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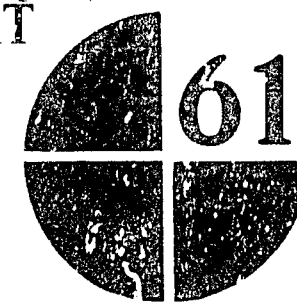

THE PILOT FOOD PRICE SUBSIDY SCHEME IN THE PHILIPPINES: ITS IMPACT ON INCOME, FOOD CONSUMPTION, AND NUTRITIONAL STATUS

Marito Garcia
Per Pinstrup-Andersen

August 1987

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FOREWORD

Food costs represent more than 80 percent of total expenditure for the poorest families in developing countries and are a significant budget item even for upper- and middle-income people. Hence, the provision of food subsidies as a means of income distribution in developing countries has had a strong attraction for policymakers. Subsidy costs compose as much as 15 to 20 percent of national budgets, providing important trade-offs among inflation rates, exchange rates, food subsidies, other types of income distribution measures, and development expenditures, which raise incomes in the longer run. In view of this, the International Food Policy Research Institute has, right from its inception, included studies of food subsidy schemes as a major part of its program.

If government expenditure on food subsidies is to be reduced, it is immensely important to know who the beneficiaries of food subsidies are, particularly regarding rural-urban distribution and the distribution among various income groups. There is considerable interest in the impact of various targeting schemes designed to ensure that a high proportion of the benefits go to lower-income people.

The research for this report by Marito Garcia and Per Pinstrup-Andersen was conducted in the Philippines in collaboration with the National Nutrition Council of the Philippines. It was financed by the United Nations Development Programme, the Government of the Philippines, and the U.S. Agency for International Development.

The particular focus of the study is the targeting of food subsidies to the poor by directing subsidies to regions with particularly high proportions of low-income people. Because administrative costs represent a large share of the cost of targeting, devices such as targeting by location help reduce these costs.

In keeping with the tradition of such studies at IFPRI, a carefully drawn sample of households is analyzed in detail to determine the impact of food subsidies. The study is designed to permit an analysis of the cost of the delivery system, and comparisons are made between this and other means of targeting. The results should be useful not only in the Philippines but in other countries that are contemplating means of reducing the cost and increasing the effectiveness of measures to increase the food consumption of low-income people. The study also analyzes the interaction of nutrition education with food subsidies, finding that nutrition education is much more valuable in conjunction with increased food consumption. This information should be useful in a developmental as well as a distributional context.

Although this study does not analyze the returns to expenditure on food subsidies if those returns have been spent in some other way, it provides a basis for such an examination by presenting comparative cost figures.

John W. Mellor

August 1987
Washington, D.C.

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This consumer food subsidy experiment would not have been possible without the support and cooperation of the Philippine National Nutrition Council (NNC) and its director, Delfina B. Aguillon, to whom we are grateful for continuous support throughout the study. The massive day-to-day logistical problems of running this pilot program fell squarely on the shoulders of the field personnel of NNC and the Ministry of Agriculture, who did an outstanding job. In particular, the home management technicians in the provinces of Abra, Antique, and South Cotabato were instrumental in the monitoring of the sample households and making sure that designated shops were open to sell rice and cooking oil at subsidized prices. They, too, were competent interviewers for the four consumption and socioeconomic surveys that were conducted as part of the study.

We gratefully acknowledge the assistance of the Nutrition Foundation of the Philippines and the Food and Nutrition Research Institute in training our survey teams. Melba Aligaen provided excellent organization of the supervisory and field survey teams along with Benilda Labayog, who was seconded to the project from the Bureau of Agricultural Extension. Minda Caedo was a great help in the initial design of the logistics of the subsidy experiment.

This report benefited from the valuable comments and suggestions from many colleagues including John W. Mellor, Jere Behrman, Harold Alderman, Joachim von Braun, Eileen Kennedy, and Gunvant Desai. We are also indebted to Elizabeth Jacinto and Fe Lisondra, who provided excellent computing assistance.

Finally, we wish to thank the United Nations Development Programme, the Government of the Philippines, and the U.S. Agency for International Development Mission in Manila, all of whom provided financial support for this research.

1

SUMMARY

This report presents the results of a pilot targeted food price subsidy scheme implemented in three provinces of the Philippines for 12 months beginning in mid-1983. It assesses the economic and nutritional effects of the scheme, analyzes its technical and administrative feasibility, and considers possible alternatives.

The scheme consisted of price discounts on rice and cooking oil and a nutrition education component. It was made available to half of 14 villages selected for their high incidence of malnutrition and poverty. The other half acted as a control population. Because targeting was geographical, all households in villages selected to receive the discount were eligible. Each household was issued a ration card indicating its monthly quota of rice and oil, based on family size. The rice ration subject to a price discount was only about half the amount usually consumed by most of the households, but the oil ration exceeded the amount usually purchased prior to the subsidy. Thus, consumer rice prices were not reduced at the margin, but oil prices were.

To evaluate its effects, one-third of the households from the selected villages were surveyed. Both comparative and multivariate analyses were made to estimate the impact of the scheme and its components on household food expenditures, acquisition, and consumption. Effects on consumption by preschoolers and their nutritional status were also monitored. Data on a variety of socioeconomic, environmental, and biological variables relating to food consumption and nutrition were collected before, during, and after the scheme. Two alternative methods were used to collect data on household food consumption. In the food acquisition method, called flexible period recall, all foods obtained by family members for a week were recorded. Under the food consumption method, all food consumed by household members was weighed for a 24-hour period. Food consumption by individual preschoolers was estimated on the basis of 24-hour food weighing for a subsample of the survey households.

The average monthly income of the sample households was 910 pesos, which is substantially lower than the Philippine average. Total expenditures of the sample households were 84 percent of total incomes, on average. The poorest showed a dissaving, while those who were better off were able to save significant amounts.

Although the total sample was drawn from agricultural and fishing villages in rural areas, only about one-third of the incomes originated directly from farming and fishing; almost one-half came from salaries and wages. Food accounted for 79 percent of total expenditures of the poorest quartile and 71 percent, on average, for the sample as a whole.

About 40 percent of the average food budget was spent on rice. Food expenditure patterns and diet composition differed considerably among occupational and income groups, with the poorest obtaining a larger share of calories from rice and maize. Average daily calorie consumption per adult equivalent unit (AEU) was 1,700 calories when based on 24-hour food weighing and 1,837 calories when based on flexible period recall. The 7 percent difference is explained primarily by the exclusion of weekends from food weighing.

Individual food consumption data collected from a subsample of 140 households indicate that the distribution of food within the households was biased in favor of adults. The calorie adequacy rate is estimated to be about 0.80 for adults, 0.60 for male preschoolers, and 0.55 for female preschoolers. School-age children and pregnant and lactating women also had low calorie adequacy rates.

The average weight of the sample preschoolers was about 83 percent of the standard weight-for-age. About one-fourth of the preschoolers were malnourished (less than 75 percent of the standard). Although most of the sample households were poor, the extent of malnutrition varied considerably among occupational groups. Forty percent of the preschoolers of hired fishermen were malnourished compared with 15 percent for professionals and salary earners. As income increased, malnutrition decreased, ranging from 30 percent among the poorest quartile to 10 percent among the richest.

According to the comparative analyses, the subsidy component of the scheme caused an increase in household food expenditures and calories acquired and consumed, as well as in calories consumed by most individual household members. Although adults obtained the largest share, the average weight of preschoolers also increased.

The second component of the scheme—nutrition education—had a small positive effect in households where it was accompanied by the subsidy. When education was provided without additional purchasing power, however, no effect could be detected. But the subsidy without the education component was still effective.

Multivariate analysis confirms and further refines these findings. The impact of the price subsidies on household food expenditures and acquisition was highly significant. Increased purchasing power, lower oil prices, and the subsidy itself all contributed.

The income elasticities of total food expenditures and total calorie acquisition indicate that a 10 percent increase in household incomes could result in a 7 percent increase in food expenditures and a 3 percent increase in calorie acquisition. Each additional peso of income from sources other than the subsidies is estimated to expand daily calorie acquisition by about 150 calories per AEU. However, an additional peso of purchasing power of food subsidies is estimated to result in an increase of about 230 calories. These findings indicate that consumers are more likely to increase their food consumption if foods are subsidized than if incomes are raised directly.

When multivariate analysis is employed, the nutrition education component of the scheme shows no significant impact on household food expenditures and acquisition, but food consumption and the nutritional status of preschoolers are strongly affected, indicating that the nutrition messages increased the focus on children.

Estimation of the effects of the scheme on the nutritional status of preschoolers is based on five indicators: weight; weight as a percent of standard weight-for-age; the z-score (a method of standardizing distribution) of weight-for-age; the z-score of weight-for-height; and height as a percent of standard height-for-age. The nutritional status of preschoolers was most affected by household incomes and calorie consumption—variables influenced by the subsidies.

The evidence indicates that the subsidy had positive effects on both households and preschoolers. The scheme resulted in net increases in household calorie acquisition of 136-138 calories per AEU per day, which is about 7 percent of current calorie consumption; in calorie consumption by preschoolers of 51-55 calories per child per day (4-6 percent of current consumption); and in the weight of preschoolers of 0.12-0.14 kilograms.

Eighty-four percent of the cost of the scheme was the subsidy itself. Administrative costs accounted for about 9 percent and the incentive payment to retailers to assure efficient distribution of subsidized food was about 7 percent. The fiscal cost of each $1.00 transferred to participating households was $1.19 in U.S. dollars. However, if only transfers to households with malnourished preschoolers are considered a benefit, the cost increases to $3.61. Similarly, the annual cost of a net increase in calorie consumption of 100 calories per AEU per day among all households is estimated to be $6.75 per AEU. The amount increases to $13.66 if only the food received by households with malnourished preschoolers is considered.

The annual cost of eliminating calorie deficiencies in the study population is estimated to be $25 per AEU. Adding 1 kilo-

gram to the weight of each preschooler would cost $24 per year. If only weight gains among the malnourished are counted as benefits, the cost would increase to $56.

In comparison with other food and nutrition programs, the scheme's cost-effectiveness is favorable. Costs were low because, first, geographical targeting based on growth monitoring costs less than targeting based on household income levels; second, the use of existing private-sector retail outlets for the distribution of subsidized foods costs less than a separate distribution network; and third, the use and expansion of existing local bureaucratic structures cost less than the creation of a new and independent structure.

If the sole goal of such a scheme is to expand food consumption by households with malnourished preschoolers and to improve the nutritional status of these preschoolers, its cost-effectiveness could be significantly improved by additional targeting based on growth monitoring. However, the calorie adequacy rates of school-age children were almost as low, which casts doubt on the wisdom of targeting to one group of children alone.

Finally, the study finds a strong relationship between malnutrition and poverty. Groups such as landless farm workers and tenant farmers are most likely to be malnourished because of their limited purchasing power.

2

THE PILOT FOOD PRICE SUBSIDY SCHEME

Introduction

In 1980 the Philippine Ministry of Agriculture together with the National Nutrition Council and the National Economic Development Authority formulated the Philippine Food and Nutrition Plan (FNP) to provide the framework for action and research in nutrition, food consumption, and food production for the 1980s. The main objectives of the Plan were to increase and diversify the production of food and other agricultural commodities; to improve the quality of the diet of all Filipinos; and to assure a basic minimum diet for the undernourished. These objectives were to be achieved through the following broad strategies: stimulating the growth of the food economy; increasing export earnings and producing import substitutes; maintaining consumer prices at reasonable levels; and undertaking immediate programs to prevent malnutrition and to correct the most serious nutritional deficiencies, particularly calorie deficiency.

