

<sup>63</sup>Kielmann et al., "The Narangwal Nutrition Study."

<sup>64</sup>Berg, "Nutrition Review."

<sup>65</sup>Kielmann et al., "The Narangwal Nutrition Study."

<sup>66</sup>Berg, "Nutrition Review."

<sup>67</sup>Jon E. Rohde et al., "Mothers as Weight Watchers: The Road to Child Health in the Village," *Journal of Tropical Pediatrics* 21 (December 1975): 295-297.

<sup>68</sup>See Jerianne Heimendinger et al., *Nutrition Intervention in Developing Countries, Study IV: Formulated Foods* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981); I. Beghin et al., "Assessment of Biological Value of New Corn-Soy-Wheat Noodle Through Recuperation of Brazilian Malnourished Children," *American Journal of Clinical Nutrition* 26 (1973): 246; and R. N. Chaudhury, "Home-made Vegetable Protein Food in the Treatment of Kwashiorkor," *Journal of the Indian Medical Association* 42 (1964): 560.

<sup>69</sup>E. F. Jelliffe, "A New Look at Multimixes of the Caribbean," *Environmental Child Health* 17 (September 1971): 135-150.

foods.<sup>70</sup> Even with substantial subsidies from governments, the cost of these foods is prohibitive for many of the poorest households.

The acceptability of commercial formulated foods to consumers has also been low; most families have not succeeded in incorporating blended foods into the typical diet. In addition, there seems to be an urban bias in distribution because these foods are available through commercial vendors, and these products have not been very effective in decreasing malnutrition in rural areas.

The governments in many developing countries are now stressing the use of village- or home-produced weaning foods; acceptable blended foods can be produced at a lower cost using indigenous foods.<sup>71</sup> In some instances, the family food supplies may be sufficient to provide the needed ingredients. As already reported, village workers in India were able to educate mothers to feed their children the total caloric ration in smaller but more frequent meals.<sup>72</sup> As a result, preschoolers have been able to obtain sufficient calories from the home diet. This is consistent with data from the World Bank-Indonesian nutrition education project, in which it was found that the growth of preschoolers could be improved without the distribution of supplemental food.<sup>73</sup>

There are instances, however, in which education by itself is not the limiting factor in providing an adequate diet for preschoolers. Financial constraints within the family may preclude the provision of sufficient calories for the preschool-aged child. In this case, a weaning food could be provided as part of an integrated health and nutrition intervention. If possible, such a weaning food should be one that is prepared locally in villages and not manufactured on a large-scale commercial basis.

## FAMILY-ORIENTED INTERVENTIONS

The foregoing review of the interventions aimed at specific individuals revealed that these approaches have often fallen short of their stated objectives, although these programs have the

potential to improve health and nutritional status significantly. What has been suggested as a more cost-effective alternative approach is a family-oriented intervention. Berg has concluded that even if policymakers were interested in reaching only preschoolers, it would often be more cost-effective to reach them through programs that would affect malnourished households as a whole.<sup>74</sup> Beaton and Ghassemi, in their review of supplementary feeding, come to a similar conclusion: in many countries, malnourished children cannot be reached in any way that does not include the family.<sup>75</sup> It is artificial to look at the individual child in isolation from the family; it may be primarily through augmentation of the food intake of the whole family that consumption by the child will be increased.

A number of different types of family-level interventions have been used—price subsidies, food stamps, food-for-work. Each is concentrated on increasing income—either through transfers in kind or increased purchasing power—as a means of enhancing the general welfare of the family. These programs generally have broad social and political goals, of which nutrition objectives may or may not be a part. For purposes of the present discussion, however, it is assumed that improved nutrition is the major objective. The effects of these interventions on the nutritional status of the whole family and of its individual members will be examined.

### Consumer Price Subsidies

Consumer price subsidies are a common and popular type of family intervention. Many countries operate explicit food subsidies as one means of holding down the price of food to the consumer. Lower food prices increase real incomes, which generally means increased food consumption. Subsidy programs are attractive policy instruments because they are highly visible and allow governments to reach a large number of people easily.

The manner in which food-subsidy programs have been implemented varies. Some countries operate broad-based subsidy schemes whereby

<sup>70</sup>Barry Popkin and Michael C. Latham, "The Limitations and Dangers of Commercially Produced Nutritious Foods," *American Journal of Clinical Nutrition* 26 (September 1973): 1015-1023.

<sup>71</sup>Derrick B. Jelliffe, "Approaches to Village-Level Infant Feeding of Multimixes as Weaning Foods," *Journal of Tropical Pediatrics* 13 (1967): 46-48.

<sup>72</sup>Gopaldas, "A Review of the Impact of Selected Programs."

<sup>73</sup>Berg, "Nutrition Review."

<sup>74</sup>Alan Berg, *Malnourished People: A Policy View*, Poverty and Basic Needs Series (Washington, D.C.: World Bank, 1981).

<sup>75</sup>Beaton and Ghassemi, "Supplementary Feeding Programs."

all individual members of the population receive benefits.<sup>76</sup> In Egypt, wheat flour and bread are subsidized by the government.<sup>77</sup> The entire population qualifies for this subsidy. There are no restrictions on eligibility and there are no limits to the amount of flour or bread that may be purchased. In addition to this general subsidy, there is rationed subsidy on a limited number of additional items. Similarly, Brazil has a general price subsidy on wheat. Mexico, India, Bangladesh, and the Philippines also operate food subsidy programs.

General subsidies are expensive, however. In 1980, Egypt spent approximately U.S.\$1.6 billion, or about 20 percent of current government expenditures, on consumer subsidies.

Until 1979, Sri Lanka operated a general subsidy program on rice and wheat, which was available to virtually the entire population. The ration system was dismantled largely because of the enormous drain on the government budget.

Apart from being expensive, general subsidies are an inefficient means of improving the diets of low-income households. In a general subsidy scheme, many families with higher incomes and those not nutritionally in need receive benefits. As a result, many countries have adopted policies that limit the amount of subsidized food that may be purchased, restrict the subsidy to certain foods, or direct the subsidized items to particular households.

### Nutritional Effects of Food Subsidies

Most subsidy programs have been established to achieve broad social and political goals. Better nutrition is typically but one of several objectives of a subsidy program. For the purpose of the present discussion, it is assumed that the government has made a decision to try to improve nutrition through a subsidy scheme. What evidence is there that subsidies are effective in improving nutrition?

Subsidy schemes have been successful in increasing the incomes of the poor. In Egypt, the subsidy transfer accounted for 12.7 percent of expenditures for the lowest quartile in urban areas;<sup>78</sup> the consumer transfer was equivalent to 18 percent of the total expenditures of the poorest households in rural areas. In Sri Lanka, the consumer subsidy accounted for 14 percent of the total income of the poorest group.<sup>79</sup>

Subsidy programs have also had substantial effects on the calorie intakes of families. The food ration in Sri Lanka accounted for 20 percent of the total calories taken in by the families with the lowest incomes. In Kerala, India, consumption of the subsidized ration increased caloric intake 20 to 30 percent in the lowest income group.<sup>80</sup> Similarly, in Pakistan, increments of 6 percent of calories were associated with the subsidized ration in urban areas.<sup>81</sup>

Only a limited amount of information on the effect of consumer price subsidies on consumption by individual members within the household is available. This is largely because the main nutritional objective of most subsidies is to increase the intake of food in households in which there are calorie deficits. It is only recently that researchers have focused their attention on the effects of subsidy schemes at the subhousehold level.

Kumar found that in Kerala, the ration was not only associated with increments in calories in the family diet but was also positively and significantly associated with growth of preschoolers from participating households.<sup>82</sup>

In other studies, however, no positive effect on the growth of children has been demonstrated. In Pakistan, the prevalence rates of malnutrition among preschoolers were similar in children from households that participated in the ration scheme and those that did not.<sup>83</sup> In the milk subsidy scheme in Mexico City, children who participated in the program received a significantly greater percentage of calories and protein from milk than did those who did not participate.<sup>84</sup>

<sup>76</sup>Jeffrey Davis, *The Fiscal Role of Food Subsidy Programs*, International Monetary Fund Staff Paper 24 (Washington, D.C.: International Monetary Fund, 1977): 100-127; Harold Alderman, Joachim von Braun, and Sakr Ahmed Sakr, *Egypt's Food Subsidy and Rationing System: A Description*, Research Report 34 (Washington, D.C.: International Food Policy Research Institute, 1982).

<sup>77</sup>Alderman, von Braun, and Sakr, *Egypt's Food Subsidy*.

<sup>78</sup>Harold Alderman and Joachim von Braun, *The Effects of the Egyptian Food Ration and Subsidy System on Income Distribution and Consumption*, Research Report 45 (Washington, D.C.: International Food Policy Research Institute, 1984).

<sup>79</sup>Paul Isenman, "The Relationship of Basic Needs to Growth, Income Distribution and Employment: The Case of Sri Lanka," Policy, Planning and Program Review Department Paper, World Bank, Washington, D.C., 1978 (mimeographed).

<sup>80</sup>Kumar, *Impact of Subsidized Rice*.

<sup>81</sup>Beatrice Rogers et al., *Nutrition Intervention in Developing Countries, Study V: Consumer Food Price Subsidies* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981).

<sup>82</sup>Kumar, *Impact of Subsidized Rice*.

<sup>83</sup>Rogers et al., *Nutrition Intervention, Study V*.

<sup>84</sup>Eileen Kennedy et al., "Effect of a Milk Subsidy on the Distribution of Benefits within the Household," International Food Policy Research Institute, Washington, D.C., 1983 (mimeographed).

There was no significant difference between the two groups, however, in calorie consumption and growth. The subsidized milk was substituted for other foods that would normally have been consumed, so the total caloric intake of the child did not increase.

The ambiguity of the findings is in part related to differences in the circumstances under which various subsidy programs have been implemented.

### Determinants of Effective Subsidy Schemes

If a consumer price subsidy is intended to improve nutritional status, its effectiveness will be increased if it is aimed at those households with the greatest calorie deficits and at those individuals within families who are most vulnerable nutritionally. Thus, the potential effect of any consumer price subsidy will be enhanced if the subsidy can be applied to a food normally consumed in large amounts by the malnourished population but that is not eaten by other income groups.

This approach was tried in Pakistan where low-priced *atta* (a type of wheat flour) was made available through the ration shops.<sup>85</sup> The poorest households chose *atta* over the higher-priced but generally preferred whole wheat; for each dollar spent, a larger quantity of *atta* than of whole wheat could be purchased and the effect on household food consumption was increased.

A similar experiment was tried in 1978 in Bangladesh where sorghum was subsidized to half the price of rice.<sup>86</sup> For each dollar spent, a larger quantity of sorghum than rice could be purchased, and the effect on household food consumption was increased. Sorghum sales were low in the urban areas, but after three months, approximately 70 percent of the poorest rural households were purchasing sorghum. Since only 7 percent of the cereal consumed by the rural population comes from the ration shop system, however, the addition to total caloric intake as a result of the consumption of sorghum was small.

In order to identify these self-targeting foods, it is desirable to find a commodity that has a high income elasticity of demand for malnourished families and those with the lowest incomes and a low-income elasticity for other groups. In some cultures, no such food seems to exist.

In addition, evidence indicates that some programs are subsidizing the wrong types of food. Williamson-Gray, in her study of the Brazilian subsidy program, concludes that the subsidies on wheat, liquid milk, beef, and vegetable oils are primarily of benefit to the higher-income and better-nourished population.<sup>87</sup> A larger subsidy on wheat bread might actually hurt the households with the lowest incomes because they would substitute bread for other calorically denser foods. The author concludes that if one goal of the Brazilian subsidy program is to increase the calorie intakes of the poor, rice would be a better commodity than wheat to subsidize.

Even if the programs were able to identify an appropriate self-targeting food, however, the problem of distribution within the household would still not be solved. In some programs an attempt has been made to provide subsidies on foods that are more likely to be consumed only by certain individual members of a household.

There has tended to be an urban bias in the distribution of benefits in many subsidy programs.<sup>88</sup> The subsidy on CONASUPO milk was limited exclusively to Mexico City. In Pakistan, the ration system increased calorie intake by 114 calories per capita in the urban population while having no significant effect on the rural population.<sup>89</sup> This was partly because wheat was unavailable in many of the rural ration shops on the assumption that it was unnecessary to subsidize wheat because rural farmers grew wheat. The wheat constraint in the ration shops discriminated against the poor, landless laborers, and farmers who were unable to supply all the wheat consumed from their own production.

The urban bias of many programs is not surprising given the administrative difficulties of operating a rural subsidy scheme. In rural areas, there is less of an infrastructure for distribution, and transportation is difficult; these two factors combine to make rural operations more expensive. As a result, policymakers have looked to other types of family-level intervention in order to achieve nutritional objectives for the rural poor.

### Food Stamps

Consumer price subsidies have been criticized for being very expensive. Reutlinger and Selowsky estimated that with a general subsidy, it would cost \$12.00 to get \$1.00's worth of food

<sup>85</sup>Rogers et al., *Nutrition Intervention, Study V*.

<sup>86</sup>Rezaul Karim and F. J. Levinson, "The Bangladesh Sorghum Experiment," *Food Policy* (February 1980): 61-63.

<sup>87</sup>Williamson-Gray, *Food Consumption Parameters for Brazil*.

<sup>88</sup>Egypt and Sri Lanka provide examples of subsidy systems that are not strongly biased toward the urban area.

<sup>89</sup>Rogers et al., *Nutrition Intervention, Study V*.

to the malnourished.<sup>90</sup> Even with some form of targeting, these schemes usually account for a large expenditure from the government budget.

Attention has recently been focused on food-stamp programs as an alternative to subsidies. In 1979, Sri Lanka switched from the ration system to food stamps, and total government expenditures were reduced from 14 percent to 7 percent. Costs cannot be examined, however, without simultaneous examination of the benefits associated with specific programs.

The United States food stamp program is one of the oldest of its type, so much of the information about the nutrition effects of food stamps is based on the U.S. experience. The food-stamp program represents an attempt to transfer income in the form of food purchasing power to low-income households. The rationale behind transferring stamps rather than cash is that the marginal propensity to consume food may be greater with transfers in kind. If the value of the food stamps given is inframarginal, however—less than a household would spend on food—the expected nutritional effect should not be greater than that which would be produced by an equivalent amount of cash. Except for such an income effect, there is no apparent reason that the household should allocate more of its real income to food, because the marginal cost does not change.

One way to change a food-transfer program so that it is not inframarginal is to require the household to pay an amount close to that which it ordinarily would spend on food in order to receive food stamps with a larger cash value. In the United States, for example, a household might spend U.S.\$100 to receive U.S.\$150 worth of stamps. The U.S. food stamp program had such a purchase requirement until 1979.

Programs designed in this fashion are likely to have a greater effect on the food intake of a family than would an income effect alone. Purchase requirements are difficult to implement and administer, however. In addition, the need for a ready source of cash for the purchase requirement often acts as a barrier for the neediest households. When the purchase requirement

was lifted from the U.S. program in 1979, an additional 3 million people were added to the program.<sup>91</sup>

The new entrants included disproportionate numbers of the elderly and the rural poor. These had been eligible for the program but chose to participate only after the elimination of the purchase requirement. The need for cash to purchase the stamps apparently acted as a barrier to participation.

Purchase requirements may pose even more of a barrier in rural areas of developing countries where the malnourished are subsistence and semisubsistence farmers. It is unlikely that food-deficit households will be able to set aside the cash for a monthly or biweekly purchase requirement on a regular basis.

Studies conducted on the U.S. food-stamp program have generally been concentrated on three areas: the effects on food expenditures, the effects on nutrient intake, and the effects on individual members of the household. Price et al. found that participation in a food-stamp program was associated with a significant increment in expenditures for food. West and Price in another study report similar findings.<sup>92</sup>

Furthermore, the findings of some studies conducted before the elimination of the purchase requirement indicate that participation in the food-stamp program was also associated with significant increments in the intake of some nutrients.<sup>93</sup> Lane reports that intakes of six of nine nutrients were higher in the diets of recipients of food stamps than in those of nonrecipients. Madden and Yoder found significant improvement in the diets of participants in food-stamp programs only under certain unfavorable conditions, such as a two-week lapse between pay checks.