A food price discount or subsidy program was one of the immediate and short-term programs identified under the FNP to reduce calorie deficiencies among low-income households.[1] The scheme was conceived as a stop-gap measure aimed at bringing about immediate improvements in the energy intakes of malnourished individuals. Although viewed as a temporary measure, its phase-out was inextricably linked to the success of other elements of the FNP that seek longer-term solutions, such as increasing productivity and incomes of the beneficiaries, which would reduce the need for food subsidies.

The food subsidy scheme evolved out of the recognition that undernutrition cannot be solved effectively without expanding the ability of the poor to acquire food. Although the food production program of the government, particularly for rice, was a success, there were clear indications that these achievements, though important, were not sufficient to bring food consumption and nutritional status of the majority of the poor up to an acceptable level.

Past programs in nutrition have pointed toward direct intervention, such as supplementary feeding, health protection, nutritional rehabilitation, nutrition education, and family planning. Less attention has been focused on programs to improve the accessibility of food, particularly to the more deprived groups. Since 1981, a marketing scheme called KADIWA has been promoted to lower the costs of food in the main urban areas. The level of coverage, however, is low, and the scheme has reached only a small portion of the disadvantaged groups. Although the KADIWA program focuses on food, it has no expressed nutritional objective.

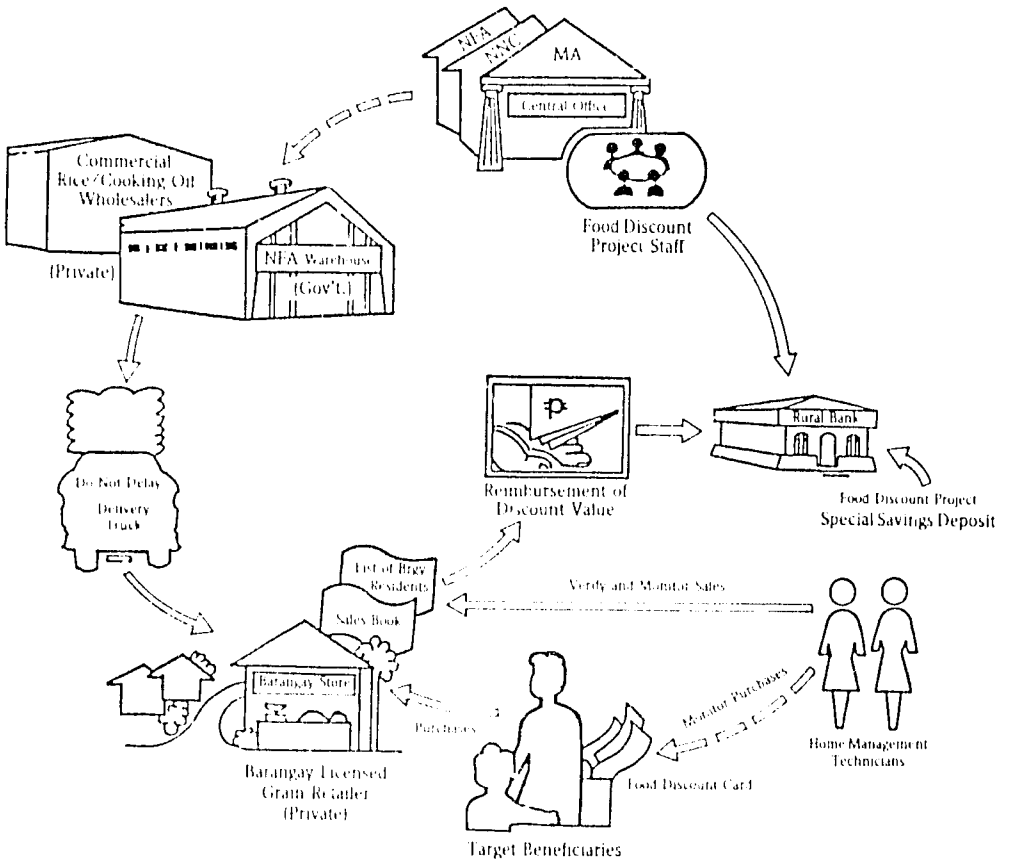
To assess the feasibility of FNP's proposed food subsidy program and to help assure that its design would be cost-effective, a one-year pilot scheme was implemented during 1983-84 in three provinces of the Philippines. The pilot program was specifically designed to permit its evaluation from viewpoints of incomes, nutrition, and technical and administrative feasibility. In addition to periodic surveys of selected households in the areas where the pilot scheme was implemented, data for the economic and nutritional assessments were obtained from extensive monitoring of all parts of the scheme. This report presents findings from the surveys and monitoring.

[1] Philippines, Ministry of Agriculture, National Nutrition Council, and National Economic and Development Authority, *The Philippine Food and Nutrition Plan for the 80s* (Manila: Ministry of Agriculture, 1980).

Description of the Pilot Scheme

The principal element of the pilot subsidy scheme was a reduction in the price of rice and edible oil offered for sale in selected areas identified as having high rates of malnutrition.[2] Nutrition education formed another element. Figure 1 is a simplified flowchart of the operation of the pilot food subsidy scheme. Each household in the project area was issued a ration (discount) card, which guaranteed a monthly quota of rice and cooking oil at a subsidized price. Participating families could use the ration card only in the accredited stores and only for the discounted purchase of rice and edible oil. The coded, nontransferable card, which showed the monthly quota of the household based on household size, provided space to record the purchases and signature of the store owner. For each sales transaction, the participating households were required to sign a sales logbook and the retailer was required to sign in a space provided on the ration card. The distribution and certification of the ration cards were handled by the Ministry of Agriculture through its local officers—the home management technicians (HMTs). Cards were valid for a period of one month, and they were issued at the beginning of each month.

Figure 1—Pilot food discount project delivery system



Note: NFA is the National Food Administration, NNC is the National Nutrition Council, and MA is the Ministry of Agriculture.

[2] These areas are described in detail in the next chapter.

The retail distribution outlets chosen for the pilot scheme were the neighborhood variety stores (called *sari-sari* stores) usually located within each village. The advantage of using local neighborhood stores in the scheme was their accessibility to the target beneficiaries. Locating the outlets in the neighborhood is compatible with the food-buying practices of the poor, who often buy food on a day-to-day basis and in small amounts. A study of such practices indicates that, among the very poor, small but frequent purchases are resorted to deliberately to ensure that food will not be consumed at once—a survival technique that allows families to stretch their budgets.[3]

Sari-sari stores are typically small, family-run enterprises that carry food, beverages, household items, tobacco and cigarettes, and other items that are normally sold in public markets. They perform a unique function in the life of the poor because they serve immediate needs of households. Without such outlets, households would have to buy from the nearest market town, which in many cases is far from the village.

Sari-sari stores normally operate with small revolving capital; not all are able to carry large quantities of rice. Under Philippine law, a license from the National Food Authority is necessary for any enterprise to sell grains. Under the pilot scheme, the local office of the Ministry of Agriculture followed a set procedure to select the *sari-sari* stores that would be accredited under the scheme. Among the criteria for selection were accessibility to participating households, size of revolving capital, license to retail grains, and acceptability of the retailer to local community leadership.

The ultimate distribution mechanism under the pilot scheme was left entirely to the private sector. Hence, the *sari-sari* store owner was responsible for the procurement of food commodities, as well as handling and final sales to the participating households. The function of the store owner was to serve all card-carrying participants within his designated area of jurisdiction. The government's role was to monitor the retail prices of subsidized food in the stores, audit their accounts for proper redemption of the subsidies, and reimburse retailers for the difference between the market price of the subsidized food commodity and the designated subsidized program price. The government depended on the services of the HMTs from the local extension office of the Ministry of Agriculture to carry out these tasks.

The *sari-sari* store owners procured subsidized rice and edible oils mostly from commercial sources, but in some instances they were procured from the government-owned National Food Authority. In general, store owners preferred to buy from the commercial sources where they were normally given credit.

The retailers were reimbursed for the subsidy only after the sales transactions were made. In return, the scheme provided an incentive to the retailers of 7 percent of the gross sales of the subsidized commodities. Subsidy accounting, which was done by the extension officer, was computed from the discount cards. These cards were redeemed every month along with the retailers' sales books. The program used local banks to reimburse the participating retailers. A special savings deposit account, which was opened in each area, was jointly held by the program office and the retailer. An accounting form called a discount reimbursement voucher was required for the twice-a-month withdrawal from the bank subsidy account. These vouchers helped the program office keep track of the accounts.

Selection of Food Commodities for the Scheme

The 1982 Second Nationwide Nutrition Survey carried out by the Food and Nutrition Research Institute (FNRI) indicated that the most important nutritional problem in the country was inadequate calorie intake. The

[3] Simeon G. Silverio, *The Neighborhood Sari-Sari Store*, Institute of Philippine Culture Poverty Series 2 (Quezon City, Philippines: Ateneo de Manila University, 1975).

average Filipino consumed 200-250 calories[4] below the recommended dietary allowances, and the problem was more severe among low-income groups.[5]

In the light of these findings, two calorie-rich foods, rice and edible oil, were selected for the program. These foods contribute nearly two-thirds of the calorie consumption of an average Filipino. Rice was selected for the scheme because it is universally available and the preferred staple food in the country, composing 56 percent of the calorie consumption of the average Filipino.

Apart from these nutritional considerations, the use of rice was justified on economic grounds, rice having high income and price elasticities for low-income households.[6] In addition, the marketing system for rice in the Philippines is efficient and reaches even the most widely dispersed populations.

Edible oil from coconuts, on the other hand, is nutritionally important because of its caloric density. This is particularly critical in the case of infants and small children, whose digestive systems may be unable to absorb the necessary energy from diets that are based on a high-bulk food such as rice. FNRI considered the average annual consumption of 2.9 kilograms of vegetable oil per capita inadequate.[7]

The Size of the Subsidies

The amount of rice that target households could obtain under the pilot scheme was smaller than the amount consumed by most but not all households prior to the scheme: that is, it was inframarginal for most households. Under the scheme, each household member irrespective of age was entitled to 5 kilograms of subsidized rice per month. The average rice consumption of the targeted households before the start of the project was about 10 kilograms per capita per month.

The amount of edible oil, 400 grams per month, that each household member could obtain at the discounted price was higher than the average consumed prior to implementation of the scheme. The higher discounted quantity of edible oil reflected a government policy to expand its domestic consumption. The National Nutrition Council saw increasing consumption of edible oil in the diet of Filipinos as a strategy to narrow the calorie gap. FNRI concluded that the current share of oils and fats in the diet was too low, while the potential for its use was considerable because the Philippines is among the world's leading exporters of coconut oil.

The initial price subsidy was 32 percent for rice and 50 percent for cooking oil. These discounts were initially projected to transfer approximately 200-250 calories per person per day—a level that was computed directly from the food consumption elasticities available at the start of the pilot experiment. The initial plan was to maintain these percentage discount rates throughout the study period. In the latter half of the experiment, the last quarter of 1983, domestic consumer rice and oil prices increased abnormally—the rice price rose from 2.90 pesos (P) per kilogram to P 4.25 per kilogram, while the price of cooking oil doubled. Thus it was necessary to reduce the percentage of the retail price to be discounted in order to keep the cost of the scheme within its original budget. Further price increases were followed by a reduction in the percentage of the discount. The price discounts are given in Table 1.

Nutrition Education

The nutrition education component of the scheme was included as a complementary intervention to the price subsidy. The form of nutrition education adopted closely followed that used under the Philippine Nu-

[4] All calories referred to in this report are kilocalories.

[5] Philippines, Food and Nutrition Research Institute, National Science and Technology Authority, *Second Nationwide Nutrition Survey, Philippines 1982* (Manila: NSTA, 1984).

[6] Howarth Bouis, "Rice Policy in the Philippines" (Ph.D. dissertation, Stanford University, 1982).

[7] Ibid.

Table 1—Price discounts on rice and cooking oil and their share of the retail price, 1983/84

Period	Price Discount as a Percent of Retail Price		Price Discount	
	Rice	Cooking Oil	Rice	Cooking Oil
			(pesos/person/month)	
July – August 1983	32	50	4.95	2.25
September 1983 – April 1984	29	45	4.90	2.25
May – June 1984	21	23	5.10	2.60
July 1984	19	22	5.15	2.60

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Note: The exchange rate in 1983/84 was U.S. $1.00 to P19.

trition Program, which had been in existence for 10 years at the time of the study. The method consisted of face-to-face extension education supplemented by handout materials for information dissemination.

The nutrition education in this scheme was aimed at changing behavior relating to food consumption, first, to encourage optimal use of the additional oil from the scheme; second, to ensure that food consumption and nutritional benefits would be realized from the rice and cooking oil subsidy; and third, to improve child feeding practices. The first two items were specific to the project scheme, while the third is standard in all of the nutrition education messages in the Philippine Nutrition Program. In this respect, the scheme's nutrition education messages and the desired behavioral changes differed from regular nutrition education in that nutrition education was used as a complement to, rather than as a substitute for, the subsidies.

Mothers, the primary audience of the nutrition education scheme, regularly attended mothers' classes. Outreach was high: only 15 percent of mothers in the study villages did not regularly participate. In households where cases of second- and third-degree malnutrition were identified, extension workers made monthly home visits.

The field workers used as educators in the scheme consisted of the HMTs of the Ministry of Agriculture supported by local paraprofessional volunteers, known as *barangay* nutrition scholars (BNS). All field workers had prior experience in nutrition education methods. Retraining of these workers for the pilot scheme emphasized the nutrition education messages. The central staff of the project monitored the scheme to attain uniformity in methods and messages across all of the treatment villages, to ensure that classes would be consistent, and to maximize attendance by mothers.

3

THE STUDY AREAS

Criteria for Site Selection

The pilot areas were selected from economically depressed provinces. Although no attempt was made to select a sample of areas representative of the country as a whole, the three provinces chosen were drawn from each of the three main geographical groupings: Luzon, Visayas, and Mindanao. The three provinces were Abra, located in the northern Philippines; Antique in the central part; and Cotabato in the south (see Figure 2). Four villages were selected from each of the three provinces. The rice and oil subsidies were implemented in two villages, and the other two were used as control (comparison) areas. In each of the provinces, nutrition education was introduced in one of the two subsidy villages and in one of the two control villages. In one of the provinces (Antique), two additional villages were selected to test the impact of a scheme using edible oil as the only subsidized commodity, with and without education. The number of the study villages was, therefore, 14. This sample size was largely dictated by research costs and the ability to maintain an acceptable level of control over experimental conditions, and it represents an incomplete experimental design in that not all combinations of treatment and controls were included. In selecting the villages, representation of the dominant socioeconomic and ecological environments in the country was considered, as well as the nutritional situation of the village's children, based on the anthropometric reports of the National Nutrition Council. The treatment and comparison villages within each province were chosen for maximum comparability in economic base, topography, demography, ethnic origin, infrastructure services, and other socioeconomic characteristics.

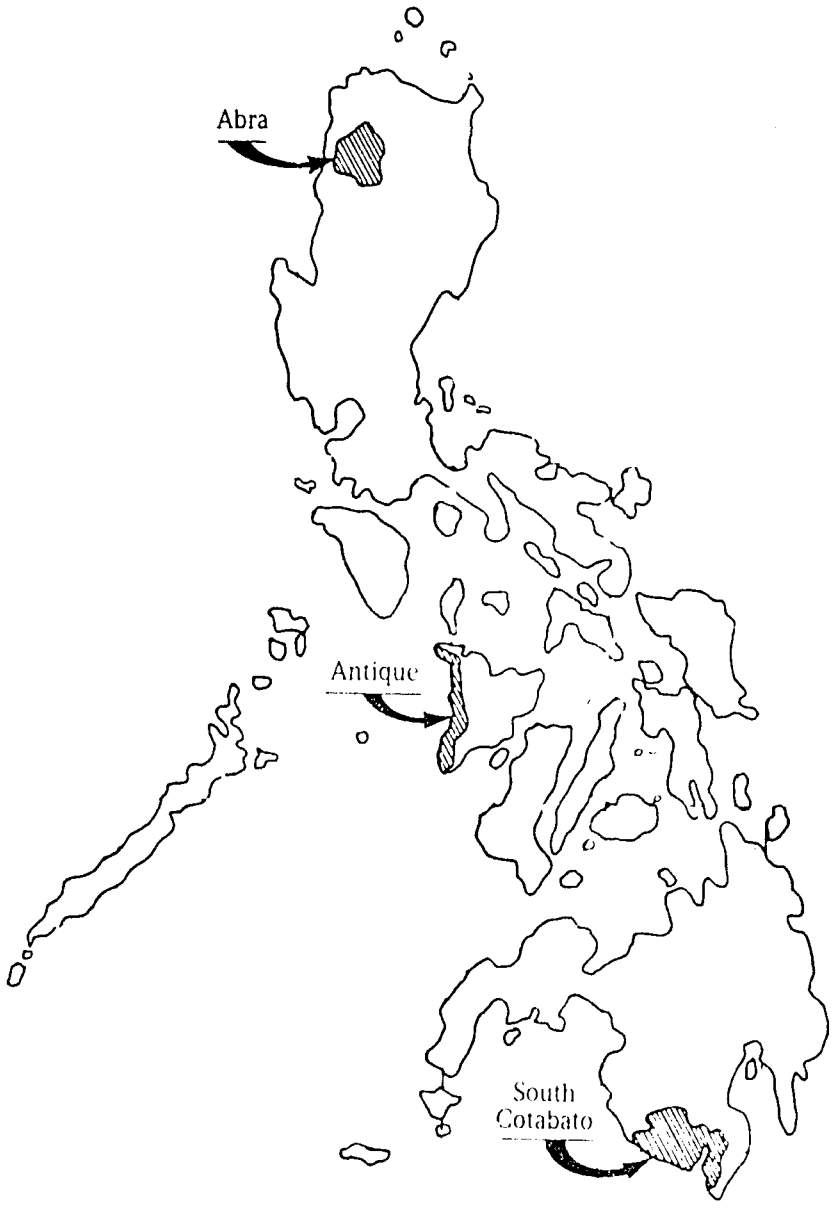
It should be noted that because an aim of the pilot scheme was also to test its administrative feasibility, the pilot areas were chosen to include a variety of infrastructural and extension service conditions. Hence, areas with both adequate and inadequate extension services and distribution outlets were represented.

As can be seen from the summary of characteristics of the pilot areas in Table 2, the various types of socioeconomic and ecological environments covered include upland, lowland, and coastal areas, and areas whose economic base varies, such as maize, rice, and coconut farming, fishing, handicrafts, and other indigenous industries.

Characteristics of Study Areas

The first group of study villages is located in the province of Abra in northern Luzon, situated approximately 450 kilometers north of Manila. The area is primarily in the uplands, generally mountainous with small patches of flatlands. The dominant source of livelihood is tobacco, maize, and vegetable farming, which accounted for 44 percent of total employment at the time of the study. Nearly half of all farmers owned land, but the average farm size of 2 hectares was less than half the national average. Because of the generally poor soil and hilly terrain, farm productivity was considerably lower than the national average. Some 15 percent of the population were engaged in livestock production, with freshwater (river) fishing as a secondary source of livelihood. About 21 percent of the household breadwinners were employed outside the province (7 percent overseas as contract workers or as seamen), mainly because of the limited economic opportunities in their home villages. The nonfarm labor force in Abra was absorbed by small home industries, by the informal and service sectors as wage earners

Figure 2—Map of the Philippines indicating study areas



(30 percent), or as professional and salaried workers in government and private sectors (10 percent).

The low household income per capita in Abra reflects the poor economic conditions in the study villages. Nearly three-fourths of household expenditures went to food, compared to 57 percent for the rest of the Philippines. The average family size in Abra was 6.30 people, and the average years of schooling were 7.06 years for fathers and 7.04 for mothers (Table 3). A third of all children were below 7 years of age, indicating a young population and a high dependency ratio. One of every five preschool children was either moderately

Table 2—Study areas of the Philippine pilot food price subsidy scheme

Study Provinces and Villages	Study Treatment: Rice and Oil Subsidy	Study Treatment: Oil Subsidy	Study Treatment: No Subsidy	Study Treatment: Nutrition Education	1983 Population	Locational Characteristics	Economic Base	Ecology
Province of Abra								
Tangadan (San Quintin)	x				1,078	20 kilometers from provincial capital along main road; accessible through main road	Maize, tobacco, and livestock production; firewood	Upland and mountainous
V. Mercedes Pobl (San Quintin)	x			x	1,211	15 kilometers from provincial capital along main road	Maize, tobacco farming	Upland and mountainous
Quillat-Baac (Langiden)			x	x	621	8 kilometers from provincial capital; accessible by boat across the river	Maize, rice, tobacco, vegetable farming	Upland and mountainous
Nalnas Poblacion (Langiden)			x		718	16 kilometers from provincial capital; accessible by boat	Fishing on river banks, maize, rice farming	Upland and mountainous
Province of Antique								
Funda (Hamtic)	x				1,360	12 kilometers from provincial capital; accessible by main road	Sustenance fishing, rice, coconut, farming, wages/professionals/service workers	Coastal area
Guintas (Hamtic)	x			x	1,251	8 kilometers from provincial capital; accessible by main road	Fishing, rice, coconut, vegetable farming	Coastal area
Butuan (Anini-y)		x		x	880	65 kilometers from provincial capital	Fishing, services, marginal farming of rice	Coastal area
Bayo (Anini y)		x			917	70 kilometers from provincial capital	Fishing, services abroad, native industries	Coastal area
Magcalon (San Jose)			x	x	507	3 kilometers from town center	Fishing, rice, maize, and vegetable farming, wages/professionals/service workers	Coastal area

(continued)

Table 2—Continued

Study Provinces and Villages	Study Treatment: Rice and Oil Subsidy	Study Treatment: Oil Subsidy	Study Treatment: No Subsidy	Study Treatment: Nutrition Education	1983 Population	Locational Characteristics	Economic Base	Ecology
San Fernando (San Jose)			x		687	5 kilometers from town center	Rice farming, professionals/ service workers	Coastal area
Province of South Cotabato								
Bolomala I (Tupi)	x			x	1,062	80 kilometers from main city	Maize, rice farming, cottage industries	River basin, flat
Bololmala II (Tupi)	x				852	85 kilometers from main city	Maize farming, cottage industries	River basin, flat
Colonguio (Surallah)			x		1,818	30 kilometers from provincial capital	Maize farming	River basin
Tubi-Aliah (Surallah)			x	x	1,746	35 kilometers from provincial capital	Maize farming	River basin

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Note: The places in parentheses are municipalities.