Very little information is available to evaluate the effect of participation in food-stamp programs on individuals within a household. In looking at the effect of food stamps on school-aged children, West and Price find that, although participation in food-stamp programs increased the value of food within the home, this did not lead to an improvement in the diets of children between the ages of 8 and 12.<sup>94</sup>

<sup>90</sup>Reutlinger and Selowsky, *Malnutrition and Poverty*.

<sup>91</sup>Robert Ferish, "Food Stamps: A Program at a Crossroad," *Public Welfare* 39 (1981).

<sup>92</sup>David W. Price et al., *Evaluation of School Lunch and School Breakfast Programs in the State of Washington*, final report to Food and Nutrition Service (Washington, D.C.: U.S. Department of Agriculture, 1975); and Donald A. West and David W. Price, "The Effects of Income, Assets, Food Programs and Household Size on Food Consumption," *American Journal of Agricultural Economics* 58 (November 1976): 725-730.

<sup>93</sup>Sylvia Lane, "Food Distribution and Food Stamp Program Effects on Food Consumption and Nutritional 'Achievement' of Low-Income Persons in Kern County, California," *American Journal of Agricultural Economics* 60 (February 1978): 108-116; and P. J. Madden and M. D. Yoder, *Program Evaluation: Food Stamps and Commodity Distribution in Rural Areas of Central Pennsylvania*, Pennsylvania State University Agricultural Experiment Station Bulletin 780 (University Park: Pennsylvania State University, 1972).

<sup>94</sup>West and Price, "Effects of Income, Assets, Food Programs, and Household Size."

Unfortunately, little empirical information is available to evaluate the effectiveness of food-stamp programs in developing countries. It would be unwise to conclude much solely on the basis of the U.S. experience. The U.S. population—even low-income households—are better nourished than poor households in developing countries. In addition, the level of benefits provided in other food-stamp programs contributes a higher percentage of income than is accounted for by the U.S. program. Inferences that can be drawn about the nutritional effectiveness of food-stamp programs are, therefore, limited until additional data become available.

Moreover, consumer price subsidies and food-stamp programs can be very expensive. Part of the expense is due to the large numbers of individuals not in need who receive program benefits. Untargeted subsidies make no attempt to separate the poor from other income groups. Even in food-stamp programs that have an income criterion as the basis for eligibility, it is difficult to target benefits in rural areas where income is primarily nonwage income. There is some indication in Sri Lanka that the income-verification procedure for food stamps has eliminated the wage-earning workers on tea estates, even though they appear to be the most nutritionally needy group in the population.

### Food-for-Work

Food-for-work schemes are another kind of family-level intervention that is in a sense self-targeting. Because of the nature of the work, only the poorest households tend to participate. As the name implies, wages in food-for-work projects are paid either partially or totally with food, some of which is often supplied by food aid.

Food-for-work projects were originally started to provide income-generating employment and to improve rural infrastructure in areas where there were large numbers of persons unemployed or underemployed. Increasing employment has always been a primary aim of food-for-work projects; a secondary goal has been construction

and maintenance of public works. It is only recently that food-for-work interventions have taken on improvement of nutrition as a program goal.

Given the initial focus of food-for-work projects, much of the data available for evaluation of them have been concentrated on employment effects. Food-for-work programs have been successful in generating employment among low-income families. In Bangladesh, food-for-work projects increased the man-days of work by 45 million, provided employment for 1.5 million people, and used 160,000 metric tons of grain.<sup>95</sup> Corroborating data have been reported from other countries.<sup>96</sup>

In addition, in some countries food-for-work projects have added significantly to rural infrastructure.<sup>97</sup> Development of better roads, irrigation and drainage systems, and soil conservation have been the principal types of project conducted.

The data on nutritional effectiveness of food-for-work projects are much more limited. A land-army project in Mysore, India, was reported to have increased the weight of adult males doing manual labor by 8-15 kilograms.<sup>98</sup> This example may not be particularly representative of food-for-work projects, however; the participants were living away from their families in a work camp where other basic needs besides food were being provided.

A more typical picture of food-for-work schemes is probably reflected in the studies reported from Bangladesh.<sup>99</sup> There, sale or barter of the food wages was common. As a result, no more than 50 percent of a family's calorie requirements were met. Similar findings have been reported from other studies.<sup>100</sup> Note also that on the average, participants worked for only 30 days. While the program provided a net increase in income and smoothed out seasonal unemployment, the short duration makes it difficult to measure nutritional effectiveness.

Virtually no evidence yet exists to document the effects of food-for-work projects on individuals within the family. A study recently con-

<sup>95</sup>Hjalman Brundin, *Food for Work Saturation Level and Constraints to Expansion Study* (Dhaka: U.S. Agency for International Development, 1978).

<sup>96</sup>S. Wigga, *The Nutritional Impact of Food-For-Work Programmes*. (Wageningen: Netherlands Universities Foundation for International Cooperation, 1983).

<sup>97</sup>Simon Maxwell, "Food Aid, Food for Work and Public Works," discussion paper, Institute for Development Studies, University of Sussex, England, 1978 (mimeographed).

<sup>98</sup>W. G. Donovan, *Rural Works and Employment: Description and Preliminary Analysis of a Land Army Project in Mysore State, India*, Occasional Paper 60 (Ithaca: N.Y.: Cornell University, Department of Agricultural Economics, 1973).

<sup>99</sup>United Nations, World Food Programme, *Interim Evaluation Report: Bangladesh 2197 Q Relief Works Programme for Land and Water Development* (WFP/ICFA 2/12-A), 1976.

<sup>100</sup>A. Grissa, *Agricultural Policies and Employment: Case Study of Tunisia*, OECD Development Centre Studies, Employment Series 9 (Paris: Organization for Economic Cooperation and Development, 1973).

ducted in Bangladesh indicated that, while children in food-for-work project sites were worse off nutritionally than those in the control sites at the initiation of the project, anthropometric indicators in the project site were as good or better after the completion of the project.<sup>101</sup> The authors attribute this effect, achieved during a two-year period, to the economic effects of the project.

In general, the remaining data are too scanty for any generalized inferences about the nutritional effectiveness of food-for-work projects to be drawn from them. Certain issues need to be considered in assessing food-for-work projects, however. First, the level of benefits—whether in cash or in kind—will influence the effectiveness of a project. Food-for-work projects may contribute a substantial amount of food—50 to 100 percent of the calorie needs of the participants—but for very limited periods, such as one to three months. Although this approach may be useful for dealing with seasonal hunger, it would not be a solution to chronic calorie deficits. What happens to families once the food-for-work efforts have stopped? Both short- and long-term effects need to be considered.

In addition, as stated earlier, wages are paid either partially or totally in food rather than in cash. The availability of food aid is an important reason for using food as partial payment of wages. Another reason may be the belief that it will be a more effective way of improving the household diet. The opposite may be true, however. If people are selling the food at very low prices, the nutritional effect of food-for-work may actually be less than the effect of payment in cash. This could also cause negative effects on local market prices. Little empirical information exists to document this point. Additionally, it appears that administration of a food-for-work program using food aid is more expensive than a cash wage program. The cost of transporting, storing, and distributing large volumes of food aid to rural areas is a large one and is borne by the government. At the same time, such administrative costs may be offset by the availability to the government of cheap or free food.

Most of the work performed as part of a food-for-work program is hard manual labor. The wages paid, whether in kind or in cash, must be sufficient to compensate the workers for the additional energy that they spend. A growing number of food-for-work laborers, moreover, are women. The extra amount of time put into food-for-work projects may detract from the child-care activities of these women. In rural areas, mothers

who work outside the home typically leave infants and preschoolers to be cared for by other siblings. The quality of child care and food provided by the mother substitute is often inadequate. The potential positive effects of food-for-work may be negated by an alteration of child-care patterns. These factors must be considered in any assessment of the nutritional effects of food-for-work projects.

More important, one of the main arguments for wage payment in the form of food rather than cash, is that food is less likely to be diverted to unintended uses. Also, the administration of the program may provide for transporting food to meet additional demand generated at a time when seasonal patterns and poor marketing infrastructure may contribute to sparse availability of food on the private market. Bottlenecks that lead to food-price inflation might thus be avoided. Where markets function well, employment-guarantee programs, such as that of the Maharashtra State government in India, may serve the expected function of food-for-work schemes without the need for wages in kind. The nutritional effects of such programs, however, have not been studied.

## COMMUNITY OR COUNTRY-LEVEL INTERVENTIONS

Direct interventions—whether aimed at the individual or the family—are expensive and cannot be self-sustaining without continued government support. These interventions are seen by many policymakers as short-term palliatives rather than permanent, long-term solutions to the nutrition problem. As a result, governments have begun to explore the feasibility of broad-based approaches, including agricultural policies and programs, as a more effective means of achieving policy objectives. Various agricultural strategies that have been used—either explicitly or implicitly—to achieve nutrition objectives are reviewed in this section.

### Commercialization of Agriculture

The governments of many developing countries are encouraging an increase in the production of export crops as one means of generating foreign-exchange earnings while at the same time augmenting the incomes of the subsistence and semisubsistence farm households.

<sup>101</sup>Shubh K. Kumar and Omar Chowdhury, "The Effects on Nutrition Status," in *Technical Papers on Development Impact of the Food-for-Work Program in Bangladesh* (Washington, D.C.: International Food Policy Research Institute, 1985).

Cash cropping may affect consumption and nutritional status, however—either positively or negatively—in a variety of ways. Von Braun and Kennedy outlined the main pathways through which the commercialization of agriculture might influence health and nutritional status;<sup>102</sup> at the household level, these include the effects on agricultural production, the demand for hired labor, and the effect on the allocation of time and other household resources. Through each of these three household-mediated routes, consumption and nutritional status of children may be affected.

Much of the early literature suggested that cash cropping would have a positive influence on the ability of the household to obtain food. It was assumed that farmers' incomes would increase as they diverted all or part of their land into the production of cash crops. Some data suggest that this has happened.<sup>103</sup> In addition, it was assumed that as incomes increased, at least a part of the incremental earnings would be spent on food; while this does happen, it is surprising that the effect of incremental income on food expenditures and caloric intake is not larger.

Although the marginal propensity to consume food may be significant, the propensity to consume calories paid for out of additional income can be quite low, even in households with malnourished members. It is a widespread phenomenon that even in low-income households, additional income is spent on more expensive sources of calories rather than in simply purchasing more calories. In one maize-producing village in Tanzania, for example, total income was related to food expenditures but had no effect on the caloric adequacy of diets within the family.<sup>104</sup>

The relation between income and nutrients is not only influenced by total family income but is also affected by income flows. Unlike most food crops, income from which tends to be more even-

ly spaced throughout the year, some cash crops are paid for in a lump sum. Lumpy sources of income are more likely to be spent on items other than food. In the Mwea irrigation scheme in Kenya, a higher percentage of income was spent by participating households on such items as bicycles and children's schooling than was spent by farmers not involved in the plan.<sup>105</sup> As a result, there was virtually no difference in the patterns of food consumption of farmers on the scheme and that of farmers not participating in it, even though the incomes of participating farmers had increased. Similar findings have been reported from Brazil; households spent more of their additional income on housing than they did on food.<sup>106</sup> This was also the pattern found among the Meru tribe in Nigeria. Wealth, as measured by durable possessions, was positively correlated with lump-sum income, while the adequacy of the diet was more closely correlated with continuous sources of income.<sup>107</sup>

The expenditure behavior of a family is influenced not only by its total income and its source of income but also by the form of income—cash or in kind—and by who controls the income. There is some evidence that income in kind is more likely to be used for family consumption than cash income.<sup>108</sup> Income from home gardens and home production may therefore be more likely to increase the intake of food by the household than an equivalent amount of cash income.

In many cultures, men control cash income and women control food income. As mentioned earlier, this is particularly true in African cultures. Resources controlled by women are more likely to be allocated to increasing the intake of food by the family, in particular the diet of the preschooler.<sup>109</sup> Policies and programs that transfer control of the budget from members with a high marginal propensity to consume food—women—to members with a low marginal propensity to

<sup>102</sup>Joachim von Braun and Eileen Kennedy, *Commercialization of Subsistence Agriculture: Income and Nutritional Effects in Developing Countries*, Working Papers on Commercialization of Agriculture and Nutrition 1 (Washington, D.C.: International Food Policy Research Institute, 1986).

<sup>103</sup>Larry Lev, *The Effect of Cash Cropping on Food Consumption Adequacy Among the Meru of Northern Tanzania*, Working Paper 21 (East Lansing: Michigan State University, 1981).

<sup>104</sup>Lalitha Seshamani, "Food Consumption and Nutritional Adequacy in Iringa: A Case Study of Four Villages," paper presented at the University Dar Es Salaam, 1980.

<sup>105</sup>R. Korte, "Chapter 1: Health and Nutrition," in *Mwea Irrigation Scheme* (Washington, D.C.: World Bank, 1981).

<sup>106</sup>Williamson-Gray, *Food Consumption Parameters*.

<sup>107</sup>Lev, *Effects of Cash Cropping*.

<sup>108</sup>Shubh K. Kumar, *Role of the Household Economy in Determining Child Nutrition at Low Income Levels: A Case Study in Kerala*, Occasional Paper 95 (Ithaca, N.Y.: Department of Agricultural Economics, Cornell University, 1977); and R. B. Reese et al., *Bonus Food Stamps and Cash Income Supplements*, Marketing Research Report 1034 (Washington, D.C.: U.S. Department of Agriculture, Economic Research Service, 1977).

<sup>109</sup>Donald Bender, "A Refinement of the Concept of Household: Families, Co-Residence and Domestic Functions," *American Anthropologist* 69 (1967): 493.

consume food—men— may decrease the intake of food within the family.<sup>110</sup> Data from Latin America indicate that as families devoted more of their resources to cash crops, women were left without the means to feed the household adequately.<sup>111</sup> These data suggest that with respect to nutritional goals, programs may be more effective if control of the budget rests with women.

The performance of local markets may be one of the primary factors that determine how cash cropping affects real income and, in turn, nutritional status.<sup>112</sup> If food supplies could move freely throughout the regions in a country, production of cash crops would not affect local food prices beyond the effect of marketing costs. If markets cannot respond to a decrease in food supplies, however, then nutritional status may be adversely affected.

In Brazil, when cash cropping of soybeans displaced black beans, the price of black beans on the local market increased dramatically.<sup>113</sup> If food prices increase enough to offset any gains in income, net purchasing power remains constant or may decrease as a result of cash cropping. Farmers who continue to allocate a portion of their land to food crops will be less affected by these market distortions. Clearly, households that produce for their own consumption would rely less on the marketplace for food. In one study in Africa, the children of subsistence farmers were nutritionally better off than the children of producers of cash crops.<sup>114</sup> Other studies show similar findings. Thus, the diets of families who are required to purchase most of their food in the local marketplace may be of lower quality.

In households in which real income has increased, however, why is there not a consistent pattern of improvement in nutritional status? Part of the answer may be related to the short-term versus the long-term effects of cash cropping. Fleuret and Fleuret introduced the conception of transitional malnutrition associated with

export crops.<sup>115</sup> Cash crops, such as coffee and sugarcane, which require a long lead time between initial planting and harvest, may precipitate temporary food insufficiencies within the household. In Malawi, farmers who planted coffee but who did not have other sources of income before the coffee harvest did suffer some temporary food shortages.<sup>116</sup> This may explain why the households of farmers whose income is generated from a mixture of cash crops and food crops tend to be those whose consumption of food is adequate.

Although these studies provide some evidence as to the way cash cropping may affect the availability and consumption of food at the household level, there is still little indication of the influence of the production of crops for export on the intrahousehold distribution of resources, including the allocation of mothers' time to nurturing activities. In a few studies it has been suggested that when less time is devoted to child care and food preparation, the nutritional status of the preschooler may be affected adversely. In the Philippines, the highest rates of preschool malnutrition were found in households where the mother worked outside the home.<sup>117</sup> It is not known, however, whether and under what circumstances production of cash crops causes a reallocation of women's time. Much more work needs to be done to explain how agricultural strategies, including production of cash crops, affect the dynamics within households.

Only a limited number of studies have been made for the purpose of evaluating the nutritional effects of the production of cash crops. Taken as a whole, the studies are inconclusive. Although results from some studies indicate a negative nutritional effect from cash cropping,<sup>118</sup> an equal number of other studies associate cash cropping with a positive,<sup>119</sup> or at least a neutral,<sup>120</sup> effect on nutritional status.