Table 3—Characteristics of sample households compared with the rest of the Philippines

Characteristic	Abra	Antique	South Cotabato	Average for the Philippines
Population of study areas, 1983	3,628	5,682	5,478	. . .
Number of households in sample survey[a]	240	360	240	. . .
Household characteristics				
Household size	6.30	6.52	6.41	6.14[b]
Adult equivalent units (AEU)	4.96	5.07	5.09	4.80[b]
Years of schooling, father	7.06	7.06	6.25	n.a.
Years of schooling, mother	7.04	7.53	6.74	n.a.
Per capita income (P/year)	1,680	1,768	1,505	n.a.
Percent of income spent on food	71.13	60.37	71.60	50.20[b]
Percent of expenditures spent on food	73.90	69.50	71.00	57.00[b]
Calorie acquisition in AEUs	1,818	1,915	1,736	. . .
Calorie intake in AEUs	1,755	1,720	1,613	1,808[c]
Calorie deficit in AEUs	327	383	410	224[c]
Occupation of main income earner			(percent)	
Farmers with land	23.64	6.80	27.30	14.20[b]
Tenant farmers	12.68	1.90	17.69	n.a.
Landless farm laborers	7.38	3.47	21.41	19.70[b]
Wage earners	30.66	29.45	20.89	29.30[b]
Fishermen	4.43	14.62	4.87	8.60[b]
Professionals/salaried	10.22	24.52	1.00	17.00[b]
Employed overseas	7.14	11.07	5.76	1.10[b]
Others	3.81	7.74	1.79	10.10[b]
Characteristics of preschool children[a]				
Percent of all children below 6 years	33.30	27.36	32.58	26.09[b]
Mean weight as percent of standard for age	82.84	82.71	83.09	84.0[d]
Percent of children second and third degree malnourished	20.72	26.46	23.19	17.2[d]
Mean Z scores for weight for age	−1.60	−1.72	−1.68	n.a.

Sources: Data for the three provinces were collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines. Averages are taken from the sources indicated below.

Notes: The z-score is a method used in standardizing the distribution of actual weight of the child relative to the standard weight for a child of that sex and age. The standards devised by the U.S. National Center for Health Statistics (NCHS) were used in the study. n.a. means not available.

[a] This is the number of households randomly selected to be surveyed at the start of the experiment, 1983.

[b] Philippines, National Economic and Development Authority, *Philippine Statistical Yearbook* (Manila, NEDA, 1984).

[c] Philippines, Food and Nutrition Research Institute, *Nationwide Food Consumption Survey*, 1985.

[d] Strictly speaking, these results taken from Philippines, Food and Nutrition Research Institute (FNRI), are not comparable to the data for the three provinces included in the survey because FNRI uses Philippine child growth standards, whereas the study uses international (NCHS) standards.

[e] These data are from the first survey round.

or severely underweight—a higher figure than in most parts of the country.

The second group of pilot villages is located in Antique, a province on the island of Panay in the central part of the Philippines. The villages are situated along a narrow coast bounded by mountains to the east and the sea to the west. The area is one of the least arable in the country.

Because of the limited land resources, most of the area's population is engaged in nonfarm employment. At the time of the survey, about 30 percent were wage workers in local industries and crafts, 24 percent

were salaried and professional workers, and 15 percent were fishermen. Only 12 percent of the heads of households in the study areas in Antique were engaged in farming, mainly in marginal maize, rice, and coconut production.

Per capita incomes in Antique were higher than in the two other pilot areas, but still below the national average. The 60 percent proportion of income spent on food was nearer the national mean than that of the two other areas. However, the incidence of second- and third degree malnutrition, at 26 percent, was highest among the three pilot areas and particularly prevalent among small fishermen.

The third group of pilot villages is located in the province of South Cotabato, on the island of Mindanao. Located in a rich river basin, the area is one of the main maize-producing provinces in the country. In 1983, two-thirds of its population were engaged in farming, mostly growing maize used as animal feed. South Cotabato had a high tenancy rate; less than half of the farmers owned land, and 21 percent were landless farm laborers. About 20 percent of the heads of households were wage earners in secondary and service industries.

In the pilot areas of South Cotabato, the population is composed largely of second generation migrants from Luzon and Visayas. About 15 percent are natives (tribal minorities) who have been assimilated into the Christian population of immigrants. Per capita incomes in South Cotabato were the lowest among the pilot areas. The share of total income spent on food—72 percent—was high compared to the national average. Per capita calorie deficits exceeded 400 per day, and the native minority groups were the most affected by calorie inadequacy. Malnutrition among preschool children, estimated at 23 percent, was moderately high. Levels of educational attainment were also lower in South Cotabato than in Abra or Antique (Table 3).

Population Coverage of the Pilot Scheme

The total population of the study villages was 14,788 at the start of the experiment in May 1983. Out of these, some 1,407 households (8,611 people) received the subsidy, while the rest were treated as a control group. A total of 840 households with 5,376 members, or about one third of the total population of the villages, were randomly selected for the pilot study. A total of 88 households out of the 840 households dropped out in the second round of interviews and hence were excluded from the study.

4

ASSESSMENT OF IMPLEMENTATION

The purpose of this chapter is to assess the effectiveness of the design of the scheme based on experience and monitoring. For a continuous period of 12 months, the pilot subsidy scheme was observed under actual operating conditions. This involved the monitoring of key participants of the program: the beneficiaries, retailers, wholesalers, participating banks, extension officers, and local political functionaries. The feasibility of the program instruments—ration cards, reimbursement vouchers, and sales logbooks—were tested under local conditions. A full-time study team from the central office of the National Nutrition Council, Ministry of Agriculture, and the International Food Policy Research Institute supervised the scheme for the entire period of operation. In addition, local extension officers were designated to provide periodic on-site monitoring.

The findings exposed a number of implementation problems that were not foreseen in the design of the scheme. The implications of these constraints are discussed here because they are critical to a possible larger scale future program.

The Geographical Targeting Method

Eligibility for participation in a scheme that targets beneficiaries by geographic area is determined by residency. From an administrative point of view, the requirements for beneficiary certification in such a scheme are simple. For the pilot scheme, problems in verification of residence using the village census were few because families were usually known to the extension workers covering those areas.

Because the subsidized ration was based on household size, some families lied about the size of their households in order to draw larger quotas. To settle conflicting claims of household membership, cases were normally decided by the *barangay* captain, the local political leader. The *barangay* captain also decided whether families were bona fide residents of the *barangay* or precinct, entitled to participate in the program. At least 20 percent of the participating households padded reports of household size. There were a few migrant households and temporary settlers who were not in the census but were nevertheless included in the initial program listing.

Although area targeting is easier to administer than other forms of screening, such as income eligibility or sex and age criteria, several unanticipated effects were observed. A few households invited relatives from neighboring villages excluded from the subsidy into the targeted villages to share the subsidy benefits with them. This was observed only among the very poor households and only in the first half of the experiment. It is unlikely that large-scale population movements would occur as a result of an area targeted subsidy such as this. However, movement would likely be proportional to the size of the subsidy envisioned. In the pilot study, the level of subsidization compared to incomes was quite low; hence the in-migration was limited.

The geographical area targeting scheme assured coverage for all the needy households in the depressed village because the subsidy was available to everyone within the area. The major disadvantage of such a method, however, is that poor households who live outside the target area are excluded, while well-off households and well-off individuals in deficit households in the area are included.

Possible Problems

Leakages

The goal of the subsidy scheme was to increase and sustain the ability of the food-

deficit poor households to purchase enough food to meet nutritional requirements. By definition, therefore, program benefits that were lost in the process of implementation or that accrued to households that did not need them are considered "leakages." Alternatively, leakage can be defined as the difference between the value of food or cash transfer, and the value of the net increment of the food intake of the food-deficit or needy households.[6]

Several overt forms of leakage were observed in the pilot scheme. First, because the program did not discriminate against any household within a project village, households without a deficit (mostly higher-income households) in the villages were included in the program. Consequently, leakages were low if the majority of the households in the villages selected were calorie-deficit households. The efficiency of the area method of targeting is therefore a function of the national agency's accuracy in identifying poverty areas and the degree of geographical concentration of malnutrition. The food consumption survey conducted just prior to the enforcement of the scheme found that 73 percent of the households were deficient, which shows that targeting was relatively efficient.

In two villages in the south, a few economically well-off households shared their rations with poorer neighbors, thus reducing leakages. Some better-off households allowed their poor neighbors the use of their food discount cards, although discount cards, strictly speaking, were not transferable. These transactions, which were done with the knowledge of the store owners, involved no compensation.

During the 12-month monitoring period some cases of reselling of subsidized food were observed, although this was not rampant. All reselling cases involved cooking oil, which was attractive for the very poor families because the product commanded a good price in the open market. For instance, a family of six with a monthly allocation of 2.4 kilograms of cooking oil stood to gain about P 15 if it sold all its ration, an amount that was almost equal to half a day's wages. There was almost no resale of rice observed, mainly because rice is a staple food, and the ration for each family was only about half of what a typical household consumes.

In two villages in the north several enterprising households used all of their cooking oil ration in their small native delicacy business, not for home consumption. In a number of instances some retailers preempted the rations of households that did not consume all of their quota for the month. These practices were particularly difficult to check because the retailers could forge signatures in the salesbook records, and monitoring by the extension officers could only be done once a week.

Use of Food Discount Cards

Some problems were encountered in the use of the food discount ration cards in the retail stores. Two signatures were needed for every sales transaction in the stores: the retail store owner had to sign the ration card and the card holder had to sign the store salesbook. This procedure delayed the transaction, especially in the stores that served larger populations. Illiterate beneficiaries who could not sign the salesbook created another administrative problem. For this group—about 8 percent of the target households—a thumb mark was used to carry out the transaction. Another problem was generated by participants who in the first two months of the experiment deliberately changed the ration amount stated on the discount cards by tampering with the figures on the cards. These were easily detected when compared with the records of the stores.

Accountability and Controls

The use of local banks in the handling of subsidy reimbursements to the retail store

[6] The measurement of leakage is explicitly treated in Chapters 6 and 10.

owners was quite efficient and would probably be just as feasible in a larger program. The special savings deposit provided a convenient procedure for the redemption of the subsidies by the store owners. Because the size of the subsidy was predetermined from the potential number of beneficiaries, the amount transferred every month by the central program office into the deposit accounts was accurate to within 94 percent of the actual subsidies.

The weekly auditing of the books in the store presented some difficulties at the start of the project, but once the extension officer and the retailer became familiar with the procedures, the accounting tasks progressed without exceptional problems. Part of the difficulty in the auditing procedure could be traced to the small but frequent purchases, which resulted in a large number of bookkeeping entries.

Administration of Food Outlets

The procurement and selling performances of the accredited neighborhood *sari-sari* stores varied by area. The differences in efficiency were dependent on a number of factors, including the size of the population served, frequency of purchase, amount of revolving capital and supply credit, the amount of credit extended to customers, the location of the store, and the character of the retailers and their community acceptance.

The outlets in Antique, which served a larger clientele, experienced more difficulty than those in the other two provinces. The queuing and crowding in the stores, especially during the heavy buying days, sometimes resulted in bookkeeping errors in these larger villages. The owners of the retail outlets indicated that, given the frequent purchasing habits of households, the optimum number that each storekeeper could efficiently handle was not more than 120 households, assuming that the store was attended to by the store owner and an assistant, who was usually an immediate member of the family.

In most areas poor households made frequent purchases but in small quantities. Many households, for example, bought cooking oil three times a day, and the purchases were as small as one-half cup (80 grams). Store records compiled for the project indicated that 28 percent of all households made daily purchases. This practice increased the transaction time in the stores per unit purchased. Most stores reported heavier selling late in the afternoons when the breadwinners arrived from work or when the day's fish catch was sold.

Stores that had more than P 10,000 (U.S. $900) of revolving capital were effective in maintaining uninterrupted selling operations. On the other hand, smaller stores experienced intermittent shortages in the supply of the commodities. Although weekly credit was available from commercial rice wholesalers, the amount allowed depended on the capitalization of the store. Hence, smaller stores were not assured of sufficient credit to meet the demand. On the basis of the 12-month store records, it is estimated that in order to support a client base of 120 families a retail outlet should put up an initial revolving capital of at least P 10,000 in 1983 pesos.

It was a common practice in neighborhood stores to give weekly credit to regular clients. Larger stores offered credit on the subsidized food, but the smaller stores did not because of limited revolving capital. Families located on the fringes of the subsidized villages experienced difficulty in obtaining subsidized food because of their distance from the stores. These families usually made one-time bulk purchases, but even so transport costs increased the total food acquisition cost of these beneficiaries. The geographical distribution of target households should therefore play a crucial role in the choice of outlets for a program.

In some instances neighborhood politics hampered the scheme's delivery mechanism. In Abra, for example, one retailer refused to sell subsidized rice to constituents not belonging to her political party. Another store owner refused to sell to people who had a long-standing feud with her family. Some cultural minority groups were not properly attended to in the stores in South Cotabato and were effectively denied their

subsidized rations. However, more than half of the retailers were observed to be quite sensitive to community needs, even opening their stores late at night in order to serve their clients. Based on this experience, it is quite apparent that the choice of the retailer is crucial in program delivery. One of the important considerations in selecting an outlet is community acceptance of the retailers.

Subsidy Take-out Trends

Records compiled at the stores for the initial month of the experiment indicate that only 85 percent of the rations made available were claimed by the villagers, but this take-out rate increased to 95 percent after the third month. Households that did not get all of their subsidized food rations were those that had insufficient cash available during the month, were growing rice, or were too far from the stores to be able to take advantage of the lower price.

The rate of ration utilization varied by commodity. Almost all rice rations were taken but only 80-85 percent of cooking oil rations, probably because the cooking oil ration was larger than the amount consumed before the scheme, while the rice ration was not. Under these conditions, households can be expected to consume all of their rice allocations, but they may decide to buy only as much as or slightly more cooking oil than they used before, if reselling is difficult.

Monitoring

The monitoring clearly demonstrated that the efficiency of scheme implementation depended largely on adequate understanding by program participants of the program's objectives, mechanics, and benefits, and on the retail store owners' understanding of program procedures. Social preparation activities were conducted by local extension officers of the Ministry of Agriculture, assisted by the BNS. Monitoring of both the retail stores and the beneficiaries was done by extension officers as part of their work on the project areas. Prior to implementation, village assemblies were held to explain the scheme's mechanics and objectives. These assemblies were undertaken with the cooperation of the local political councils in the project areas.

There were no major difficulties in delivering nutrition education because all of the extension workers had prior experience in this type of intervention. Eighty-five percent of all mothers in the project areas attended nutrition education classes regularly. For the most part, the mothers who did not attend were unable to combine attendance with wage labor. It is difficult, however, to assess the degree of effectiveness across the villages because there were obvious differences in the abilities of the extension officers in delivering the nutrition education messages. The effects of nutrition education on the outcome variables (calorie intake and child nutrition) are discussed in Chapters 8 and 9.

In summary, except for a few details, the scheme's design as initially conceived was generally feasible from an administrative standpoint. Several important lessons were learned from the monitoring on ways to enhance its viability if the scheme were applied on a larger program level.

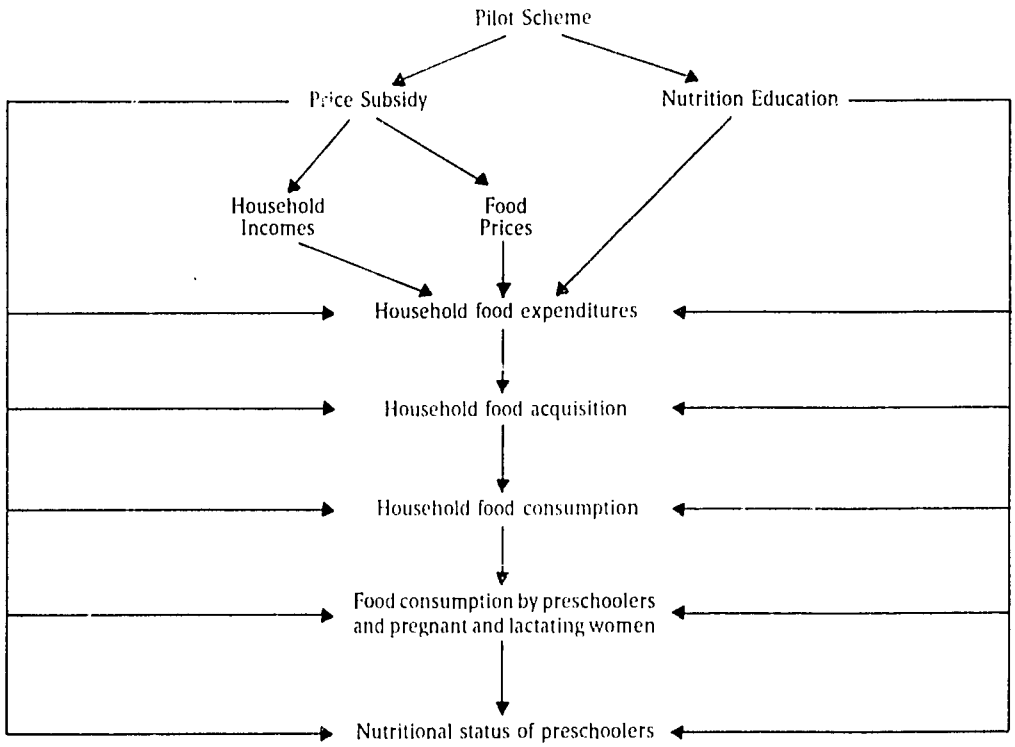
5

ANALYTICAL METHODOLOGY

The analysis of the impact of the pilot scheme on household food expenditures, acquisition, and consumption, and on food consumption and the nutritional status of preschoolers is based on a conceptual framework shown in a simplified version in Figure 3.

The price discount element of the scheme implies an increase in the real purchasing power or income of the recipient households. This increase can in turn be expected to increase household food expenditures, acquisition, and consumption. It may also result in increases in food consumption by the household members most likely to be calorie-deficient—preschoolers—and thus improve their nutritional status (Figure 3). If the amount of subsidized rice or oil exceeds the amount that would be purchased by the households without the subsidies, the subsidies will reduce the price households pay for the last unit (at the margin). This could be expected to increase the consumption of the subsidized foods. These price-induced increases would not be expected, however, if the amount subsidized were less than the amount the household would purchase without the subsidies because the price at the margin would not be affected. The price subsidies may also affect food expenditures, consumption, and nutritional status directly through changes in household behavior.

Figure 3—Simplified version of the conceptual model underlying the analyses



The nutrition education component of the scheme may also affect food expenditures, consumption, and nutritional status by changing household behavior regarding food purchases, dietary patterns, intrahousehold food distribution, and other aspects. The effects of each of the two components—price subsidies and nutrition education—on each of the five indicators shown in Figure 3—household food expenditures, acquisition, and consumption, food consumption by individual preschoolers, and their nutritional status—are estimated by means of comparative static and multivariate analyses.

Comparative Analysis

The experimental design used in this study is illustrated in Table 4. Data were collected from four rounds of surveys in the 14 villages over a 17-month period. About two months after the first survey round was initiated, subsidized rice and oil were made available to survey villages in each of the three provinces. In addition, subsidized oil alone was made available to two villages in one of the provinces. The two other villages from each province that were included in the study were not given access to subsidized food; they served as controls. In each province, a nutrition education program was introduced in one of the two villages that received subsidies and one of the two that did not.

The second survey round was executed about 2 months after the introduction of the subsidy scheme, the third 12 months after the first, and the fourth and last round was undertaken about 2 months after the scheme was terminated, that is, 12 months after the second survey. The spacing of 12 months between surveys was done to avoid confounding effects of seasonal variations.

The control villages were selected to be as similar as possible to the "treatment" villages—those receiving subsidies. Thus, effects of exogenous variables that could not be controlled or accounted for in direct comparison are assumed to have the same effect on control and treatment villages and can therefore be separated from the effects of the scheme.

The effects of the subsidies and nutrition education are estimated simply by comparing the appropriate treatment and control villages after adjusting for differences prior to the introduction of the scheme (the treatment). Analysis of variance is used to test for significant differences. The percent change in each of the five indicators of interest due to subsidies and/or nutrition education is estimated:

$$A_i = [(T_i/C_i)/(T_1/C_1) - 1]100, \qquad (1)$$

where

A_i = percent change in the indicator for month i relative to the baseline value of the indicator due to the treatment, for example, the percent change in household food consumption due to nutrition education;

T_1 and T_i = average value of the indicator for round 1 (baseline) and month i for treatment households; and

C_1 and C_i = average value of the indicator in round 1 (baseline) and month i for control households.

The results of the comparative static analyses are presented in Chapter 7.

Multivariate Analysis

Results from comparative static analyses are suspect because the effects of other factors on the groups are not fully accounted for. Multivariate analyses suffer considerably less from this problem because the effects of many factors may be isolated from the effects of the pilot scheme. Therefore, in addition to comparative static analyses, multivariate analyses are used to estimate the impact of the scheme. These analyses are based on the conceptual model presented in Figure 4, which shows the variables hypothesized to influence the indicators and thus included in the multivariate analyses.

Table 4—Experimental design of the pilot food price subsidy study

Commodities Subsidized	Nutrition Education	Province	Survey Rounds 1[a]	2[b]	3[c]	4[d]
Rice and cooking oil	Yes	Abra	x	x	x	x
		Antique	x	x	x	x
		South Cotabato	x	x	x	x
	No	Abra	x	x	x	x
		Antique	x	x	x	x
		South Cotabato	x	x	x	x
No subsidy	Yes	Abra	x	x	x	x
		Antique	x	x	x	x
		South Cotabato	x	x	x	x
	No	Abra	x	x	x	x
		Antique	x	x	x	x
		South Cotabato	x	x	x	x
Oil only[e]	Yes	Antique	x	x	x	x
	No	Antique	x	x	x	x

[a] This was the baseline survey, 2 months prior to introduction of the scheme.
[b] This survey took place 2 months after introduction of the scheme.
[c] This survey took place 10 months after introduction of the scheme.
[d] This survey took place 2 months after the scheme was terminated.
[e] In two villages of one province, only oil was subsidized at the request of the Minister of Agriculture.