Two serious flaws in most of the studies preclude making any general statements about

<sup>110</sup>Robert Tripp, *Cash Cropping, Nutrition and Choice of Technology in Rural Development* (Mexico: Centro Internacional de Mejoramiento de Maiz y Trigo, 1982).

<sup>111</sup>C. D. Deere, "Rural Women and the Development of Capitalism in Colombian Agriculture," *Signs* 5 (No. 1, 1979): 60.

<sup>112</sup>Tripp, *Cash Cropping*.

<sup>113</sup>Frances M. Lappe and Joseph Collins, *Food First: Beyond the Myth of Scarcity* (Boston, Mass.: Houghton Mifflin Company, 1977).

<sup>114</sup>Oddvar Jakobsen, *Economic and Geographical Factors Influencing Child Malnutrition*, Research Report 52 (Dar es Salaam: University Dar Es Salaam, 1978).

<sup>115</sup>Patrick Fleuret and Anne Fleuret, "Nutrition, Consumption and Agricultural Change," *Human Organization* 39 (No. 3, 1980): 250.

<sup>116</sup>J. Ogbu, "Seasonal Hunger in Tropical Africa as a Cultural Phenomenon," *Africa* 46 (1973): 317.

<sup>117</sup>Barry M. Popkin, "Time Allocation of the Mother and Child Nutrition," *Ecology of Food and Nutrition* 9 (1980): 1.

<sup>118</sup>M. Hernandez et al., "Effect of Economic Growth on Nutrition in a Typical Community," *Ecology of Food and Nutrition* 3 (1974): 283; and K. G. Dewey, "Agricultural Development, Diet and Nutrition," *Ecology of Food and Nutrition* 8 (1979): 265.

<sup>119</sup>Lev, *Effect of Cash Cropping*.

<sup>120</sup>Jon Hitchings, "Agricultural Determinants of Nutritional Status Among Kenyan Children with Model of Anthropometric and Growth Indicators" (Ph.D. dissertation, Stanford University, 1982).

the effects of cash cropping. First, most of the studies have used only a quasi-experimental design to evaluate the effect of production of crops for export. The baseline health and nutrition of individuals and households before the introduction of cash-cropping schemes has never been clearly established. Any results that are reported cannot be automatically attributed to cash cropping; rather, the positive or negative effects could simply be the result of some systematic difference between cash-cropping and noncash-cropping families.

More important, the studies of cash cropping just reviewed have not been made in such a way as to make it possible to explain why the reported outcomes are being observed. Emphasis in earlier research has been placed on a yes or no answer to the question, Is cash cropping good? As a result, understanding of the process leading to the reported effects is limited.

Much more empirical information is needed to determine the potentialities of an increase in commercial agriculture as a vehicle for increasing consumption and improving nutritional status.

### **Nutritional Effects of Technological Change in Agriculture**

Adoption of new agricultural technologies has been advocated as a means of improving the consumption of subsistence and semisubsistence farm households. This is brought about either by increasing the incomes of target households, decreasing the price of staple foods, or both.

New agricultural technologies might lead to increases in food supplies, either through greater yields per acre or increased use of previously uncultivated land. The available data indicate that recent increases in worldwide production of food have occurred mainly because of larger yields per acre.<sup>121</sup> This increased agricultural production generates greater family income, a portion of which presumably will be spent on additional food. The extent of the income effect on nutritional status will depend on how directly a household is linked to the new technology. Although the farmers using the technology will benefit, and agricultural laborers may benefit through increased employment, nonagricultural workers are less likely to experience any change in income as a result of new agricultural technology, although generation of income

among the poor employed in the rural-services sector may be important.

Agricultural marketing and rural development projects and policies that cause food prices to decrease and to fluctuate less with the passage of time offer a high potential for improving the diets of the urban poor. High price levels and severe price fluctuations are much more harmful to the poor than to the better-off urban consumers.

The rural poor who depend on food production for their incomes either directly or indirectly, however, benefit from higher food prices. The apparently conflicting objectives of low food prices to urban consumers and higher prices as production incentives and higher incomes for the rural poor need to be addressed through coordinated agricultural and price policies.

Finally, the type of crop production advocated by specific agricultural policies may influence nutritional status. A considerable proportion of existing malnutrition is found among households that produce most or all of the food they consume—the semisubsistence farm households. For those households, changes in cropping systems that influence the amounts and kinds of food produced and the fluctuations in the availability of food during the year may be much more important than changes in food prices. Agricultural and rural development projects and policies may change the crop mix and the cropping patterns so that they will better meet the nutritional requirements of the semisubsistence farm family, but they may also cause a deterioration in the nutritional situation of these families. In fact, certain projects and policies may create a nutritional problem where none existed before.

Attention has been focused only recently on the effects of a change in agricultural technology on consumption and nutrition. Information on the ability of new technologies to improve nutrition is therefore limited to a few small-scale studies.

Goldman and Overholt assessed the nutritional effects of an agricultural project in Colombia.<sup>122</sup> The goal of the project was to increase the productivity of the small farmer through adoption of a new technology using high-yielding maize. Improvement in diet or nutritional status was not an explicit goal of the project. Adoption of the new technology brought an increase in the income of the farmers; there was only a weak relation between income and intake of calories, however. The income elasticity of demand for

<sup>121</sup>Per Pinstrup-Andersen, *Agricultural Research and Technology in Economic Development* (London and New York: Longman, 1982).

<sup>122</sup>Richard Goldman and Catherine Overholt, *Nutrition Intervention in Developing Countries, Study VI: Agricultural Production, Technical Change and Nutritional Goals* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981).

calories was 0.1; a 10 percent increase in income would lead to an increase of only 1 percent in calorie intake. In addition, there was no apparent relation between increased income and improvement in the nutritional status of preschoolers. The authors suggest that preschool malnutrition may be more prevalent in the households of landless laborers than in small farm families. The landless laborers were not directly affected by the high-yielding varieties of maize.

### Home and Village Gardens

The terms "home garden," "kitchen garden," and "household garden" are often used synonymously. Ninez has defined a home garden as "a subsystem within larger food procurement systems which aims at production of household consumption items either not obtainable, readily available, or affordable through field agriculture, shifting cultivation, hunting, gathering, fishing, livestock husbandry, or wage earning. Household gardens supply and supplement subsistence requirements and generate secondary direct or indirect income. They tend to be located close to permanent or semi-permanent dwellings for convenience and security."<sup>123</sup> The practice is probably as old as settled agriculture.

As an intervention strategy, home gardens are regarded as a means of improving the micronutrient content of diets based exclusively or primarily on one basic staple. In addition, some see production of home gardens as a workable strategy for increasing the caloric and protein content of the diet.<sup>124</sup> Promotion of home gardens is an integral component of applied nutrition programs in many countries.

A recently published extensive review of home gardens offers the conclusion that in very few studies has the effect of home gardens on consumption by low-income households been systematically evaluated.<sup>125</sup> An evaluation in Puerto Rico reports that families with home

gardens consumed significantly more of some micronutrients.<sup>126</sup> Ninez summarizes the nutritional benefits of home gardens in Lima, Peru: increased intake of higher-quality carbohydrate, decreased loss of nutrients through freshness, and increased consumption of fruits and vegetables that would not have been available to families because of high market prices.<sup>127</sup> Home gardens in the Philippines were found to increase consumption of vitamin A, but at a cost far higher than fortification of food or administering capsules.<sup>128</sup>

There are a number of obstacles to the success of projects to promote home gardens. A World Bank project in Indonesia had a home and village garden subcomponent. Evaluation results indicate that the home-garden component probably failed to benefit the households at greatest risk nutritionally because many had insufficient land for a garden.<sup>129</sup> The author also states that lack of community lands also hampered the establishment of village seed gardens. Water and labor may also be in short supply. The limited success of many early garden projects appears to be the result of the inordinate emphasis placed initially on monocropping and the use of inappropriate agricultural technologies.<sup>130</sup> Home gardens are often promoted through schools, with little transference to households.<sup>131</sup>

Although the idea of home and village gardens offers the potential for increasing food supplies, particularly micronutrients, the utility of this approach in combating malnutrition in a variety of environments must await verification from future studies.

### CONCLUSIONS

The preceding review points out that the nutritional effectiveness of various interventions has been mixed. Table 3 summarizes what is known about the effectiveness and constraints to suc-

<sup>123</sup>Vera Ninez, "Household Gardens: Theoretical Consideration on an All Survival Strategy," International Potato Center, Lima, undated (mimeographed).

<sup>124</sup>United Nations Children's Fund, *The UNICEF Home Gardens Handbook — For People Promoting Mitel Gardening in the Humid Tropics* (New York: UNICEF, 1982).

<sup>125</sup>L. Brownrigg, *Home Gardens in International Development: What the Literature Shows* (Washington, D.C.: League for International Food Education, 1985).

<sup>126</sup>M. D. Immick et al., "Home Gardens and the Energy and Nutrient Intakes of Women and Preschoolers in Rural Puerto Rico," *Ecology of Food and Nutrition* 11 (1981): 191.

<sup>127</sup>Ninez, "Household Gardens."

<sup>128</sup>F. Solon et al., "An Evaluation of Strategies to Control Vitamin A Deficiency in the Philippines," *American Journal of Clinical Nutrition* 32 (1979): 1445.

<sup>129</sup>Joanne Leslie, *Design and Implementation of Nutrition Projects: Lessons Learned from the World Bank Experience in Brazil, Indonesia, Colombia, and India* (Washington, D.C.: World Bank, Economic Development Institute, 1984).

<sup>130</sup>H. C. Bittenbender, "The Home Garden: An Important Horticultural Farming System in Less Developed Countries," Michigan State University, East Lansing, undated (mimeographed).

<sup>131</sup>Brownrigg, *Home Gardens in International Development*.

cessful implementation of the various programs just reviewed.

Part of the discrepancy in nutritional effectiveness across programs is related to the differing objectives of the interventions. Most family-oriented programs—subsidies, food stamps,

food-for-work projects—emphasize a preventive strategy. By providing food or food purchasing power, these programs concentrate on allowing provision of an adequate household diet. It is not the stated objective of these family interventions to alleviate malnutrition; rather, the focus of

**Table 3—Summary of nutrition interventions**

Program	Effectiveness	Constraints
Consumer food price subsidies	There is some evidence that subsidies improve family caloric consumption, but little evidence to suggest that subsidies are able to alleviate preschooler or maternal malnutrition. They are most effective as preventive strategy for improving nutrition.	Subsidies are difficult to implement on a small scale and expensive to implement on a large scale. They are administratively difficult to implement in rural areas. They are most cost-effective when combined with some type of targeting—either to lowest income groups or by use of self-targeting food.
Food stamps	Like subsidies, there is some evidence that food stamps can increase family nutrient intake, but no evidence to date that food stamps are effective in improving maternal or preschooler nutritional status. Focus is preventive rather than therapeutic.	Food stamps are feasible only where households rely on the marketplace for food purchases; in this sense they are prone to urban bias.
Food-for-work	Information on nutritional effectiveness is limited. Given the focus of most programs (1 to 3 months participation), it is most effective in alleviating seasonal fluctuations in consumption.	Most programs rely heavily on food aid.
Supplementary feeding	As these programs have been typically operated, they are not very effective in improving preschooler malnutrition. They are most effective when targeted to high-risk individuals. Programs that offer a small ration (200-300 calories) to a large number of people are unlikely to show a measurable impact on growth.	The level of supplementation provided has not taken into account leakage to nontarget group individuals. As a result, net calories consumed by a child are not enough to cover the energy gap and/or improve growth. Also, programs are administratively intensive, requiring moderate amount of infrastructure and logistical support.
Integrated health/nutrition	An appropriate mix of health/nutrition services are effective in improving maternal and child health. Successful projects have targeted services to high-risk persons, used supplementary feeding selectively, and tailored program components to individual needs.	Program usually requires some health infrastructure and is very labor-intensive.
Formulated foods	Only limited success in improving nutritional status of preschoolers has been observed.	Cost is a primary barrier for commercially available weaning foods. Low consumer acceptability has also limited use of these foods.
Home gardens	Some evidence suggests an impact on increasing micronutrient intake, but the effect on increasing macronutrient consumption appears limited.	Land and labor is insufficient for cultivation of home garden by the most nutritionally needy families.

these programs is to prevent dietary insufficiency.

However, programs directed toward specific individuals within the family typically do have a therapeutic orientation. For example, many supplemental feeding programs target benefits only to those children who already have a measurable growth deficit. Similarly, in integrated health/nutrition programs, although health services are available to all, supplementation is often limited to those children who are moderately to severely

malnourished and those preschoolers who exhibit a faltering pattern of weight gain.

Given the range of objectives for the different programs, it is not surprising that success in achieving various objectives has varied. A food subsidy program that is effective in maintaining family caloric consumption is probably an inappropriate vehicle for treating severely malnourished children. This issue will be discussed further in Chapter 7.

# 4

## Targeting

The review presented in Chapter 3 indicated that it is targeted programs that are most likely to demonstrate measurable nutritional effect. Why, then, would governments or institutions choose not to target? The most obvious reason is that targeting is often politically unpopular. It is difficult to select certain families or individuals to receive benefits and deny service to others. This is particularly true when the nonparticipants turn out to be the most vocal and visible segments of the population.

In addition, governments are concerned about the stigma that might be attached to the people who are selected. If children are selected for a feeding program on the basis of anthropometric standards, for example, families may be hesitant to have their preschoolers participate because they do not want the community to realize they have malnourished children. On the other hand, if all children below a certain age are eligible for the program, no child is singled out as malnourished.

Finally, implementing any type of targeting strategy requires an infrastructure. If programs are to be targeted to low-income families, personnel and facilities are needed so that the intended beneficiaries can be identified. Often these are not available.

In the face of these difficulties, why bother targeting? The first and probably most important reason is that most countries have limited resources. Usually not everyone can be served by a program. Thus, it is important to reach those with the greatest nutritional needs. In addition, there is no guarantee that by having open entry to a program, the target individuals will also be reached. In fact, there is evidence to suggest the opposite. In Project Poshak in India, it was found that the program failed to reach a large percentage of the nutritionally vulnerable children less than three years old.<sup>132</sup> Similarly, Beaton and Ghassemi, in a review of more than 200 supplemental feeding programs, report that most sup-

plementation schemes do not reach the preschoolers between 7- and 36-months old, even though these are usually the children who are most malnourished.<sup>133</sup> This suggests that some targeting strategy is needed or, alternatively, that the targeting strategies implemented in the past have actually missed the neediest.

### GEOGRAPHICAL TARGETING

Geographical targeting is used to limit a program to specific areas within a country—villages, districts, regions. The parameters used as the basis for the geographical targeting have included regional income, infant mortality rates, and the prevalence of preschool malnutrition. The extent to which geographical targeting will work depends on the level of nutritional need. Two subsidy programs—a milk subsidy in Mexico City and a pilot rice and oil subsidy in the Philippines—both used geographical targeting to reach the nutritionally neediest.<sup>134</sup> In Mexico, the program is targeted on the basis of income and the presence of children under the age of 12, pregnant women, or elderly persons. Distribution centers for the subsidized milk are located in the areas of the city where incomes are lowest. The Philippine subsidy project is targeted to villages on the basis of the prevalence rates of malnutrition among preschoolers.

Although both programs attempt to use geographical targeting to serve the households whose incomes are lowest and indirectly to reach malnourished children, the effectiveness of the two approaches differs. The data in Table 4 indicate that study families in the two subsidy programs are similar in size of household and number of preschoolers. The Philippine households are at higher nutritional risk, however; more Filipino households are calorically deficient and there is a greater prevalence of malnutrition among preschoolers than in Mexico City.

<sup>132</sup>See Gopaldas et al., *Project Poshak*.

<sup>133</sup>Beaton and Ghassemi, "Supplementary Feeding Programs."

<sup>134</sup>See Overholt et al., "Subsidized Milk Distribution in Mexico;" Marito Garcia, "Preliminary Results from the Pilot Food Discount Experiment in the Philippines," paper prepared for Workshop on Consumer-Oriented Food Subsidies, International Food Policy Research Institute, Washington, D.C., 1984 (mimeographed).