Household Calorie Consumption Functions

Four of the five indicators—household food expenditures and acquisition, and food consumption and nutritional status of preschoolers—are regressed on the variables shown in Figure 4 to estimate the effect of the price subsidies and nutrition education on each of the indicators and to isolate the effects of other variables hypothesized to influence these indicators. The impact of the price subsidies is measured partly through the increase in household incomes and the decrease in rice and oil prices and partly through a direct effect hypothesized to come about primarily because households treat the real income increase from food subsidies differently from other income increases—that is, the marginal propensity to spend on food differs between subsidy income and other real income.[9]

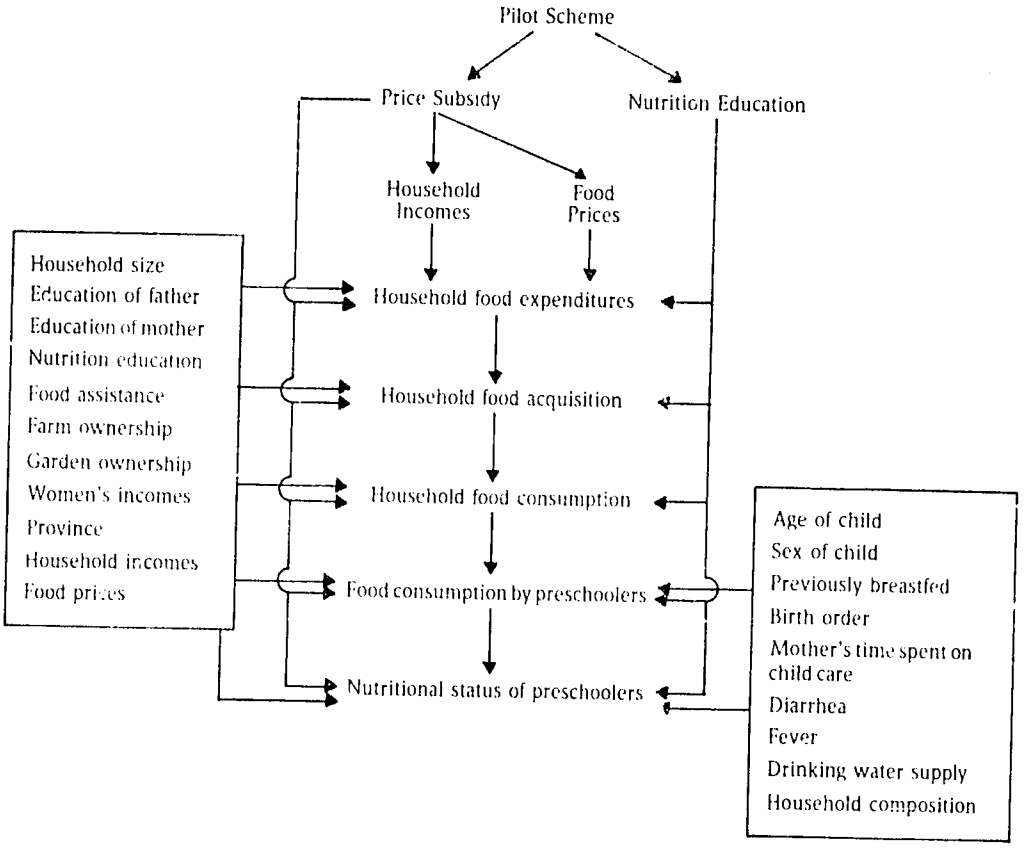
The general estimating model used to estimate the impact of the scheme on household food expenditures and acquisition is

$$C = f(Y, S, P_R, P_o, NE, Z), \qquad (2)$$

where C is total food expenditure (or calorie acquisition), Y is real household income, S is the subsidy term, P_R and P_o are the real price of rice and cooking oil, respectively, NE is nutrition education, and Z is a set of other variables hypothesized to influence the dependent variable. Here the dependent variable is a composite of expenditures on all foods or an aggregation of total calories from all of the foods acquired by the household.

[9] Evidence of such differential treatment of subsidy income has been found for the U.S. food stamp program (Ellen Senauer and Nathan Young, "The Impact of Food Stamps on Food Expenditures: Rejection of the Traditional Model," *American Journal of Agricultural Economics* 68 [February 1986]: 37-43). None has been found, however, for the Sri Lankan food stamp program (Neville Edirisinghe, *The Food Stamp Scheme in Sri Lanka: Costs, Benefits, and Options for Modification*, Research Report 58 [Washington, D.C.: International Food Policy Research Institute, 1987]).

Figure 4—Conceptual model underlying the multivariate analyses



The household-level estimating model is defined:

$$C_i/AEU = b_o + b_1 Ln(Y_i/AEU) + b_2 S_i + b_3 HHsize_i + b_4 EducS_i + b_5 EducH_i + b_6 Nutredc_i + b_7 Nutrelv_i + b_8 Foodasst_i + b_9 Ownfarm_i + b_{10} Owngard_i + b_{11} PwomenY_i + b_{12} L_{2i} + b_{13} L_{3i} + b_{14} Price_i + b_{15} Poil + u_i, \quad (3)$$

where

C_i/AEU = food consumption of household i defined either as total food expenditure per adult equivalent unit (AEU), or as total calorie acquisition per AEU;

Y_i/AEU = total income per AEU of household i;

S_i = subsidy term defined either as a percent of total incomes, or as a dummy, 1 if households received the subsidy and 0 otherwise;

$HHsize_i$ = household size;

$EducS_i$ = educational level of the wife;

$EducH_i$ = educational level of the husband;

$Nutredc_i$ = a dummy defined as 1 if the household received nutrition education from government programs, 0 otherwise;

$Nutrelv_i$ = a dummy defined as 1 if the household participated in the nutrition education classes under the pilot subsidy scheme, 0 otherwise;

$Foodasst_i$ = a dummy defined as 1 if the household participated in food assistance programs, 0 otherwise;

$Ownfarm_i$ = a dummy defined as 1 if the household owned a farm, 0 otherwise;

$Owngard_i$ = a dummy defined as 1 if the household owned a garden, 0 otherwise;

$PwomenY_i$ = proportion of total incomes contributed by women;

L_{2i} = location dummy for Antique;

L_{3i} = location dummy for South Cotabato;

$Price_i$ = unit price paid for rice by the household; and

$Poil_i$ = unit price paid for oil by the household.

The two alternative specifications of the subsidy are used to test the robustness of the estimates of the scheme's impact. Each of these implies different assumptions and levels of constraint imposed on the consumption function. The first alternative uses a proportion term (the subsidy as a percent of total incomes from all sources including the subsidy itself). If the coefficient of this subsidy term is not significantly different from zero, the marginal propensity to consume (MPC)—to acquire food—does not change with the changing proportion of total incomes coming from subsidies. A positive and significant coefficient would indicate that income transfers embodied in the scheme have a higher MPC than other household income, and vice versa.

The specification of a dummy for subsidy recipients is interpreted as a parallel shift in the relationship between consumption and income. Therefore, a positive and significant coefficient of the dummy subsidy variable would indicate an effect above the income effect. However, this subsidy variable predicts an impact that does not vary across income groups. This model is hence less intuitive, although empirically predictive of the subsidy effects at the mean level of income.

The use of an AEU scale in the food consumption and income variables explicitly accounts for the differences in household size and composition. The AEU approach is a refinement to the consumption per capita and income per capita approach, as it explicitly accounts for the differences of age composition of households.[10] For this study, the AEU scale used to translate family members of different ages into equivalent person units is derived from the Philippine recommended dietary allowances (RDAs) for calories for each sex-age group.[11] Thus, formulating incomes and consumption in AEUs allows flexibility in economies of scale and size and composition of households.

The income variable is specified in natural logarithm to allow for decreasing MPC for food with increasing incomes. Because of inherent problems in correctly measuring income, particularly in semisubsistence households, total expenditures were used as income proxy throughout the regressions. Because, as discussed in Chapter 8, household incomes are not strictly exogenous, the validity of the results is tested using wage rates instead of incomes.

The impact of the other component of the pilot scheme, the nutrition education intervention, is tested with a dummy variable equal to 1 if the household received

[10] S. J. Prais and H. S. Houthakker, *The Analysis of Family Budgets* (New York: Cambridge University Press, 1971); and Angus Deaton and John Muellbauer, *Economics and Consumer Behavior* (New York: Cambridge University Press, 1980).

[11] Food and Nutrition Research Institute, and National Nutrition Council, *Recommended Dietary Allowances for Filipinos* (Manila: FNRI, 1976).

the nutrition education and 0 if not. Various socioeconomic and locational variables are included as explanatory variables, specifically to isolate the effects of incomes and subsidies from other socioeconomic, demographic, and locational factors.

The prices of rice and cooking oil used as independent variables in the regressions are data reported from the survey. In using the unit price for rice as an explanatory variable, the market price paid is used for households where the rice subsidy is inframarginal; in the extramarginal households the price used is the price that the households paid in the subsidy stores. Price, expenditure, and income variables are deflated by price indexes for the particular month when the survey was carried out, and for the particular region where the samples were located. The use of real values in the regressions is designed to separate the effect of the increase in real income through the subsidy scheme from an increase in expenditures through inflation. The first survey is used as the baseline (index = 100) in deflating the nominal values.[12] The results from the regressions are shown in the Appendix, Table 34, and the main findings are presented and discussed in Chapter 8.

Household Consumption Functions for Rice, Oil, Fish, and Maize

In order to better understand how the scheme influenced the consumption of the principal food commodities, the calorie consumption function is complemented with consumption functions for each of the four principal food commodities—rice, oil, fish, and maize. The commodity functions are specified using the calorie consumption functions above, except that the prices of maize and fish are added. The coefficients estimated by these functions are shown in the Appendix, Table 35, and discussed in Chapter 8.

Calorie Consumption Functions for Preschoolers

To estimate the impact of the scheme on the consumption of calories by individual preschoolers, this model is used:

$$\begin{aligned} IC_j = {} & b_0 + b_1 LnAge_j + b_2 Sex_j + b_3 CBreastf_j \\ & + b_4 PBreastf_j + b_5 BirthO_j + b_6 EducH_j \\ & + b_7 EducS_j + b_8 ChTime_j + b_9 HHsize_j \\ & + b_{10} Perchd6_j + b_{11} Diarrhea_j \\ & + b_{12} Water_j + b_{13} Nutrelv_j \\ & + b_{14} Nutredc_j + b_{15} Foodasst_j + b_{16} L_{2j} \\ & + b_{17} L_{3j} + b_{18} PwomenY_j \\ & + b_{19} Ln(Y_j/AEU) + b_{20} S_j + b_{21} Price_j \\ & + b_{22} Poil_j + b_{23} Fever_j + U_j, \end{aligned} \quad (4)$$

where

IC_j = daily calorie consumption by preschooler j,

$LnAge_j$ = log of the age of preschooler j,

Sex_j = sex of preschooler j (1 if male),

$CBreastf_j$ = zero-one dummy (1 if the preschooler is currently breast-fed),

$PBreastf_j$ = zero-one dummy (1 if the child was breast-fed in the past),

$BirthO_j$ = birth order of preschooler j,

$ChTime_j$ = time spent in child care by the mother of preschooler j,

$Perchd6_j$ = proportion of children with age less than six years in household i,

$Diarrhea_j$ = zero-one dummy (1 if the preschooler had diarrhea in the past week),

$Water_j$ = zero-one dummy (1 if the household where preschooler belongs

[12] The price indexes were taken from Philippines, National Economic and Development Authority, *Philippine Statistical Yearbook* (Manila: NEDA, 1985).

has sanitary potable water facility), and

$Fever_j$ = zero-one dummy (1 if the preschooler had fever during the past week).