**Table 4—Comparison of subsidy programs of Mexico and the Philippines**

Participant and Program Variables	Mexico	Philippines
Average size of family sample	6.5	6.1
Average number of preschoolers per family	2.0	2.1
Food subsidized	Milk	Rice
Cost of food as a percentage of total cost	74.0	86.0
Percent of caloric adequacy of family	95.1	66.4
Prevalence of moderate and severe malnutrition (percent)	4.5	31.6

Sources: For Mexico, Catherine Overholt et al., "Case Study: Subsidized Milk Distribution in Mexico," in *Nutrition Intervention in Developing Countries, Study V: Consumer Food Price Subsidies* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981), pp. 79-114. For the Philippines, Marito Garcia, "Preliminary Results from the Pilot Food Discount Experiment in the Philippines," paper prepared for a workshop on Consumer-Oriented Food Subsidies held by the International Food Policy Research Institute, Washington, D.C., 1984 (mimeographed).

Whereas geographical targeting worked well in the Philippines, it was less successful in Mexico City. From the present comparison it is clear that geographical targeting is not very effective in areas in which the nutritionally needy make up only a small percentage of the total population. In the Philippines, 1 child in 3 weighed less than 75 percent of the appropriate weight for his or her age, whereas in Mexico City, by the same criterion, only 1 in 20 was malnourished. In order to reach the nutritionally neediest preschoolers in a population such as that of Mexico City, a more extensive selection procedure would be needed.

A variation of geographic targeting used in Sri Lanka gave nutritional status scores to 8,082 schools on the basis of arm circumference for height of pupil.<sup>135</sup> This approach was administratively uncomplicated and made it possible to provide school lunches in areas where average need was greatest.

Geographical targeting works best when an area—village, city, or district—has a densely concentrated group of the intended beneficiaries. The Philippine villages did; Mexico City did not. A general rule of thumb is that if less than 20 percent of the households or children in an area are nutritionally needy, geographical targeting by itself is unlikely to work.

As will be discussed later, there is some difficulty in determining the correlates of malnutrition in order to target an intervention. This may be true when determining the parameters for geographical targeting as well. While a poor neighborhood may have a greater density of malnourished families than a wealthy one, there

may be a significant number of adequately nourished families within the poor community. Similarly, the relatively wealthy neighborhood may be sufficiently heterogeneous to include a number of families in which some members are malnourished. This is one reason that programs often attempt to target families or individuals, either in lieu of geographical targeting or in conjunction with it.

## FAMILY TARGETING

An income criterion is typically used to identify potential participants for nutrition interventions. The logic behind this is that it is in the poorest households that caloric deficits are likely to be found. There are two problems with the income approach. First, as already discussed, not all low-income households are nutritionally needy. The degree of leakage of program benefits to nondeficit households can be high. In the Mexico City subsidy scheme, although the incomes of participant households were low, only 42 percent had diets that provided less than 100 percent of the calorie requirements of the household.

Income may not be a precise indicator for household targeting. Not all low-income families are nutritionally at risk. Timmons et al., in an assessment of more than 8,000 preschoolers, found that family income was not effective in identifying malnourished children.<sup>136</sup> Similarly, in the Philippines the correlation between household income per capita and the calorie adequacy of the diets of preschoolers is 0.04.<sup>137</sup> The comparable coefficient of correlation in Mexico is 0.01. Income by itself does not appear to be a

<sup>135</sup>Mary Anderson, "Targeting of Food Aid From a Field Perspective," in *Nutritional Aspects of Project Food Aid*, ed. Martin Forman (Rome: United Nations Subcommittee on Nutrition, 1986).

<sup>136</sup>Timmons, Miller, and Drake, "Targeting."

<sup>137</sup>Per Pinstrup-Andersen and Marito Garcia, "Household vs. Individual Food Consumption as Indicators of the Nutritional Impact of Food Policy," paper presented at Tufts University, Medford, Massachusetts, October 23-26, 1984.

good predictor of the preschooler's energy intake.

Targeting based on household caloric intake does not appear to be effective. Data in Table 5 indicate that household caloric intake may not be a good proxy for the level of energy intake in the preschool-aged child. Only 39 percent of the households with preschoolers consuming less than half their caloric requirements would be captured by a program targeted to households that consumed less than 50 percent of the calories they required.

In addition, total family income may be difficult to determine. Income screening works best where most of the income is wage income. In subsistence and semisubsistence areas, however, where much of the household income is not from wages, a strict income criterion for participation in a program may be impossible to implement. This was one problem with the income cutoff for the Sri Lanka food-stamp program.<sup>138</sup> The estate workers with easily verified wage income were ineligible for food stamps even though data indicated a high prevalence of

**Table 5—The relation between calorie adequacy of households and of preschoolers within the households**

Calorie Adequacy of Preschoolers <sup>b</sup>	Item	Household Calorie Adequacy <sup>a</sup>					Total
		0-50	51-60	61-80	81-100	Above 100	
0-50	Number of households	43	17	42	7	2	111
	Percent of sample	15.69	6.20	15.33	2.55	0.73	40.51
	Row percentage	38.74	15.32	37.84	6.31	1.80	....
	Column percentage	64.18	34.69	40.00	16.28	20.00	....
51-60	Number of households	14	10	18	1	1	44
	Percent of sample	5.11	3.65	6.57	0.36	0.36	16.06
	Row percentage	31.82	22.73	40.91	2.27	2.27	....
	Column percentage	20.89	20.41	17.14	2.33	10.00	....
61-80	Number of households	8	17	31	16	1	73
	Percent of sample	2.92	6.20	11.31	5.84	0.36	26.64
	Row percentage	10.96	23.28	42.46	21.92	1.37	....
	Column percentage	11.94	34.69	29.52	37.21	10.00	....
81-100	Number of households	2	4	11	12	3	32
	Percent of sample	0.73	1.46	4.02	4.38	1.09	11.68
	Row percentage	6.25	12.50	34.37	37.50	9.37	....
	Column percentage	2.98	8.16	10.48	27.91	30.00	....
Above 100	Number of households	0	1	3	7	3	14
	Percent of sample	0.00	0.36	1.09	2.55	1.09	5.11
	Row percentage	0.00	7.14	21.43	50.00	21.43	....
	Column percentage	0.00	2.05	2.86	16.28	30.00	....
Total	Number of households	67	49	105	43	10	274
	Percent of sample	24.45	17.88	38.32	15.69	3.65	100.00

Source: Per Pinstrup-Andersen and Marito Garcia, "Household vs. Individual Food Consumption as Indicators of the Nutritional Impact of Food Policy," paper presented at Tufts University, Medford, Mass., October 23-26, 1984.

<sup>a</sup> Total household calorie consumption divided by the sum of the Recommended Dietary Allowances (RDAs) for all members of the household and multiplied by 100.

<sup>b</sup> Calorie consumption by members of the household between 12 and 84 months of age divided by the sum of the RDAs for these household members and multiplied by 100.

<sup>138</sup>David Sahn, "Changes in Living Standards Among the Poor in Sri Lanka During a Period of Macroeconomic Restructuring," *World Development*, in press.

malnutrition among preschool-aged children from these families; it appears that higher-income farm households were certified for food stamps because it was difficult to quantify income that came primarily from own-farm production.

In rural areas in which most people are self-employed, measures other than income should be used. In Kenya, the Central Bureau of Statistics is developing an index based on land available per household member in order to identify families that do not have the resources to provide for basic needs. This type of index would automatically allow landless and unemployed workers to be eligible for program benefits. This approach would work effectively only in areas in which household landholdings can be accurately determined, however, something that is not possible in every area.

The manner in which the intervention is designed and implemented can be used to target a program successfully. Probably the best example is food-for-work programs. Because of the types of projects and work involved, food-for-work projects appear to have attracted only the households whose incomes are lowest.

Another parallel example is the idea of a self-targeting food in subsidy programs. The food selected should be one that has a low or even negative income elasticity of demand and provides a significant share of the calories in the diets of the poorest households. The experiences in Bangladesh and Pakistan described in Chapter 3 are examples of the self-targeting food approach.<sup>139</sup> Why is this approach not used more often? In many countries, it is difficult to identify a self-targeting food that can be used; while this approach is attractive because of the administrative ease with which it can be implemented, the appropriate food or foods are not always available.

## INDIVIDUAL TARGETING

Most direct feeding interventions have the aim of reaching only certain individuals within the family, usually mothers and children. Even within these groups, it is usually only those persons who are already malnourished who are the intended beneficiaries of program services. By and

large, direct nutrition interventions have taken a curative rather than a preventive focus. This therapeutic emphasis is reflected in the types of targeting mechanism that have been employed.

The least restrictive way to target to individuals is to base eligibility on some general category such as age—all preschoolers, for example—or physiological state—all pregnant women. Often, this is done because it will be accomplished with a minimum of administrative burden. Timmons, Miller, and Drake examined the utility of screening by age for five supplemental feeding programs.<sup>140</sup> All children 5 years of age and under were eligible for supplementation.

There are two types of errors that can occur: first, children who are not malnourished at the time may be included in the program (error of inclusion); second, children who are eligible may be eliminated (error of exclusion). Table 6 shows the percentage of these two types of error using the age-cohort screening. There was no error of exclusion since all age-eligible children could participate. In three of the five countries, however, the errors of inclusion were high, ranging from 55.5 percent to 83.4 percent. These findings indicate that age by itself is not a precise way to identify malnourished children. As a result, additional methods of targeting are usually employed.

Anthropometric measures are another common type of screening device. A weight-for-age below a certain cutoff—usually 90 percent or 75 percent—is used to identify malnourished children.<sup>141</sup> The errors of inclusion and exclusion with this approach are shown in Table 7. The weight-for-age screening eliminated any errors of inclusion because only those preschoolers with a weight deficit beyond a certain point are included in the program. There is a problem, however, in that some who will become malnourished may be excluded. Often a three-year-old child who is not malnourished in May will be three months later. Basing eligibility for participation in a program on a weight measure at only one point in time ignores the dynamic nature of malnutrition. As can be seen from Table 7, up to 50 percent of the children not enrolled in the program would be eligible on the basis of the same criteria at a later date.

One way to deal with this problem is to base the screening on a series of weighings—every month, for example. There is some evidence that

<sup>139</sup>See R. Karim, M. Majid, and F. J. Levinson, "Targeting a Consumer Food Subsidy Program: The Bangladesh Sorghum Experiment," U.S. Agency for International Development, Dacca, 1979 (mimeographed); and Rogers et al., *Nutrition Intervention, Study V*.

<sup>140</sup>Timmons, Miller, and Drake, "Targeting."

<sup>141</sup>Height-for-age and weight-for-height are also used but to a lesser extent.

**Table 6—Geographically targeted preschooler populations: errors of inclusion and exclusion**

Type of Error	Data Set				
	Kottar	Candelaria	Thailand	Esperanca	Sri Lanka
Error of inclusion	33.2	83.4	(percent) 55.5	76.6	22.0
Error of exclusion	0.0	0.0	0.0	0.0	0.0

Source: R. J. Timmons, R. Miller, and W. Drake, "Targeting: A Means to Better Intervention," report submitted to U. S. Agency for International Development, Community Systems Foundation, Ann Arbor, Mich., 1983.

Notes: The target was to reach all preschoolers in the service area. The error of inclusion is the proportion of preschoolers included in the targeted populations who actually did not need the intervention. The error of exclusion is the proportion of preschoolers excluded from the targeted populations who actually needed the intervention.

**Table 7—Preschool populations targeted by anthropometry (weight for age): errors of inclusion and exclusion**

Type of Error	Data Set				
	Kottar	Candelaria	Thailand	Esperanca	Sri Lanka
Error of inclusion	0.0	0.0	(percent) 0.0	0.0	0.0
Error of exclusion	20.1	6.4	13.2	6.3	49.7

Source: R. J. Timmons, R. Miller, and W. Drake, "Targeting: A Means to Better Intervention," report submitted to U.S. Agency for International Development, Community Systems Foundation, Ann Arbor, Michigan, 1983.

Note: The target was to reach all preschoolers who suffered from second- or third-degree malnutrition.

growth monitoring may be more effective in minimizing errors of inclusion and exclusion.<sup>142</sup>

## SEASONAL TARGETING

In many countries, especially in Africa, there are seasons in which mortality and morbidity are high.<sup>143</sup> It may be possible to target programs during these seasons. In a maternal supplementation program in Gambia, for example, significant reductions in infants of low birth weight—from 28.2 percent to 4.7 percent—were reported during the wet season, and the decrease was attributed to the program.<sup>144</sup> No effect was observed in the dry season.

A significant drawback to such an approach, besides the lack of evidence of its effectiveness, is that the initial costs of most programs made

seasonal stoppages difficult. If, however, the programs use existing infrastructure—including private channels—the initial costs may be lower. Egypt, for example, which has a year-round ration program, changes the commodities and quotas of certain goods annually. The motivation is price stabilization, however, but it may indicate feasibility.

## CONCLUSIONS

Targeting almost always improves the cost-effectiveness of a nutrition intervention. The type of targeting that is most appropriate depends primarily on two factors: first, the level of nutritional need, and second, the objective of the program.

<sup>142</sup>Berg, "Nutrition Review."

<sup>143</sup>R. Chambers, R. Longhurst, and A. Pacey, eds. *Seasonal Dimensions to Rural Poverty* (London: Francis Printer, 1981).

<sup>144</sup>A. M. Prentice et al., "Prenatal Dietary Supplementation of African Women and Birthweight," *Lancet* (1983): 489-492.

The degree to which a project should be targeted depends on local circumstances. In areas where malnutrition is prevalent, targeting to specific families and individuals is unnecessary. In this situation, geographical targeting can be effective in reaching the nutritionally needy population. In the Philippine pilot subsidy scheme it was possible to use geographical targeting effectively because areas with large numbers of calorie-deficient households and malnourished children could be identified. This is not often possible. As the rates of prevalence of malnutrition fall, more attention must be given to methods of screening families or individuals.

The decision whether to target to families or to specific members of the household should be dictated largely by the objective of the program. If the goal of a program is to improve the diets of calorie-deficient households, strategies aimed at identification of vulnerable families should be adopted. Alternatively, if the goal of a project is to reach preschoolers or pregnant and lactating women, additional screening methods are needed. Thus, it is difficult to talk about targeting outside a local environment and without an appreciation of the goals of a program. With these two caveats in mind, Table 8 provides a summary of the range of possible nutrition interventions and types of targeting strategy.

Untargeted food-subsidy schemes, such as in Egypt and Morocco, are expensive because all segments of the population receive benefits from the system, and the cost per intended beneficiary is therefore high. In addition, the cost-benefit ratio is low because a large proportion of the benefits are leaked to persons not nutritionally in need.

Ration shops targeted geographically or by using self-targeting foods and targeted food-stamp programs achieve a higher level of nutritional effectiveness at a lower cost.

If the objective of a program is to alleviate malnutrition in the preschooler population, targeting to nutritionally vulnerable children increases the effectiveness and lowers the cost. The strategy of targeting the benefits of a program to children who are already malnourished emphasizes a curative approach. The data from the review of Timmons et al. suggest that screening based on anthropometry—weight-for-age—is effective if the primary focus of a program is therapeutic.<sup>145</sup> If an intervention is focused on prevention, however, age, particularly below 36 months, is the most effective means of identifying the population that is at risk. Note also that the process of monitoring growth has a preventive function.

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<sup>145</sup>Timmons, Miller, and Drake, "Targeting."

**Table 8—Typology of nutrition intervention**

Type	Country Example	Cost Per Intended Beneficiary	Benefit-Cost Ratio	Infrastructure Required	Leakage to Nonneeded	Improvement in Nutrition Habits of the Malnourished
Untargeted food subsidies	Egypt, Morocco	High	Low	Minimal	High (60-70%)	Low
Untargeted food rations (that is, ration shops)	India, Pakistan	Moderate	Low-Moderate	Minimal	High (50-60%)	Low-Moderate
Ration shops targeted geographically	India (presently), Brazil	Moderate-Low	Moderate-High	Minimal	Low (5-10%)	Moderate
Self-targeting food rations	Pakistan, Bangladesh	Moderate-Low	Moderate-High	Minimal	Low (10-20%)	Moderate
Food stamps — targeted by income	Sri Lanka (post-1979), United States, Colombia	Moderate	Low-Moderate	Minimal-Moderate	Low-Moderate (10-30%)	Low-Moderate
Food stamps — targeted by health status	Colombia, Indonesia	Low	Moderate	Moderate	Low (3-10%)	Moderate
Supplementation schemes — on-site or take-home, preschooler plus mother	India, Indonesia, etc.	Moderate-Low	Moderate	Moderate	Moderate (30-60%)	Low-Moderate
Supplementation schemes — on-site, most vulnerable group targeting	Tamil Nadu, India	Moderate-Low	High	Moderate	Low (3-10%)	Moderate-High
Supplementation schemes — take-home, nutritionally vulnerable	India	Low	High	Moderate	Low	High
Food-for-work programs	India, Bangladesh, Indonesia	Moderate	High	Moderate-High	Low (3-10%)	Low-Moderate

Source: Adapted from Abel Mateus, *Targeting Food Subsidies for the Needy: The Use of Cost-Benefit Analysis and Institutional Design*, Staff Working Paper 617 (Washington, D.C.: World Bank, 1983).

## Cost and Administrative Concerns of Food Transfer Programs

Most people would agree that reducing malnutrition is intrinsically worthwhile. Critics of food-subsidy programs may, however, point to the costs of such programs and question whether the poor or the country as a whole would not benefit more if food-subsidy expenditures went instead to a variety of other investment and welfare projects. It is relatively easy to document the fiscal cost of nationwide subsidy programs, as they are generally large enough to appear as line items in the national budget. Food subsidies constituted more than 10 percent of total government expenditures in Egypt, Korea, Morocco, Pakistan, and Sri Lanka in 1975, for example.<sup>146</sup> Although the total costs of individual nutrition projects are available only sporadically, the magnitude and the range of project costs can be ascertained from a review of the literature.

The total cost of a program can be reduced by effective targeting, though at the risk of excluding some who are in need of the program. Even when the costs are expressed in terms of cost per recipient, however, there is a wide range of costs associated with different programs. Examples are presented in Table 9. Some of the factors that contribute to these differences include both elements essential to the effectiveness of the program and administrative concerns that may be reduced in alternative program design.

### SCALE OF INTERVENTION

Clearly, the more food a recipient obtains the greater the cost of a program. Although there are some economies of scale in administration and transportation, food costs are roughly proportional to both the daily average calorie supplement and the length of participation. The relative costs of various programs in calories delivered may differ from the costs per recipient. In the Philippines the maternal and child health pro-

grams presented in Table 9, for example, delivered 1,000 calories at a cost between U.S.\$0.24-0.26. The school feeding program, however, though nominally less expensive per person, cost \$0.37-0.48 per 1,000 calories. Similarly, food-for-work programs in the Philippines that cost between \$86.90 and \$150.00 per recipient cost less per calorie than the school feeding programs. Similar figures can be calculated from the five case studies done by Andersen et al. using CARE data. Of these five, only in the Costa Rica project were costs per 1,000 calories appreciably greater than in the Philippine example.<sup>147</sup> Though comparable data on total calorie supplementation in malnutrition wards is not available, the knowledge that they provide full feeding for children for 3-4 months can be used to calculate that the costs per calorie are not that much greater than those of supplementary feeding programs.

These figures, however, are for costs per calorie distributed. The costs per *net* calorie increase are higher. If, for example, the net increase were between 40 and 60 percent of the gross calories distributed, as observed by Beaton and Ghassemi, the costs per net calorie in a supplementation program would be twice as much as the costs per gross calorie. Frequently, when only 40 to 60 percent of the supplement is net increase of intake, analysts lament the leakage. In actuality, if the net increase is as high as this, it would seem to indicate that food-supplementation programs are effective in increasing calorie intakes in relation to income transfers.

This point can be illustrated using economic models of household food demand. These models predict that the family's increase in food expenditure would be the MPC times the net increase in total income and that the share of an increase going to a child would be some fraction of the increase going to the family. A household MPC of 0.5 is plausible for low-income families,

<sup>146</sup>Jeffrey Davis, *The Fiscal Role of Food Subsidy Programs*, Staff Paper 24 (Washington, D.C.: International Monetary Fund, 1977), pp. 100-127.

<sup>147</sup>Beaton and Ghassemi, "Supplementary Feeding Programs."

**Table 9—Annual cost per recipient of selected programs**

Program	Cost per Recipient
	(1982 U.S. dollars)
Supplemental feeding	
Colombia <sup>a</sup>	42.08
Dominican Republic <sup>a</sup>	24.48
Pakistan <sup>a</sup>	39.97
Costa Rica <sup>a</sup>	160.72
India <sup>a</sup>	24.51
Philippines	
Maternal and child health <sup>b</sup>	25.21-37.61
School feeding <sup>b</sup>	11.14-12.77
Day care <sup>b</sup>	19.20
Morocco <sup>c</sup>	39.51
Sri Lanka <sup>d</sup>	6.16
Integrated health care	
India	
Narangwal <sup>e</sup>	49.91
Tamil Nadu <sup>f</sup>	20.76
Indonesia <sup>g</sup>	24.32
Food subsidy	
Mexico <sup>h</sup>	38.16
Philippines <sup>i</sup>	8.90
Egypt <sup>j</sup>	41.60
Mothercraft center	
Philippines <sup>b</sup>	> 400 per family
Haiti <sup>k</sup>	65.90

<sup>a</sup> Retabulated from Mary Ann Anderson et al., *Nutrition Interventions in Developing Countries, Study I: Supplementary Feeding* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981).

<sup>b</sup> S. Blumenfeld et al., *PL480 Title II: A Study of the Impact of a Food Assistance Program in the Philippines* (Washington, D.C.: U.S. Agency for International Development, 1982).

<sup>c</sup> Judy Gilmore et al., *Morocco: Food Aid and Nutrition Education* (Washington, D.C.: U.S. Agency for International Development, 1980).

<sup>d</sup> William Drake et al., "Nutrition Programs in Sri Lanka Using U.S. Food Aid: An Evaluation of P.L. 480 Title II Programs", report to U.S. Agency for International Development, Washington, D.C., 1982.

<sup>e</sup> Arnfield A. Kielmann, Carl E. Taylor, and R. L. Parker, "The Narangwal Nutrition Study: A Summary Review," *American Journal of Clinical Nutrition* 31 (1978): 2,040-2,052.

<sup>f</sup> Alan Berg, "Nutrition Review," World Bank, Population, Health, and Nutrition Department, Washington, D.C., 1984.

<sup>g</sup> G. Cornia, "A Cost Analysis of the Indonesian Experience with Gobi-FF," United Nations Children's Fund, New York, 1983 (mimeographed). Includes intervention package but excludes cost of family planning.

<sup>h</sup> Eileen Kennedy, International Food Policy Research Institute, Washington, D.C., personal communication, 1983.

<sup>i</sup> Marito Garcia, "Preliminary Results from the Pilot Food Discount Experiment in the Philippines," paper prepared for workshop on Consumer-Oriented Food Subsidies at International Food Policy Research Institute, Washington, D.C., May 1984 (mimeographed).

<sup>j</sup> Calculated from Harold Alderman and Joachim von Braun, *The Effects of the Egyptian Food Ration and Subsidy System on Income Distribution and Consumption*, Research Report 45 (Washington, D.C.: International Food Policy Research Institute, 1984).

<sup>k</sup> K. King et al., "Preventative and Therapeutic Benefits in Relation to Cost: Performance Over 10 Years of Mothercraft Centers in Haiti," *American Journal of Clinical Nutrition* 31 (1978): 679-690.

and a child's share of family food of 0.2 would imply equal shares in a family of five or somewhat less than equal shares in a family of four. Under such conditions, a dollar increase in income would lead to an increase of 10 cents in expenditures on food for the child. Assuming that this entire increment would be spent on wheat, which

cost approximately \$150 a ton in 1982 *exclusive* of transport and processing, that 10 cents would purchase approximately 1,800 calories after milling. A dollar of income transfer, then, should increase the child's intake by approximately 1,800 calories. As transport would increase the cost of calories, this figure is surely at the high end of

the range. Nevertheless, it is a rough indicator that the observed figures for cost per net calorie in food supplementation schemes are not appreciably different from the \$0.55 estimated from income transfers, despite the administrative costs and leakages.

The similarity of these costs comes, on the one hand, from the relatively high ratio of net calories to total calories reported by Beaton and Ghassemi and, on the other hand, from the estimations being made for specific members of the family. Note that if one is interested in total calories consumed by a family, with equal value placed on increments for all members of the family, then the net increment in the supplementation programs may be more costly than the income transfer. The delivery system in supplementation programs—or integrated child health or food-for-work programs—entails different costs from income transfer. These costs are generally higher and need to be justified by extra services provided or differences in the responses of consumers attributed to the design of the project. It is therefore necessary to investigate the various components of the costs of the project.

## FOOD COSTS

Foremost among the costs of a project are the costs of food. Net of transport, these will differ among projects according to the choice of commodities and the degree of concession at which the foods are available to the project. Frequently, the food for such projects is provided on grant or with negative real interest rates. If monetization by the administrative agency is permitted, then the proper food costs for evaluation should be the local market cost. More frequently, however, monetization is not permitted under the terms of the aid project, and the real cost depends on the amount of other aid that is forgone in accepting the food aid. Such valuation depends in part on the political circumstances and is not intrinsically tied to any specific typology of food programs. Consequently, it is not important for this discussion.

Choice of commodities, however, affects unit food costs, the willingness of groups to participate, and the possibility of targeting programs. The  $\alpha$ -value criterion for choice of commodities has already been discussed. If resale or

substitution by the household is widespread, then the effectiveness of a project is directly related to the  $\alpha$ -value and not to the cost of calories. The  $\alpha$ -value approach, however, entails the assumptions that markets are broad and efficient and that transaction costs are small, as well as assumptions about the manner in which a family evaluates the foods consumed in on-site feeding. When a commodity replaces a similar but not identical food in the local diet—when children are fed bread from enriched flour, for example, foods using corn-soy milk, or other nonindigenous foods—the unit cost of the nutrients is clearly relevant. When an individual or family receives a fortified commodity and reduces consumption of calories from other sources by an amount nearly equal to the calories in the fortified food, then the cost of the other nutrients is a primary determinant of the cost-effectiveness.<sup>148</sup>

Prepared weaning foods are commonly introduced in programs. The cost of such commercial preparations is usually two to four times that of nutrients from indigenous foods.<sup>149</sup> Similarly, expenditures per unit of nutrient in programs to promote the consumption of animal protein are usually high. Beaton and Ghassemi noted that the costs per 1,000 kilocalories varied little among 11 countries investigated with the notable exception of on-site feeding in Costa Rica, where the costs were nearly twice the costs of other programs, because meat, milk, and fresh fruits were included in the program.

## COSTS OF DISTRIBUTION AND COMPLEMENTARY SERVICES

In many environments, transportation costs add a significant markup to the initial procurement costs of foods. Even when foods are donated, there may be appreciable costs of transportation to be borne by the local government or private voluntary organizations (PVOs). These costs may be substantial, for the infrastructure in poor regions is often rudimentary. Furthermore, donated foods may be available only in prepackaged loads, rather than in bulk; may include contractual obligations as to the nature of the shipper; and may be available in irregular shipments rather than a regular flow. The data in Table 10 indicate the appreciable markup

<sup>148</sup>If the family's criterion for substitution is an equal volume of food, then the costs of all nutrients, including calories, is relevant. Similarly, if a rice-based culture views a food made from wheat as a snack, as in Tamil Nadu, the costs of nutrients rather than the alpha-value approach appears more relevant.

<sup>149</sup>Elizabeth Orr, *The Use of Protein-Rich Foods for the Relief of Malnutrition in Developing Countries: An Analysis of Experience* (London: Tropical Products Institute, 1972).

**Table 10—Retail prices, adjusted forward to 1981, and cost of acquisition and transfer of commodities to Food-for-Peace**

Country/Commodity/Year	Retail Price in Year t	Retail Price Adjusted to 1981	Food-for- Peace Cost, 1981
(U.S.\$/metric ton)			
Egypt, 1975			
Wheat	90	94	361
Wheat Flour	184	193	445
Maize	83	105	333
Rice	264	370	629
Oil (free market)	768	763	954
Oil (ration)	256	254	954
Milk	410 <sup>a</sup>	624 <sup>a</sup>	598 <sup>b</sup>
India, 1980			
Wheat	188	187	388
Wheat flour	190	189	467
Maize	175	213	331
Rice	279	328	627
Sorghum	162	171	325
Oil	2260	1889	1025
Milk	442 <sup>a</sup>	403 <sup>a</sup>	590 <sup>b</sup>
Pakistan, 1979			
Wheat	162	178	361
Wheat flour	168	185	446
Wheat flour (ration)	96	106	446
Rice	293	451	679
Mustard oil	939	873	954
Milk	324 <sup>a</sup>	332 <sup>a</sup>	590 <sup>b</sup>
Philippines, 1978			
Rice	266	369	627
Oil	684	693	1025
Milk	1013 <sup>a</sup>	1150 <sup>a</sup>	591 <sup>b</sup>

Source: National Research Council, *Nutritional Analysis of PL480 Title II Commodities* (Washington, D.C.: National Academy Press, 1982).

Note: Food-for-Peace is part of the U.S. Agency for International Development and is responsible for P.L. 480 commodities.

<sup>a</sup> Fluid.

<sup>b</sup> Nonfat dry milk.

that food-for-peace programs had to pay in selected countries, particularly for foodgrains. These costs are indicative of the difficulties in handling foods generally available to PVOs. Note, however, that this is not a necessary condition. In Egypt, grain delivered to the World Food Program (WFP) is placed in government silos in the port of Alexandria, and the program is given credit to

draw equal tonnage in other districts. In this manner, the government absorbs the costs of storage and transport, and economies of scale in transport are realized. Similarly, administration and logistics of WFP programs in Botswana cost only 18 percent of the value of donated food between 1971 and 1975.<sup>150</sup>

<sup>150</sup>How transport to landlocked Botswana was calculated, however, was not indicated [(C. Stevens, "Food Aid and Nutrition: The Case of Botswana," *Food Policy* 3 (1978): 18-28)].

A significant cost of food programs comes in the final link of the distribution network between outlets and recipients. Frequently programs use a distinct network of distribution centers and consequently entail substantial observable costs for staffing and overhead. Unfortunately, data on such costs are rarely available. In other cases, existing clinics or schools are used. Since these programs add new services to these centers, generally substituting for others, the costs of staff time and overhead are still project costs even if rarely documented as such. There may be some synergism in administration, however, when nutrition projects are managed in conjunction with other services, as was observed in Narangwal. In that study, the total costs of nutrition programs and health care programs were greater when taken individually than when they were conducted jointly.<sup>151</sup>

Because supervised feeding programs perform a service—preparing the food—that is not undertaken by take-home programs, they may be more costly per unit of food handled. This is illustrated by the data in Table 11. The ratio of expenditure for food to total expenditures in the extensive phase of the Poshak project was similar to the 74 percent in the Mexican milk scheme and some-

what less than the 86 percent observed in the geographically targeted subsidy scheme in the Philippines. In Sri Lanka, distribution of the weaning food, Triposha, cost only 6 percent of total costs in 1981, processing cost 21 percent, and raw materials and ocean transport the remaining 73 percent.<sup>152</sup> In the intensive phase of the Poshak project, health-care services were increased. Consequently, food costs dropped to 42 percent of total costs in the take-home program, which continued to deliver the same amount of food per beneficiary. The supervised feeding program delivered more food per recipient than the take-home program but entailed still greater costs other than for food—nearly 65 percent of total costs.<sup>153</sup> In some of these examples, the nonfood costs represent costs of medical care and nutrition monitoring. These are included in such programs because they are believed to increase the effectiveness of the project.

Similarly, although costs other than for food were nearly half the total cost of the supplementary feeding in Morocco indicated in Table 9, many of those costs were the costs of the educational component of the program. This component contributed significantly to the effectiveness of the program. Education, as well as

**Table 11—Cost components of Project Poshak, India**

Item	Food Per Beneficiary	Expenditures		Percent Spent On Food	Percent Spent Other Than For Food	Total Cost per Beneficiary	
		Day	Year			Day	Year
	(Rs./day)	(Rs./child)				(Rs./child)	
<b>Extensive phase</b>							
Primary health center	0.238	0.061	22.98	79.1	20.9	0.301	110.06
Secondary health center	0.238	0.073	27.38	76.1	23.9	0.313	114.46
<b>Intensive phase</b>							
Take-home experiment	0.238	0.330	120.47	41.9	58.1	0.568	207.55
Supervised feeding	0.317	0.658	240.20	35.4	64.6	0.896	327.28

Sources: David Sahn, "The Integrated Maternal and Child Nutrition Project in India: Recommendations Based on a Review of Past Experience," report submitted to U.S. Agency for International Development by Community Systems Foundation, Ann Arbor, Mich., 1980. Tabulated from T. Gopaldas et al., *Project Poshak*, vol. 1 (New Delhi: CARE, 1975).