Other terms have already been defined.

The dependent variable in the equation is the calorie content of foods consumed by individual children between the ages of 13 and 83 months. Children less than 13 months of age are excluded from the analysis because breast-feeding of that age group is widespread and the calorie content of breast milk consumed was not estimated.

The pilot scheme's net effect on individual children is hypothesized to come from increases in overall incomes, nutrition education, and from the effects of the subsidy scheme itself. A semilog functional form is chosen to express the relationship between income and individual child consumption. A variant of this model is also tested using household calorie acquisition in place of household incomes. The inclusion of individual child variables such as age, sex, morbidity, birth order, and breast-feeding serve to control for child-specific variations and biological factors, whereas other household variables, such as the parent's education, household size and composition, women's incomes, child care time, rice and oil prices, and geographical location, are included in order to account for household differences that could influence individual calorie consumption of children. The demand equations are estimated by ordinary least squares for the 589 sample preschool children aged 13 to 83 months. Results of the regressions are given in the Appendix, Table 36, and the key findings are presented and discussed in Chapter 8.

Anthropometric Functions for Preschoolers

The effects of the scheme on the growth of preschoolers are estimated on the basis of estimating equations of the following general form:

$$W_j = f(Y_i, S_i, P_{rice}, P_{oil}, C_j, NE_i, Z_{i,j}), \quad (5)$$

where

W_j = an anthropometric indicator of the nutritional status of preschooler j,

Y_i = total income per capita of the household to which the preschooler belongs (i),

S_i = an indicator for the food subsidy,

C_j = calorie consumption by the household to which the preschooler belongs (used only as an alternative to Y_i),

NE_i = an indicator for whether the household received nutrition education from the scheme, and

$Z_{i,j}$ = a set of other variables hypothesized to influence W_j. All Z-variables are identical to those specified in the calorie consumption function for preschoolers.

The dependent variable is specified in five alternative ways: (1) weight of the preschooler, (2) weight as a percent of the standard weight for a particular age, (3) a standardized Z-score for weight-for-age, (4) a standardized Z-score of weight-for-height, and (5) the height as a percent of the standard height for a particular age. Z-scores are a method used to standardize a distribution. International standards are used in estimating the Z-scores because they facilitate comparison with other studies. The Z-scores for weight variables are defined as:

$$Z_{WA} = (W - W^*)/s.d. \quad (6)$$

where

W = actual weight of the child,

W^* = standard weight for a child of a particular sex and age, that is, the median of the reference population, and

s.d. = standard deviation from the standard for a particular sex and age.

Weight-related measures are expected to be more appropriate than height-related

measures for analyses of effects on child growth in the short run. Thus, for the period of time involved in this study, the scheme is less likely to have an effect on height.

Cost-Effectiveness Analysis

For estimating the cost-effectiveness of the scheme, three sources of cost are identified: the cost of administration, the cost of the subsidy or price discount (the price discount per unit of rice and cooking oil times the quantity for which the discount was given), and the cost of the subsidized food paid by the participating households. The first two are borne by the public sector and referred to as "fiscal costs," whereas the last refers to the amount consumers pay for the subsidized commodities. The last two add up to the value of the subsidized commodities at nonsubsidized prices. The cost of the subsidy equals the subsidy benefits to the consumer because all costs of the scheme other than the price subsidy times the quantity subsidized are included under cost of administration.[13] The transaction costs incurred by participants are assumed to be identical to these they would incur with the purchase of nonsubsidized rice and oil. The transaction costs associated with participation in the nutrition education program, including the value of the time spent by the participants, are ignored in the cost estimations.

Effectiveness is measured, first, by the amounts of real income and calories transferred to the participating households including those households with either severe calorie deficits or children weighing less than 75 percent of standard, and, second, by the change in the nutritional status of children.

Table 5 provides an overview of the various measures used to estimate cost-effectiveness. These measures represent different indicators of benefits, such as changes in household incomes and food acquisition, food consumption by preschoolers, and the weight of preschoolers. They also represent five different target groups: all households in the target villages, only households with calorie consumption below 80 percent of requirements, only households with malnourished preschoolers, only preschoolers, and only malnourished preschoolers.

Thus, if the goal of the scheme is to reduce malnutrition among preschoolers, the measures reflect different degrees of leakage. Three sources of leakages are considered. The first source is households participating in the scheme that are not deficient in calories or that do not have preschoolers. The second is substitution between food and nonfood items and among foods resulting in a net increase in household food expenditures and calorie consumption that is smaller than the equivalent real income transfer. The third is when some of the net increase in household calorie consumption is consumed by household members other than preschoolers.

The fiscal cost of transferring one U.S. dollar of real income to all participating households is a crude indicator of cost-effectiveness from a nutrition point of view because all three sources of leakages are present. However, it may be an appropriate indicator if the goal is to transfer purchasing power at a low fiscal cost. One source of leakage is removed if only transfers to calorie-deficient households or households with malnourished preschoolers are considered (Table 5).

The second source of leakage—reduction in food acquisition from sources other than the subsidy—may be deleted from the cost-effectiveness measure by considering the cost of a net increase in household calorie consumption. The third source of leakage is deleted in the indicators that only deal with the effects on malnourished preschoolers.

In specifying the estimation procedures for each of the indicators, an estimate is made of the fiscal cost of transferring U.S. $1.00 of real income, first, to all participating households (H_1),

[13] Shlomo Reutlinger and Judith Katona Apte, *The Nutritional Impact of Food Aid: Criteria for the Selection of Cost-Effective Foods*, Discussion Paper WB-ARU Report No. 12 (Washington, D.C.: World Bank, 1984).

Table 5—Overview of the cost-effectiveness measures used in this study

Fiscal Cost	All Participating Households (H_1)	Households Consuming Less than 80 Percent of RDA (H_2)	Households With Malnourished Preschoolers[a] (H_3)	All Preschool Children (C_1)	Preschool Children Consuming Less Than 80 Percent of RDA (C_2)	Malnourished Preschoolers[a] (C_3)
Fiscal cost of transferring U.S. $1.00	x	x	x			
Fiscal cost of a net increase in food acquisition of 100 calories per AEU per day	x	x	x			
Fiscal cost of eliminating the calorie gap	x	x	x			
Fiscal cost of a net increase in food consumption of 100 calories per preschooler per day				x	x	x
Fiscal cost of increasing the average weight of preschoolers by 1 kilogram				x	x	x

[a] Malnourished preschoolers are those with weight-for-age below 75 percent of standard.

$$(C_A + C_S)/C_S, \qquad (7)$$

where C_A is the cost of administration of the scheme, and C_S is the cost of the subsidy (price discount · total quantity of subsidized commodities). This is equal to the value of the subsidy received by all participating households.

Second, the cost of transferring U.S. $1.00 to households with a calorie deficit in excess of 20 percent of requirements (H_2) is estimated:

$$(C_A + C_S)/C_{S80}, \qquad (8)$$

where C_{S80} is the value of the subsidy received by households with a calorie deficit in excess of 20 percent of requirements.

Finally, the cost of transferring U.S. $1.00 to households with at least one preschooler whose weight-for-age is below 75 percent of the standard (H_3) is estimated:

$$(C_A + C_S)/C_{SMC}, \qquad (9)$$

where C_{SMC} is the value of the subsidy received by households with at least one preschooler whose weight-for-age is below 75 percent of standard.

The next step is to estimate the fiscal cost of increasing net household calorie acquisition by 100 calories per AEU per day among households in groups H_1, H_2, and H_3. The cost is given by $C_A + C_S$. The impact on calorie acquisition is estimated from the calorie acquisition function (3):

$$[\partial(C/AEU)/\ln(Y/AEU)]VS \cdot [\partial(C/AEU)/S]S + b_7 \cdot [\partial(C/AEU)/P_{oil}]\Delta P_{oil}, \qquad (10)$$

where

VS = value of the subsidy, and

ΔP_{oil} = change in P_{oil} due to subsidy, and

b_7 = coefficient for nutrition education from the pilot scheme.

Thus, the fiscal cost of increasing the net household calorie acquisition by 100 calories per AEU per day is given by $(C_A + C_S)100$, divided by equation (10) above.

Now, the fiscal cost of increasing the net calorie consumption of preschoolers by 100 calories per AEU per day among groups of C_1 (all preschoolers), C_2 (preschoolers consuming less than 80 percent RDA), and C_3 (malnourished preschoolers) is estimated. The cost is as shown above. The impact is estimated from the calorie consumption function for preschoolers, equation (4), as

$$[\partial(IC)/\partial\ln(Y/AEU)]VS + [\partial(IC)/S]S + b_{13} \cdot [\partial(IC)/P_{oil}]\Delta P_{oil}. \quad (11)$$

The equation is evaluated at the mean for each of the three groups.

Finally, the fiscal cost of increasing the weight of preschoolers is shown above. The impact is estimated from equation (5),

$$[\partial(w)/\partial\ln(Y/AEU)]VS \cdot [\partial(w)/S]S \cdot [\partial(w)/\partial(NE)]NE \cdot [\partial(w)/P_{oil}]\Delta P_{oil}. \quad (12)$$

Data Collected and Survey Characteristics

The analytical framework discussed in this chapter was the basis for choosing the data that were collected in the study.

A stratified random survey of households in the pilot areas was conducted as a component of the project. A random sample of households was drawn from each of the eight subsidized and six nonsubsidized villages for a total sample of 840 households. These households were visited four times during the period between May 1983 and November 1984. Between the first and fourth survey round, 88 households dropped out of the survey. As stated earlier, the first survey was conducted two months prior to the introduction of the food subsidy. This survey provided the baseline information for the scheme. Within two months from the start of the scheme, the second survey was conducted using the same questionnaire as in the first survey. Exactly 12 months after the first survey, a third survey round was conducted. Thus, the first and third surveys were conducted in similar months of the first and second year in order to eliminate possible seasonal effects on income, production, consumption, and nutrition.

The subsidy scheme was in effect for a period of 12 months—July 1983 to June 1984. Two months after the withdrawal of the subsidies, the fourth survey was conducted. One of the purposes of the fourth survey was to understand how household consumption behavior was affected by the withdrawal of the subsidy.

Data were collected for all variables shown in Figure 4. Several modules were included. The first was a socioeconomic survey, including income of each household member; household expenditures on food and nonfood items; size, age, sex, occupation, and education of all household members; time allocated separately by the wife and husband to various activities; a series of questions on household decisionmaking, such as who within the household decides on expenditure patterns and purchases of specific items; environmental sanitation, including toilet and water facilities; and household participation in local government programs.

The second module was a consumption and food acquisition survey including household food consumption; household food acquired from purchases, own production, gifts, and wages; expenditures and prices of food; and only for a subsample of households, food intake by each household member.