<sup>151</sup>Kielmann et al., "The Narangwal Nutrition Study."

<sup>152</sup>W. Drake et al., "Nutrition Programs in Sri Lanka Using U.S. Food Aid: An Evaluation of PL480 Title II Programs," report prepared for the U.S. Agency for International Development, Washington, D.C., 1982.

<sup>153</sup>Note that the Poshak project had a large research component in all phases. Hence, it may not be indicative of long-term operating costs (Gopaldas et al., *Project Poshak*).

health care, is a significant element of the total costs of Mothercraft centers. Food costs were only 25 percent of total costs in the Haitian example. In such situations, of course, comparisons on the basis of the costs of food delivered are apt to be misleading. The cost-effectiveness, then, must be evaluated in relation to the overall goals of the program.

The costs of consumer price subsidies cannot be evaluated in the same manner as those of most supplementary programs. In general, the consumer pays the government or the agency managing the consumer subsidy program a portion of the total cost of the food, so the concern is with the operating loss rather than the cost of the food per se. This loss may be incurred in transport and storage as well as in the costs of food. Untargeted subsidy programs may have minimal administrative costs if the subsidy is applied at the wholesale level, with retail markets handling the final distribution. Rationed programs may also use consumer outlets in the private sector, as is done in Egypt and Pakistan.

## COSTS OF TARGETING

Targeting can reduce total project costs and increase cost-effectiveness by decreasing participation by families or individuals not at risk of malnutrition. It may, however, increase the cost per recipient, for targeting entails additional non-food costs to nutritional programs. Some forms of targeting, such as geographical targeting, entail few additional costs to the project, while nutrition or income monitoring requires extensive expertise and administrative staffing.

Little explicit information about these costs has been reported. It is logical that the sensitivity and specificity increase with expenditures. There is probably a point, however, beyond which improved targeting involves costs in excess of the benefits to be gained. When the risk of malnutrition is widespread in a population, potential gains from extensive targeting are fewer than when such risks are isolated. On the other hand, costs of gathering and processing data are frequently high in regions that have poor infrastructure. Whereas in developed countries, particularly in urban areas of such countries, data on income are frequently collected routinely as part of

tax and employment monitoring, such data are largely unavailable in developing countries. Targeting by income, then, is difficult in poorer countries, although ownership of assets, particularly land or automobiles, may be a suitable and readily available proxy.

Two examples of targeting by income illustrate pitfalls that appear in the costs of handling information. In Bangladesh, tax classification indicators have been used in part to determine access to rationed subsidized food.<sup>154</sup> Homeless or migrant populations, however, do not have such classifications, and the difficulty of monitoring the sizes of their incomes and families is undoubtedly a partial explanation for the exclusion of this population from the system. The circumstances in Sri Lanka are somewhat different. In this case, accurate income data are readily available for only a small portion of the population, urban wage earners and the estate sector. For this reason, relatively few families in the estate sector reported that their incomes were below the eligibility cutoff for the food-stamp program, although malnutrition and infant mortality rates are higher in this sector than in other parts of the country. The incomes of the rural population were self-reported and difficult to verify or refute.<sup>155</sup>

The example from Sri Lanka also illustrates another cost consideration in the administration of targeting. Such costs can obviously be reduced if eligibility is determined at one time and not continuously. In Sri Lanka, monitoring of eligibility is not continuous. Families cannot gain access to food stamps if their employment situation deteriorates or a new family is formed. They are occasionally dropped from the rolls but mainly because of reporting by their neighbors rather than a general monitoring system. The costs of income targeting are thereby kept low but the effectiveness of the program in improving nutrition is also reduced. This can be considered analogous to the commonly reported occurrence of health-care projects that budget for capital expenditures but fail to consider recurring costs and maintenance sufficiently.

Monitoring of weight or gains in weight is frequently the basis for entry to and exit from nutrition programs. The expense of monitoring is a recurring expense and involves trained staff. It fulfills an important function in education,

<sup>154</sup>Raisuddin Ahmed, "Food Subsidy Policy in Bangladesh: Structure, Costs and Benefits of the Program," paper prepared for Workshop on Consumer-Oriented Food Subsidies held by the International Food Policy Research Institute, Washington, D.C., May 1984 (mimeographed).

<sup>155</sup>Neville Edirisinghe, "The Implications of the Change from Ration Shops to Food Stamps in Sri Lanka for Fiscal Costs, Income Distribution, and Nutrition," paper prepared for Workshop on Consumer-Oriented Food Subsidies held by the International Food Policy Research Institute, Washington, D.C., May 1984 (mimeographed).

however, and it is therefore difficult to assign all of such costs to targeting alone. The Tamil Nadu program sponsored by the World Bank is an example of a program in which regular monitoring of weight gain is used as the criterion for participation in supplementary feeding. Similarly, in Mothercraft centers in Haiti monitoring of growth was used as a determinant of participation. While the costs of this weighing were not reported, it surely was dwarfed by the extensive care and feeding costs of the treatment.

## COSTS INCURRED BY PARTICIPANTS

In many programs, a portion of the operating costs is paid by the recipients. Cash payments by the family present no particular obstacle to the evaluation of the effectiveness of a program. They shift the burden of the costs somewhat from the government to the community, generally reducing the net benefits to the family.<sup>156</sup> The payments and their timing are frequently barriers to participation and consequently may reduce the effectiveness of a program. Many families find such payments less difficult if they are daily or weekly, rather than monthly, even if the total amount is the same. Similarly, many families appreciate the flexibility of being able to subdivide a monthly ration, particularly of bulky commodities. Such flexibility imposes on the project additional costs of bookkeeping and monitoring quotas, however.

The frequency of distribution is also related to the costs of household labor. When a family is expected to travel long distances or wait in line for a supplement or ration, its cost in household production or leisure forgone increases. At times these costs offset the benefits, and the family declines the service. This was observed at subsidized cooperatives in Egypt.<sup>157</sup> Monthly rations distributed through private retail outlets in Egypt, however, were rarely declined, for the value of the rations was greater, the lines smaller, and the probability of an unsuccessful visit less than at the cooperative. Similarly, participation in a supplementation scheme in Brazil was reduced and the work of administration increased by reliance on a few program supermarkets rather than existing neighborhood retail outlets.<sup>158</sup> Such time-related costs of participating are particularly burdensome in on-site feeding programs, which

require daily visits. To a degree, the costs can be reduced when older siblings are entrusted with the task of supervising the younger, but this generally entails some loss of efficiency and costs something in lost education or economic activities of the older child.

The costs incurred through waiting and transport to a project site are a particular type of inefficiency. Whereas cash payments by a household are income to a project or to merchants, waiting and travel times are a loss of service to the family for which there is no corresponding gain by another group. Because the regularity of participation is a frequent contributing factor to the nutritional effectiveness of the project, particular attention should be paid in the design of the project to reducing these burdens on a household.

## CONCLUSIONS

Considering that programs that appear relatively expensive in costs per participant may be less expensive in cost per calorie delivered, comparisons of costs of programs need to be made in relation to benefits. These benefits, however, are difficult to quantify in cash terms. Many benefits are not only behavioral and hard to measure, but also other more easily measured results, such as growth and reduced morbidity and mortality, are not easily assigned dollar values without debatable assumptions.<sup>159</sup>

If the goal of a program is merely to maximize the transfer of calories per dollar spent, there is little difference between programs. What differences exist occur generally in the choice of commodities. If the goal is expressed in net increase in intake of calories, however, then increases in costs of targeting toward households with high propensities to spend on food—generally the poor—are justified, particularly when there is wide variation in such spending patterns in the region or among potential recipients.

Components of programs designed to target specific members of a household or to add medical services or education to a food-related income transfer add additional cost to a program over those incurred in the use of existing marketing channels. Such administrative costs may include targeting; this may reduce overall

<sup>156</sup>As mentioned earlier, such fees may increase the effectiveness of a food-stamp program.

<sup>157</sup>Alderman and von Braun, *Effects of the Egyptian Food Ration and Subsidy System*.

<sup>158</sup>Leslie, *Design and Implementation of Nutrition Projects*.

<sup>159</sup>George Beaton, "Evaluation of Nutrition Interventions—Methodological Considerations," *American Journal of Clinical Nutrition* 35 (May 1982): 1280; and Knudsen, *The Economics of Supplemental Feeding of Malnourished Children*.

costs while they increase costs per participant. The additional services, moreover, are likely to increase the effectiveness of a program in nutritional outcome. The additional staffing may not affect the calorie consumption mediated by the program (although it may in the case of educa-

tion), but it may assist in reduction of neonatal mortality through changes in morbidity or in child care. As discussed in the chapter on comparative analysis of interventions, these structures improve the curative aspect of food subsidies and increase the effectiveness of these programs.

# 6

## Other Issues Related To Food Subsidies

Most nutrition programs for which data are likely to be available are "top down" programs initiated by government agencies. This, in part, is an artifact of documentation; programs initiated by civic groups or mosques, churches, and temples may feed a considerable portion of the population without generating a single paper or report. A more fundamental factor that contributes to the top-down nature of projects is the fact that communities most in need of nutrition intervention lack control over either the resources necessary to initiate projects or the political power that would influence others to devote resources to such projects.

### COMMUNITY PARTICIPATION

Yet community participation may be essential to the long-run success and survival of a project.<sup>160</sup> Community participation is commonly evidenced by the exercise of what political scientists call negative power. A community or class may lack the power to initiate nutrition programs or redirect food policy but they may be able to prevent change in existing policies. Thus, attempts to rescind food subsidies have been stymied by popular demonstrations in recent years in North Africa, in Sub-Saharan Africa, and in Latin America. Analysis of these experiences or of coalitions that have been successful in persuading governments to initiate projects, however, are beyond the scope of this paper.

The hierarchy of community involvement goes from active involvement to passive acceptance. Functions include initiation, planning, promotion, operation, and use. A community may identify the need for a project and obtain funds for it, either locally or from an outside agency. In other instances, the impetus comes from outside, but

the community participates in the design. Once the project has been implemented its success depends on whether the community supports its goals and disseminates information about its services. Frequently, a community can ensure the long-term survival of a project by becoming involved in daily administration of it. Finally, if a community does not use the services regularly it is not likely to continue.

The Sarvodaya movement in Sri Lanka operates an extensive network of community-initiated funding, mainly of programs for preschoolers. The movement is motivated by an ideology of self-help and has organized a comprehensive system of educational and developmental projects into which the feeding centers fit. Although the movement as a social phenomenon has been analyzed in a number of papers, there is less information on its effect on nutrition.

Another example of community participation from Sri Lanka is the *kola-kendra* (herb porridge) program. This program provides a supplementation of rice, herbs, and coconut amounting to 300 kilocalories a cup. Initial support of the program comes from a grant of U.S.\$76 from the government, two-thirds of which is for utensils and equipment; after three months, the community is expected to operate the scheme by providing the foods and labor. The majority of programs initiated have continued into the self-help phase. In 1983-84, 368 of such programs were in operation.<sup>161</sup>

A more localized example of grass-roots initiative is the Jamkhed Comprehensive Rural Health Project in India.<sup>162</sup> Active community involvement in this project included the identification of local needs, donation of land and production of food for supplementary feeding, and the choosing of a village health worker to supervise the feeding. Similarly, in Indonesia it was ob-

<sup>160</sup>See, for example, P. V. Sukhatme, "Nutrition Policy: Need for Reorientation," *Economic and Political Weekly* 15 (1980): 1101-1105.

<sup>161</sup>Plans for the program include expansion and provision of subsidized soy flour currently being used as an ingredient in a pilot project. Personal communication, Nimal Hettiarachy, deputy director, Food and Nutrition Policy Planning Division, Ministry of Plan Implementation, Sri Lanka.

<sup>162</sup>M. Arole and R. Arole, "A Comprehensive Rural Health Project in Jamkhed, India," in *Health by the People*, ed. K. Newell (Geneva: World Health Organization, 1975).

served that villages not included in the nutrition intervention pilot program adopted some of the same activities at their own expense and initiative.<sup>163</sup>

The function of village health workers is also emphasized in the Philippines. For many years that country has made use of the services of semivolunteer nutrition workers, Barangay Nutrition Scholars, in programs of growth monitoring and education. These workers also assist in the pilot program for food supplementation now being undertaken.<sup>164</sup> This service not only provides administration and outreach but also increases the rate of community participation. In other successful projects, such as the Tamil Nadu project, the effectiveness of village health workers is increased by the formation of women's working groups that transform passive recipients into active participants.

In many communities participants are charged a small fee to defray costs and increase the likelihood of long-term survival of the project. These fees, which are assessed in the Jamkhed project and in the Moroccan ration and nutrition education program, increase the sense of membership and contribute to the success of the project.<sup>165</sup> Similarly, in many cases families are expected to donate time or services in lieu of cash fees to programs in which they participate. In the Mothercraft centers in Haiti, the mother receives training during the performance of her tasks.

The Jamkhed and *kola-kendra* projects emphasize the local provision of food. Such emphasis is rare, for it is virtually equivalent to self-financing, although in many projects the aim is to purchase foods locally. Strictly speaking, these purchases represent market development, or spin-off, external to the project, rather than community participation.

Community participation is not without its pitfalls. Not only does decentralization pose particular administrative burdens not always met by local staffs, but it involves the risk that the benefits of a project will be captured by local elite groups. This is a particular danger in food-for-work programs. What may appear as local participation in the planning of the project may actually be efforts by rural landowners to obtain capital improvements at public expense. Even attempts by local leaders to initiate nutrition projects may be motivated by a desire to extend patronage networks and may not reflect nutri-

tional need. Conversely, the absence of such initiatives may indicate the social handicap of poverty and not lack of interest in nutrition programs. Community involvement, then, may be necessary for long-run success but in many situations it should be an intermediate goal or indicator of the success of a program rather than a prerequisite for implementation.

## SPECIAL CONCERNS FOR RURAL COMMUNITIES

Often the target community of a nutrition program is a semisubsistence economy. Frequently households produce the majority of the food they consume and have little cash to participate in a market economy. Furthermore, even in rural communities where market participation has developed to a moderate degree, the topography, distance from administrative centers, and historical patterns of development have left the community with only rudimentary administrative infrastructure. Consequently, certain programs that have proved effective in urban areas may be inappropriate in rural areas.

Project design in these situations depends, in part, on the relative strengths of marketing and nonmarketing infrastructure. In both Pakistan and Egypt, for example, rural residents regularly receive subsidized rations distributed through licensed private channels. At the same time, studies in these countries indicate that the alternative of using health-care facilities for the distribution of subsidized foods in these areas is inadequate.

It is not advisable to generalize in which region or under which conditions it is more practical to improve market facilities for distribution of subsidized goods or to establish distribution through improved rural health-care facilities. The choice depends only in part on the geographic conditions. It also depends on the goals of the project, since, as discussed earlier, complementary health-care services can enhance the nutritional aspect of the provision of food.

Using or improving private marketing channels may be a workable option even in primarily agricultural regions. In many areas, particularly Asia, the rural poor are net purchasers of grain. This is true both of a number of small farmers and of landless laborers. In Thailand and Sri

<sup>163</sup>Leslie, *Design and Implementation of Nutrition Projects*.

<sup>164</sup>Garcia, "Preliminary Results from the Pilot Food Discount Experiment in the Philippines."

<sup>165</sup>Judy Gilmore et al., *Morocco: Food Aid and Nutrition Education* (Washington, D.C.: U.S. Agency for International Development, 1980). Another example is the Indo-Dutch Project for Child Welfare cited by David Sahn in "The Integrated Maternal and Child Nutrition Project in India: Recommendations Based on a Review of Past Experience," a report submitted to the U.S. Agency for International Development by Community Systems Foundation, Ann Arbor, Mich., 1980.

Lanka a sizable percentage of the small farmers buy more grain than they sell, although the rural sector as a whole is more than self-sufficient. There are few regions, even in Africa, in which the poor do not purchase or trade a portion of their staple foods. These market activities, however, may be seasonal or they may be carried on through itinerant traders rather than permanent markets. Nevertheless, if the costs of such foods procured on the market can be reduced, the poor may be able to increase their total consumption.

In addition to directly subsidizing foods, a project may improve nutrition by reducing marketing costs.<sup>166</sup> An example is the REDE SOMAR component of the World Bank-sponsored nutrition project in Brazil.<sup>167</sup> With the project serving as a wholesaler, the program reduces costs to retailers and ultimately to consumers. Evaluation attributed increases in consumption of up to 100 calories a day to these price decreases. This particular project is largely urban, but rural consumer cooperatives may provide similar services.

Similarly, policies that release government stocks on the open market when retail prices exceed trigger prices can reduce seasonal peaks of prices. Both Bangladesh and Indonesia have such policies, which have decentralized administration and storage in order to respond to regional and seasonal fluctuations. These projects appear to meet their administrative goals, although no studies of their effects on nutrition have been reported.

Rural employment is generally seasonal. For this reason, food-for-work programs and employment-guarantee schemes, such as that of Maharashtra state in India, can improve nutrition by reducing fluctuations in incomes. Again, more is known of the effects of such programs on wages than of the direct effects on nutrition.

## EXTERNALITIES

Food-subsidy and nutrition projects frequently offer benefits not directly related to the nutritional goals of the project. Similarly, they may have negative consequences that are distinct from the fiscal costs of the project design. Such indirect effects, or externalities, may ultimately determine whether the project is worth undertak-

ing. The most common example of an externality of a nutrition project is the effect of school feeding programs on education. While school-aged children are generally at lesser risk of malnutrition than preschoolers, proponents of school feeding frequently justify this type of program by virtue of interaction with schooling. These interactions are of two types. First, the availability of food at school increases the perceived benefit to the family, which, combined with other perceived benefits, may offset the family's reluctance to incur the costs of sending a child to school. Second, children fed at school may learn more readily than they might otherwise.<sup>168</sup>

A number of studies reviewed by Levinger indicate that feeding children at school has a significant effect on attendance. The most dramatic example is that of the Dominican Republic, where school attendance dropped nearly 25 percent when feeding children there was discontinued. Other studies indicate similar patterns. For example, government sources indicate that there was a 70 percent increase in school enrollments in the six months following introduction of free meals at schools in Tamil Nadu, India.<sup>169</sup> In general, the effects are greater in rural regions and on girls, thereby reducing some of the pronounced attendance gaps of these subgroups. The effects are greater when attendance is not already high and in low-income settings.

It is generally believed that education confers a social benefit beyond the economic benefits to the individual himself or herself. In this case, feeding children at school confers social benefits beyond its contribution to family nutrition. Unfortunately, the benefits of the synergism between feeding programs and attendance are difficult to quantify in such a way that they can be added to the nutrition benefits, although it would be necessary to do so if a proper economic evaluation of such a program were being made.

The effects of a program on school attendance are conceptually distinct from the comparison between the amount a school participant learns if he or she is being fed at school and what is learned without such a supplement. Studies of the latter effect are inconclusive, in part because of difficulties in measuring response. Further, it

<sup>166</sup>Ahmed and Rustagi discuss the seasonal and regional price variations in a number of countries and the potential for reducing marketing margins. They warn against excess government involvement, however. See Raisuddin Ahmed and Narendra Rustagi, "Agricultural Marketing and Price Incentives: A Comparative Study of African and Asian Countries," International Food Policy Research Institute, Washington, D.C., May 1984 (mimeographed).

<sup>167</sup>Leslie, *Design and Implementation of Nutrition Projects*.

<sup>168</sup>For a comprehensive review of school feeding, see Beryl Levinger, *School Feeding Programs in Less Developed Countries: An Analysis of Actual and Potential Impact* (Washington, D.C.: U.S. Agency for International Development, 1983).

<sup>169</sup>B. Moses, "Noon Meals Scheme," *Economic and Political Weekly* 18 (January 22, 1983): 101-103.

is possible that the effects are related not only to the amounts received and the regularity with which they are received but also to the time of day the feeding takes place. Nevertheless, despite this difficulty, the overall effects on education are important and offer an additional rationale for feeding at school in certain settings.

Interaction between nutrition programs and health-care systems can be analogous to education externalities. In addition to the potential biological synergism in joint nutrition and health projects, the availability of food supplements may encourage families to attend facilities that they would otherwise ignore. While proponents of health care may argue that the service should be of value to the family regardless of food supplements, the social value of prenatal programs or inoculation campaigns may be greater than the gain perceived by the family. In such cases, the clinics will not be used to their economic optimum, and the inclusion of a food program will have a positive externality.

Nutrition programs may also have positive effects on market development, depending, in part, on the choice of commodities. A subsidized milk scheme, for example, may enable marketing channels to develop to a point at which they reach a commercially viable scale.<sup>170</sup> Similarly, the *Tripasha* project in Sri Lanka is credited with encouraging production of maize and soybeans.<sup>171</sup>

In Bangladesh, subsidized wheat in ration shops may have contributed to market development during the period when wheat production grew 10-fold. Such market development, however,

is a two-edged sword, for in many countries subsidized imported grain may lead to patterns of consumption that burden foreign-exchange resources.

One of the most dangerous shifts in preference that may be encouraged by subsidized foods in supplementary feeding is the shift from breast feeding to reliance on formulas. One of the principal dangers is the cost of infant formulas. Formula that is beyond a family's means encourages dilution and contributes to infant malnutrition. This, of course, can be minimized when the formulas are subsidized. The advantages of breast feeding in terms of hygiene, immunity transfer, and birth control, however, would not be obtained in such circumstances. Furthermore, subsidized infant formulas may serve as a demonstration effect that would encourage the use of a formula even when the product was not available with a subsidy.

Weaning formulas, however, are different from infant formulas and may be used effectively in the context of maternal and child health or similar programs. One potential externality of such a program is that it may encourage the development of a domestic industry for commercial production of such foods, as it has in India. The industry may be reliant on sales to institutional markets, however, rather than commercial markets. If so, the concern for market development is not particularly important and the focus should be on the question whether the formula is appropriate in costs and materials to the nutrition goals.

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<sup>170</sup>The Anand Dairy Scheme in India is an example in which milk received as aid helped establish marketing channels. The project, however, was not a consumer subsidy scheme or a nutrition project per se.

<sup>171</sup>Drake et al., "Nutrition Programs in Sri Lanka."

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## Comparative Analysis of Selected Nutrition Interventions

In this chapter the issues of costs, benefits, and targeting will be integrated in a comparative analysis of selected types of nutrition intervention. The choice of the specific case studies to be included was guided in large part by the information presented in Chapters 3 through 6. The main objective of this analysis is to determine which type of nutrition program appears to be most cost-effective in alleviating malnutrition among mothers and children in developing countries.

This type of comparative approach is always difficult because data are limited and studies have been conducted with varying degrees of methodological rigor. There were three basic criteria that had to be met, however, for studies to be used in the comparative analysis. First, the research design used to evaluate the program had to involve some type of comparison or control group. Second, cost data and a description of the intervention had to be included. Finally, information on preschoolers and pregnant or lactating women within the family had to be provided.

Because studies were selected on the basis of these three criteria, some potentially effective interventions were eliminated. No food-for-work study that is now available, for example, provided information at the subhousehold level. In fact, as already indicated, it was difficult to identify any study evaluating food-for-work programs in which any nutritional parameters were included.

Two subsidy schemes, five supplementation programs, and two integrated health and nutrition interventions were selected for comparison. The intention was to compare the costs of each type of intervention in achieving a common set of outcomes. Because of limitations of the data in most studies, however, the weight of preschoolers and the calorie intake of children were used as the common outcome variables in the cost-effectiveness comparisons. It is important

to note that by restricting the comparison to these two measures of primary outcome, other potentially important effects of these programs are undoubtedly overlooked.

### SUBSIDIES

Broad-based subsidy schemes are an expensive means of achieving nutritional objectives because they entail large leakages to households that do not have calorie deficits. The available evidence suggests that some form of targeting should be used in order to improve the nutritional cost-effectiveness of subsidy schemes.<sup>172</sup> For the present comparison, therefore, only targeted subsidy programs are selected.

Two subsidy schemes—one in Mexico City and a pilot project in the Philippines—are discussed here.<sup>173</sup> They are similar in that both are attempts to target benefits to low-income families with preschoolers and pregnant and lactating women.

In both the Mexico City and Philippine projects an attempt is made to target geographically. In Mexico, the program is targeted on the basis of income and the presence of children under the age of 12, pregnant women, or both. Distribution centers for the subsidized milk are located in the areas of the city where income is lowest. The Philippine project is aimed at villages with a high prevalence of malnutrition among preschoolers, which is determined by weight-for-age.

The data in Table 12 indicate that study families in the two programs are similar in size of household and number of preschoolers. The Philippine households are at greater nutritional risk, however: more of the households suffer calorie deficiencies, and there is a greater

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<sup>172</sup>See Abel Mateus, *Targeting Food Subsidies for the Needy: The Use of Cost-Benefit Analysis and Institutional Design*, Staff Working Paper 617 (Washington, D.C.: World Bank, 1983).

<sup>173</sup>See Overholt et al., "Subsidized Milk Distribution in Mexico," Eileen Kennedy, "Determinants of Family and Preschooler Food Consumption," *Food and Nutrition Bulletin* 5 (April 1983): 22; and Garcia, "Preliminary Results from the Pilot Food Discount Experiment in the Philippines."

prevalence of malnutrition among preschoolers than in Mexico City. Although both subsidy programs are targeted to high-risk families, the particular aim of the household targeting was to reach the child. A primary objective in the ex-

amination of these two programs, therefore, is to determine the potential of this type of scheme for improving the nutritional status of children. In Table 13 the cost-effectiveness of the two programs is compared.<sup>174</sup> The cost per recipient is

**Table 12—Comparative data for two subsidy schemes in Mexico and the Philippines**

Item	Mexico	Philippines
Average size of family sample	6.5	6.1
Average number of preschoolers	2.0	2.1
Food subsidized	Milk	Rice, oil
Food costs as a percentage of total cost	74.0	86.0
Percent caloric adequacy of family	95.1	66.4
Prevalence of moderate and severe malnutrition (percent) <sup>a</sup>	4.5	31.6

Sources: For Mexico, Eileen Kennedy, "Determinants of Family and Preschooler Food Consumption," *Food and Nutrition Bulletin* 5 (April 1983): 22; and for the Philippines, Marito Garcia, "Preliminary Results from the Pilot Food Discount Experiment in the Philippines," paper prepared for the Workshop on Consumer-Oriented Food Subsidies, International Food Policy Research Institute, Washington, D.C., May 1984 (mimeographed).

<sup>a</sup> Determination of malnutrition is based on the Gomez classification.

**Table 13—Cost comparisons for two subsidy schemes in Mexico and the Philippines**

Item	Mexico	Philippines
Annual cost per recipient	38.16	8.90
Annual cost per recipient family	95.40 <sup>a</sup>	54.25 <sup>b</sup>
Percent decrease in prevalence of moderate and severe malnutrition <sup>c</sup>	0	8.47
Cost per child removed from moderate/severe malnutrition <sup>d</sup>		331.00

Sources: For Mexico, Catherine Overholt et al., "Case Study: Subsidized Milk Distribution in Mexico," in *Nutrition Intervention in Developing Countries, Study V: Consumer Food Price Subsidies* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981), pp. 79-114; and Marito Garcia, "Preliminary Results from the Pilot Food Discount Experiment in the Philippines," a paper prepared for a workshop on consumer-oriented food subsidies, International Food Policy Research Institute, Washington, D.C., May 1984 (mimeographed).

<sup>a</sup> In the Mexican study, 2.5 recipients per family were assumed.

<sup>b</sup> In the Philippine study, a family size of 6.1 members was assumed.

<sup>c</sup> Severe malnutrition is defined as weight-for-age less than 75 percent of the standard.

<sup>d</sup> The children in the Mexican study were not malnourished to the extent that the subsidy would make a measurable difference.

<sup>174</sup>Throughout this section, all costs have been converted into 1982 U.S. dollars.

substantially lower in the Philippines project. Because the primary interest in the present discussion is in reaching the preschooler, however, the more appropriate measure is the cost per recipient family. In subsidy programs it is only by delivering services to the family that the programs will reach the preschooler.

The annual cost per recipient family is higher in the Mexican program. In addition, the effectiveness of the programs in improving the growth of preschoolers is very different. There was no significant decrease in the prevalence of moderate and severe malnutrition among the participating children in Mexico. On the basis of preliminary findings from the pilot project, however, preschoolers from the subsidy families in the Philippines showed a decrease in malnutrition of 8.47 percent from that found in the children who were not treated.

These disparate results are not surprising and are almost entirely the result of differences in the nutritional status of children in the two programs. The children in Mexico City are, on the average, only mildly malnourished. One would not expect to see a change in average weight or an increase in mean caloric intake as a result of the subsidy. Not surprisingly, although the proportion of calories from milk was increased in participating children from 19.3 percent to 24.0 percent, there was no direct effect of the subsidy on total caloric intake. The participating children received 96.1 percent of the calories needed for an adequate diet and the nonparticipating children received 95.5 percent—not enough of a difference to be meaningful.<sup>175</sup>

Children's consumption of calories increased only to the extent that the household's calorie intake increased, and a portion of this was passed on to the child. For each 100-calorie increase in household consumption, the preschooler's calorie intake increased by approximately 9 calories.<sup>176</sup>

The Philippine project was effective in decreasing the prevalence of malnutrition in preschoolers at a cost of U.S. \$331 to remove a child from moderate and severe malnutrition.

These data seem to suggest that a subsidy that is properly targeted to nutritionally needy families can be effective in improving the nutritional status of preschoolers. The next step is to

determine whether alternative types of intervention strategy are more effective in achieving the same end.

## SUPPLEMENTATION SCHEMES

Supplementary feeding programs for young children and pregnant and lactating women are common and popular in many developing countries. Cost data from supplementation schemes in five countries were used to assess the potential of these programs as alternatives to targeted subsidies.<sup>177</sup> Table 14 provides a comparison of the five programs. In all five areas, energy intake is low, ranging from 59 to 75 percent of the calorie requirement, which was set at 1,360 calories a day. The calories provided in the supplement vary widely from 298 to 737, which if totally consumed would fill anywhere from 67.0 to 88.2 percent of the estimated calorie gap.

Data on the annual cost per child in each of the five programs were presented in Table 9. The variations in the costs per recipient are in large part a reflection of the size of the food package. Costa Rica, with the highest supplement, has the higher cost per child. The more important indicators of the effects, however, are shown in the first two columns of Table 15. The cost of delivering services to each malnourished child increases dramatically in Colombia, the Dominican Republic, and Costa Rica. This is because the prevalence of malnourished children is low in the study population.<sup>178</sup> In areas in which there is a high proportion of malnourished children—India and Pakistan—the cost per malnourished child is not much different from the annual cost per recipient.

In order to compare these data to the results shown in Table 13, it would be interesting to determine how much it would cost to remove a child from second- or third-degree malnutrition. As the five programs are now operated, however, there is no practical way of achieving this objective. The programs fail to decrease the prevalence of second- and third-degree malnutrition for two reasons. First, the size of the nutrition problem is small in three of the five countries. Thus, the results are similar to those achieved in Mexico City. If the population served is not very

<sup>175</sup>Overholt et al., "Subsidized Milk Distribution in Mexico."

<sup>176</sup>Eileen Kennedy, "The Nutrition Effects of Subsidized Milk Distribution Schemes: Evidence and Justification," paper presented at Dairy Development Workshop, Copenhagen, January 6-8, 1987.

<sup>177</sup>Anderson et al., *Nutrition Intervention, Study I*.

<sup>178</sup>Anderson et al. used less than 90 percent of weight-for-age as the cutoff point for identifying the malnourished. If the more conservative estimate of less than 75 percent of weight-for-age were used, as in Tables 12 and 13, the rates of prevalence would be even lower and the cost per malnourished child higher.

malnourished, it is unlikely that a significant average growth effect or change in calorie intake will be detected. Only in India and Pakistan are significant growth deficits apparent. Even in the

countries in which retardation of growth is prevalent, the supplement as consumed fills only 6.6 percent of the energy gap in Pakistan or 28.2 percent of the gap in India.

**Table 14—Comparison of supplemental feeding programs in five countries**

Country	Weight-for-Age as Percent of Standard	Change	Height-for-Age as Percent of Standard	Change	$\bar{X}$ Calorie Intake	Calorie Gap	Calories in Supplement	Increase in Calories	Percent of Caloric Gap Filled by Supplement <sup>a</sup>
Colombia Take home	88.8	- 1.7	93.4	- 0.8	978	382	305	165	21.6
Dominican Republic Take home	92.2	- 0.3	96.1	0.0	877	483	337	48	6.0
Pakistan Take home	79.4	+ 0.1	93.1	- 0.3	1,004	356	298	131	6.6
Costa Rica Take home	93.4	- 3.6	96.5	0.0	1,033	327	737	462	88.2
India	72.9	+ 1.6	89.7	+ 1.0	811	549	340	160	28.2

Sources: Mary Ann Anderson et al., *Nutrition Interventions in Developing Countries, Study I: Supplementary Feeding* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981); George Beaton and Hossein Ghassemi, "Supplementary Feeding Programs for Young Children in Developing Countries," *American Journal of Clinical Nutrition* 34 (supplement, 1982): 864-916.

<sup>a</sup> To obtain the percent of the calorie gap filled by the supplement, calorie intake is divided by the calorie gap and multiplied by the percent of months during which food was available and by the percent of the population that consumed it.

**Table 15—Comparison of costs of five supplementary feeding programs**

Country	Annual Cost Per Malnourished Child Served
	(U.S. \$)
Colombia	442.90
Dominican Republic	119.37 <sup>a</sup>
Pakistan	48.74 <sup>b</sup>
Costa Rica	493.00
India	40.70 <sup>c</sup>

Source: Mary Ann Anderson et al., *Nutrition Interventions in Developing Countries, Study I: Supplementary Feeding* (Cambridge, Mass.: Oelgeschlager, Gunn and Hain, 1981).

Note: It was not possible to determine the cost per child removed from moderate or severe malnutrition with the programs as they are now operated.

<sup>a</sup> This is the average of dry and wet take-home food.

<sup>b</sup> This includes take-home food only.

<sup>c</sup> This is the average of on-site and take-home food.

Supplementary feeding programs have the potential to improve consumption and nutritional status. But the actual results have been discouraging. The most effective supplementation schemes appear to be those with a strong tie to health care.

## NUTRITION IN PRIMARY HEALTH CARE

Integrated health and nutrition interventions (IHN) are projects that provide a mix of health care, nutrition, family planning, and sanitation. Although the nutrition component varies, it typically includes a combination of nutrition education and monitoring of growth. Not every individual receives all services; the components of the program are used selectively on the basis of individual need.

The Narangwal and Tamil Nadu projects—both in India—are two programs that provided nutrition services as part of a larger intervention.<sup>179</sup> Although supplemental food is available, not all children participate. Very strict criteria of velocity of growth are used to identify children less than 36 months of age who need food. In Tamil Nadu, about one in three of the children weighed actually received food. Similarly, in Narangwal, although food was available for all children, malnourished preschoolers were particularly encouraged to attend the feeding centers. Of prenatal participants in Narangwal, only those women who were underweight at time of conception were eligible for the food supplement.

The relevant costs for Tamil Nadu and Narangwal are shown in Table 16. The costs per recipient in Tamil Nadu are lower than the costs per child of supplemental feeding. The IHN costs per family are lower than those in the subsidy schemes. In addition, the cost of removing a child from malnutrition is substantially less in Tamil Nadu than in the Philippines.

It would appear that selective use of supplemental feeding in an individually targeted program can be cost-effective. The relative returns from various service components will differ, however, depending on the age of the recipient. Table 17 presents data on the cost-effectiveness of health and nutrition components in decreasing mortality. Prenatal supplementation, either alone

or in combination with medical care, was the most cost-effective means of decreasing perinatal mortality. Medical care was most effective in reducing infant mortality, and nutrition and health care were equally effective in decreasing mortality in one- to three-year-old children. In all cases, mortality was higher in the control villages.

These two interventions have several features in common. First, there is a strong emphasis on targeting to nutritionally vulnerable individuals. The programs are aimed at pregnant and lactating women and children under the age of three. In Tamil Nadu, India, children less than three years old are screened further to identify the malnourished, and only these children receive the food supplement.<sup>180</sup> Once the preschooler's nutritional status has improved, the supplementation is stopped. There has been no evidence that because adequate growth is used as the exit criterion, mothers have deliberately kept children undernourished in order to stay in the program.

The rationale behind the prudent use of the calorie supplements is that not everyone needs the additional food. Inadequate intake of energy may or may not be the basis of the nutrition problem. Given that the food is the principal cost in most interventions, the selective use of supplementation will minimize the cost per recipient without jeopardizing the nutritional effectiveness. The results in both the Tamil Nadu and Narangwal projects demonstrate that this can be done successfully.

The food-as-medicine approach works best when there is a need for immediate remediation of moderate and severe malnutrition. The risk of mortality of preschoolers with severe weight deficits is approximately 17 times as high as that of children of normal weight.<sup>181</sup> The distinction sometimes made between short-run and long-run strategies is moot for these children, for whom there is often no long term. In these cases, the integrated health and nutrition approach usually makes more sense than a subsidy transfer to the household.

What happens to the young child when his participation in these highly targeted interventions is terminated? If the precipitating cause of the child's weight deficit was inadequate food within the home, unless the availability of food within

<sup>179</sup>See Kielmann et al., "The Narangwal Nutrition Study"; and Berg, "Nutrition Review."

<sup>180</sup>Berg, "Nutrition Review."

<sup>181</sup>For moderately malnourished children, the mortality rate is six times higher than for normal weight children. See Arnfield Kielmann and Colin McCord, "Weight-for-Age as an Index of Risk of Death in Children," *Lancet* (1978): 1247-1250; see also L. Chen, A. Chowdhury, and S. Huffman, "Anthropometric Assessment of Energy-Protein Malnutrition and Subsequent Risk of Mortality Among Preschool-Aged Children," *American Journal of Clinical Nutrition* 33 (1980): 1836-1845.

**Table 16—Cost comparisons of two integrated health and nutrition interventions, India**

Item	Tamil Nadu	Narangwal
	(U.S.\$)	
Annual cost per recipient	20.76 <sup>a</sup>	49.91
Cost per family	20.76 <sup>b</sup>	49.91
Cost per child removed from moderate or severe malnutrition	51.00	... <sup>c</sup>

Sources: For Tamil Nadu, Alan Berg, "Nutrition Review," World Bank, Population, Health and Nutrition Department, Washington, D.C., 1984; and for Narangwal, Arnfield Kielmann, Carl E. Taylor, and R. L. Parker, "The Narangwal Nutrition Study: A Summary Review," *American Journal of Clinical Nutrition* 31 (1978): 2,040-2,052.

<sup>a</sup> This indicates the cost for a child that is fed; the cost for a child that is only weighed and screened is 12.34.

<sup>b</sup> This assumes an average of one participant per family.

<sup>c</sup> It was not possible to determine this from the data reported.

**Table 17—Mortality rates of Narangwal children, by experimental group, India**

Age-Specific Mortality	Control Villages <sup>a</sup>	Nutrition Supplementation	Medical Care	Nutrition + Medical Care
	Births: 805 1-3 years: 1,398	Births: 352 1-3 years: 634	Births: 343 1-3 years: 635	Births: 654 1-3 years: 1,285
Perinatal	104	61	81	63
Neonatal	78	46	47	47
Postneonatal	51	43	23	34
Infant mortality rate	129	89	70	81
Mortality of children, 1-3 years	19	10	11	13

Source: Arnfield Kielmann, Carl E. Taylor, and R. L. Parker, "The Narangwal Nutrition Study: A Summary Review," *American Journal of Clinical Nutrition* 31 (1978): 2040-2052.

Notes: The mortality rates are for every 1,000 children in each age group. Perinatal is defined as the time of birth, neonatal is the first month of life, postneonatal is one-to-three months, and infant is three months to one-year of age.

<sup>a</sup> The control villages include four villages of a parallel population study.

the household is increased, malnutrition is likely to recur in the preschooler. In this situation, subsidy schemes targeted to food-deficit households will complement the integrated health and nutrition programs. The therapeutic focus of IHN programs will be balanced by the preventive emphasis of family-targeted subsidies.

Malnourished children are sometimes found in households in which food supplies are adequate, however. In these cases, subsidies are not the answer. A combined growth-monitoring and nutrition-education program may be effective. Monitoring of growth in Indonesian children was shown to improve the growth of children

significantly without necessitating the distribution of food.<sup>182</sup>

### **A CAVEAT**

Having looked at examples of these three specific types of intervention, a warning is in

order. Data based on only a limited number of case studies must be interpreted cautiously. The examples used in this chapter are not meant to present definitive conclusions but rather to illustrate observations discussed in the preceding chapters and to provide guidelines for identifying factors that appear to influence the effectiveness of a program.

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<sup>182</sup>Rohde et al., "Mothers as Weight Watchers."

## Conclusions

Consumption and nutritional status can be improved in a variety of ways. The choice of a particular policy instrument should be dictated in large part by the nature of the malnutrition problem and the goals of the intervention. Planners are frequently ambivalent about what a program should do. This, of course, affects evaluation.

A program is commonly intended to improve growth or decrease mortality, including the outcome of pregnancy. That being the case, critical months for intervention are the last trimester of pregnancy and the first 36-months of an infant's life. The effectiveness of such interventions is affected by both the net amount of calories provided and the duration of participation. Intensive feeding of severely malnourished children may have measurable effects in as little as one month, while other programs may require six months to a year to have any effect. Beyond that, little effect on growth is expected, so the curative phase, as opposed to the preventive phase, is most effectively designed with these timings in mind.

Participants with lower initial levels of nutrition tend to show greater growth. Criteria for selection of participants in both child-feeding and maternal supplement programs have been derived on the basis of field experience and are presented in Chapter 3. Focusing on these individuals requires infrastructure that tends to increase costs per recipient but to reduce total program costs.

The most appropriate targeting strategy will depend on the local environment. Geographical targeting as a means of reaching malnourished households can work if it is possible to identify an area with a high proportion of calorie-deficient households. The two subsidy schemes that have been used as case studies in the previous chapter are both geographically targeted to households. The results, however, differ. Geographical targeting worked well in the Philippines because in the villages chosen for treatment the prevalence of families with food deficits and malnourished preschoolers was high. The targeting to low-income areas in Mexico City was less effective in achieving the same result, mainly because the overall prevalence of growth retardation was low. In the Philippines, 1 child in 3

weighed less than 75 percent of the appropriate weight for age, whereas in Mexico City it was only 1 in 20.

This can be generalized. Geographical targeting is less effective by itself in areas in which the prevalence of malnutrition is low. In such cases, effectiveness can be enhanced with additional screening measures. Adoption of a more sophisticated certification system would increase the costs per recipient, but since there would be fewer participants, the total costs of the program would decrease.

Again Mexico can be taken as an example. In 1977 there were approximately 250,000 recipients of subsidies in Mexico City. If 5 percent of these are the intended target audience for the program, it can be estimated that approximately 12,500 people need to be served. Even if the costs per recipient were to double because of the additional screening procedures, total costs of the program would still decrease by a factor of 10. Alternatively, the program could serve a greater number of the most nutritionally vulnerable at the same level of expenditure, as shown by the data from Tamil Nadu also. As malnutrition among preschoolers decreases in the project area, the projected cost per child fed increases from 20.76 to 37.82 percent, but *total* program costs would decrease because significantly fewer children would need food.

The support institutions in IHN and similar programs, however, are important for more than their ability to screen recipients. The effectiveness of a program may be enhanced when supplemental feeding is part of a package of services. In some programs, such as those in Indonesia and Morocco, education enhances the effectiveness of the project. Other programs, such as those in the Philippines, Tamil Nadu, and Narangwal, involve weight monitoring. The latter two programs also include the delivery of health care.

The monitoring and surveillance of growth that was a large part of the effort in Narangwal involved the creation of an awareness within the family of the health and nutritional status of the child. The project was quite labor-intensive. In the villages with supplementation, preschoolers had a total of 55 service contacts in a year. Similarly,

in Tamil Nadu, there was regular contact with the child and family. The importance of this contact can also be generalized. It is unlikely that the selective distribution of food and the whole idea of food as medicine for a child would work without an intensive campaign within a project area. As revealed from a number of programs, from communities as diverse as Morocco and Maharashtra, community participation, ranging from initiation to planning and administration of a project, has been shown to contribute to the success of a program. This ensures not only that the design will be appropriate for community conditions but also that information will be disseminated and the services used. Furthermore, outreach may be essential for the acceptance of targeted programs. Such an approach will meet less resistance when the community, through involvement and participation, understands the nutritional justification for the targeting.

While the costs of decreasing malnutrition among preschoolers may be lower if the program can be delivered directly to the child, this is not often possible. Indeed, both from theory and from any intuitive understanding of household dynamics, it is unrealistic to expect food given to a child to be 100 percent additional. In Mexico and the Philippines, net increments to a child's consumption were found to be in the neighborhood of 10-20 percent of calories. Beaton and Ghassemi, however, found a number of supplementary programs in which the net transfers to children were in the neighborhood of 50 percent of the total calories.<sup>183</sup> A number of approaches may be used to raise net calorie increments to this level—designing programs to be perceived as snacks and, therefore, less prone to substitution, focusing on food as medicine and on foods considered as children's foods, and using educational programs.

Nevertheless, the dichotomy between child-oriented strategies and family-oriented interventions is an artificial division. Not only is active parental participation and involvement a main element in a successful program, isolation of a malnourished member of a poverty-level family is unrealistic. Accordingly, supplements or subsidies should be large enough to increase consumption by the family, with a portion going to all children, including the target individual. Nor should this consumption be considered leakage.

While the value of food as medicine has been demonstrated in IHN programs and the time

frame for response to supplementary feeding has been indicated earlier, subsidies must also serve a preventive function in communities where widespread moderate malnutrition reveals risk of more severe consequences. The design of such an approach may differ from curative approaches. It may rely less on health-care professions, considering that health-care personnel are scarce and expensive, and more on education. Such a program may be most needed in communities where geographical targeting is feasible. Similarly, such a preventive approach may be employed seasonally, concentrating on seasons during which prices are high and employment is low—the present milieu of food-for-work programs.

Price subsidies are used as part of a preventive approach. In Egypt and South Asia, these programs are capable of providing 10-20 percent of the income of the poor and a sizable effect on the consumption of calories by members of the family. Such a scale is seldom found in supplementary feeding programs and has its rationale in income distribution as well as in nutrition.

One additional point is worth noting. In these analyses, growth was used as an indicator of the effect of a program on children, but growth response based on weight is unlikely in children that are only mildly malnourished; this is probably true regardless of the type of intervention. Preschool feeding centers in which only 15 percent of the new entrants were malnourished, for example, were found to have no effect on growth.<sup>184</sup> Other indicators of the effectiveness of a program may be more appropriate. Researchers have suggested that an increment in weight is an appropriate measure for evaluating the effectiveness of a program in moderately and severely malnourished children but that changes in linear growth may be a more sensitive measure of effectiveness in mildly malnourished preschoolers. In addition, as preschoolers approach normal growth, they use a higher proportion of incremental calories to increase activity rather than to increase growth.<sup>185</sup> Patterns of activity may be a better yardstick for evaluation of the effectiveness of a program on mildly malnourished children.

In summary, targeting of any type of program—whether a subsidy or a direct intervention—almost always improves its effect on nutrition. Nutrition programs also have other goals, however. Because of the need of governments for political support, interventions often cover a

<sup>183</sup>Beaton and Ghassemi, "Supplementary Feeding Programs."

<sup>184</sup>Anderson et al., *Nutrition Intervention, Study I.*

<sup>185</sup>Beaton, "Evaluation of Nutrition Interventions."

group larger than those that would be defined as nutritionally needy. Although this broad approach might be attractive, it is expensive. Direct

delivery of food—as in supplementation schemes and integrated health programs—should be used selectively.

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