Two dietary survey methods were used in the same questionnaire: the 24-hour food weighing method (here called food consumption) and the flexible period recall method (here referred to as food acquisition). The 24-hour food-weighing method was used in both the household and individual food-weighing surveys. Under this method, all items used in food preparation were weighed and so were leftovers. Snacks or foods eaten between meals were also taken into consideration. For the subsample where individual food intake was weighed, interviewers were present at the meal table.

Care was taken not to disrupt eating behavior during meals. Data collection was carried out by trained nutritionists and home economists, all females with at least a bachelor's degree, whose average work experience was six years. The interviewers came from the same provinces where the surveys were conducted in order to overcome language barriers. All interviewers underwent a week of extensive theoretical and field training on the procedures in order to minimize disruptions at mealtimes. For the other households where individual intakes were not taken, foods were weighed prior to cooking, just before the morning meals, and after dinner, when leftovers were weighed.

In the flexible period food recall method, the respondent mothers were asked to recall food expenditures (quantity, unit value, and monetary values) for the immediate past—a day, a week, or a month—which included all foods purchased from the market, foods from their own production either from home gardens or farms, and foods received as gifts or wages. The recall period was made on the basis of the normal frequency of purchase stated by respondent households.

The third module was the anthropometric data collected monthly throughout the study period to determine the health status of preschool children, including weight, height, age, and morbidity of each child less than seven years of age.

6

DESCRIPTIVE ANALYSIS OF INCOME, CONSUMPTION, AND NUTRITIONAL PATTERNS

In this chapter the results of the surveys for the five indicators are disaggregated by province, survey round, occupational group, and income quartile and analyzed to identify differences among population groups that may be useful for targeting of future subsidy programs or other interventions. A secondary but important objective is to gain knowledge about the survey households and individuals over and above what can be learned from the analyses based on the total sample.

Household Income Sources

The overall average monthly income of the sample households during the survey period was P 140 per capita (equivalent to a household income of P 910 per month) as compared to total expenditures of P 117 (Table 6). Some households in the poorest quartile spent slightly more than they earned. This occurred primarily among landless farm workers and tenant farmers other than those producing rice and maize, the two groups that were clearly the poorest of the sample. For the sample as a whole, incomes were considerably higher than expenditures during 1983, but these apparent savings did not continue in 1984, which probably reflects the rapid increase in prices during late 1983 and early 1984. About one-half of all incomes came from salaries and wages and about one-third originated in agriculture and fishing.

Food Acquisition and Consumption Patterns

Household consumption expenditures are used in this study as a proxy for income because consumption expenditure is hypothesized to be a better indicator of permanent income and hence a more important determinant of consumption behavior.[14] Consumption expenditures are also easier to measure, and nonsampling errors for this variable are likely to be much lower than those for incomes, which have been chronically understated in many household surveys.

The average share spent on major consumption items is shown in Table 7. On the average, 71 percent of total household expenditures went to food. This figure was much higher than the national average of 57 percent, which indicates that conditions in the study areas were relatively poorer.

The share spent on food fell as incomes rose in concurrence with Engelian relationships. While the households in the lowest income quartile allocated 79 percent of their total expenditures to food, those in the highest quartile allocated 63 percent. The share of income spent on food increased over time, which may be explained by the higher rate of inflation for rice than for other major budget items between 1983 and 1984. In early 1984, the ceiling price of rice was allowed to increase by about 45 percent over the previous year. Rice accounted for about 39 percent of the total food budget and nearly 26 percent of total household expenditures. Thus, rice prices were important in overall purchasing power.

Table 7 summarizes the budget shares of major expenditure items by province, season (survey round), occupation, and income group. The shares spent on nonfood items increased as incomes rose, particularly clothing and footwear, education, medical services, and housing. Shares spent on food varied widely between farm and nonfarm households. These variations may reflect

[14] Milton Friedman, *A Theory of the Consumption Function* (Princeton: Princeton University Press, 1957).

Table 6—Average incomes and income sources by province, survey round, occupation, and income quartile

Category	Number of Household Visits[a]	Income Per Capita Per Month[b]	Total Expenditure Per Capita Per Month	Income Source: Salaries/ Wages	Income Source: Farm/ Livestock/ Fishing	Income Source: Business	Income Source: Rent/ Interest/ Pensions/ Gifts
		(pesos)		(percent of total income)			
Entire sample	3,167	140	117	51.3	34.4	6.5	7.8
Province							
Abra	908	140	131	43.8	37.9	4.0	14.3
Antique	1,382	149	106	55.7	30.3	8.6	5.4
South Cotabato	877	125	120	50.9	39.4	4.6	5.1
Survey round							
May 1983	840	122	96	50.4	36.4	6.3	6.9
November 1983	799	129	75	47.0	39.0	6.1	7.9
May 1984	776	151	149	54.5	30.3	6.8	8.4
November 1984	752	159	153	53.5	31.9	6.6	8.0
Occupational categories							
Rice farmer landowner	200	148	131	21.8	66.4	4.1	7.7
Maize farmer landowner	222	135	128	12.6	74.8	4.6	8.0
Farmer, other crops	77	136	127	23.0	68.3	1.3	10.4
Tenant rice farmer	87	112	113	19.9	70.7	0.9	8.5
Tenant maize farmer	136	121	118	21.0	70.4	0.5	8.1
Tenant, other crops	50	90	103	17.1	69.0	1.8	12.1
Landless farm laborer	275	98	104	69.4	18.2	3.1	9.3
Wage earner	817	133	107	70.4	19.4	4.6	5.6
Professional: salaried	116	300	218	83.6	11.4	1.7	3.3
Fishermen, boat owners	384	110	105	13.2	77.6	4.2	5.0
Hired fishermen	39	142	94	80.8	14.0	1.7	3.5
Employed overseas	256	191	132	83.5	10.4	3.1	3.0
Occupation unclassified	508	152	123	33.7	28.1	20.6	17.6
Income group							
First quartile (lowest)	791	78	82	41.1	41.6	4.8	12.5
Second quartile	791	100	96	40.3	46.0	6.6	7.1
Third quartile	791	130	118	49.9	37.9	6.2	6.0
Fourth quartile	791	252	173	59.8	25.6	7.1	7.5

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

[a] "Household visits" is defined as the number of sample households times the number of interviews performed in each household.

[b] Income includes the value of own production consumed.

differences in income as well as the semisubsistence nature of farming. The professionals and salaried workers spent 60 percent on food compared to the poorer wage earners' 81 percent. Surprisingly, food producers, such as rice farmers and fishermen, tended to spend more on food than those who were employed. It is important to note, however, that the present definition of food expenditures covers not only cash food purchases from the market but also the imputed values of food consumed from the households' own food production and food received as gifts and wages.

Food Consumption by Source of Food

For the entire sample, nearly 80 percent of total food expenditures was accounted for by food purchases (including food consumed away from home), 15 percent by own production, 5 percent by gifts received, and a small proportion by foods received as wages. The province of South Cotabato spent more on food purchases and less on food from own production. Nearly one-fifth of Abra's food consumption came from production of their own rice and maize.

Table 7—Percent of total household expenditures on major commodity groups, by province, survey round, occupation, and income class, 1983-84

Category	Total Expenditures Per Capita	Food				Housing/ Fuel	Trans- portation	Medical Services/ Drugs	Edu- cation	Clothing and Footwear	Fiestas and Cere- monials	Durable Goods	Other Goods and Services
		Pur- chased Food	Own Prod- uce	Gifts/ Wages	Total Food								
	(pesos/month)	(percent)											
Entire sample	117	56.1	10.6	4.2	70.9	8.2	2.7	4.1	1.4	4.8	4.0	1.9	2.0
Province													
Abra	131	56.2	12.3	5.4	73.9	8.0	2.0	2.4	1.7	4.1	4.1	1.7	2.1
Antique	106	53.9	12.6	3.3	69.5	8.4	2.6	3.0	1.4	4.7	2.7	3.7	3.7
South Cotabato	120	60.4	6.9	3.7	71.0	8.2	3.6	5.0	1.2	3.9	3.2	2.6	1.3
Survey round													
May 1983	96	56.7	10.1	3.2	70.0	7.1	2.0	0.1	0.0	8.2	6.0	0.5	0.1
November 1983	75	52.1	10.2	3.4	65.7	8.3	2.1	2.3	1.5	7.9	6.5	2.3	3.4
May 1984	149	58.5	10.6	4.7	73.8	8.5	3.2	1.7	1.0	4.8	5.5	1.0	0.5
November 1984	153	55.1	12.6	4.3	72.0	8.3	3.3	2.9	1.8	6.1	1.2	3.3	0.6
Occupational categories													
Rice farmer landowner	131	46.2	19.5	4.1	69.8	7.1	1.9	6.0	1.5	7.6	4.3	0.7	1.1
Maize farmer landowner	128	52.3	10.5	3.9	66.7	8.3	2.0	7.1	1.2	7.1	5.4	1.0	1.2
Farmer, other crops	127	54.7	17.9	2.7	75.3	7.0	2.6	3.0	1.7	4.0	6.2	0.1	0.1
Tenant rice farmer	113	49.4	22.7	4.3	76.4	7.0	1.7	2.8	1.0	2.1	7.1	1.0	0.9
Tenant maize farmer	118	61.7	9.9	4.7	76.3	7.2	3.5	3.2	0.3	2.0	6.0	0.9	0.6
Tenant, other crops	103	59.5	18.1	4.1	81.7	7.4	2.9	1.9	0.5	1.1	4.3	0.1	0.1
Landless farm laborer	104	61.3	10.5	10.9	82.7	8.3	1.6	1.7	0.5	1.0	4.0	0.1	0.1
Wage earner	107	69.1	6.7	5.1	80.9	7.6	4.1	0.7	1.1	3.6	1.7	0.1	0.2
Professional/salaried	218	51.2	5.3	3.5	60.0	10.8	5.0	3.7	3.1	10.1	2.3	3.0	2.0
Fishermen, boat owners	105	58.3	20.9	3.7	82.9	7.5	3.7	2.1	1.0	3.0	1.0	0.2	0.6
Hired fishermen	94	60.9	8.1	7.8	76.8	8.3	2.1	3.2	0.9	2.0	4.7	1.0	1.0
Employed overseas	132	54.4	6.4	2.4	63.2	10.2	3.1	4.2	2.1	8.9	4.3	2.0	2.0
Occupation unclassified	123	51.5	8.7	3.1	63.3	10.0	3.0	4.1	1.7	8.8	4.1	3.0	2.0
Income group													
First quartile (lowest)	82	61.8	10.9	5.9	78.6	7.0	3.0	1.7	0.2	5.0	4.1	0.3	0.1
Second quartile	96	61.4	12.3	5.2	78.9	7.6	2.2	2.7	0.4	5.0	2.1	1.0	0.1
Third quartile	118	59.2	11.4	4.3	74.9	8.1	2.1	3.0	0.5	4.8	4.4	1.7	0.5
Fourth quartile	173	50.2	10.1	2.6	62.9	10.7	2.9	4.3	2.7	8.1	3.3	3.0	2.1

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture. "Pilot Food Subsidy Survey, 1983/84," Philippines.

Between 1983 and 1984 the absolute percentage of subsistence consumption—food grown for the household's own consumption—increased, partly indicating the effects of the increase in food prices over the period.

The food acquisition pattern by sources of food varied by occupation. The shares of food consumption from own production, as expected, were highest among the food producers, such as the rice farmers and fishermen. However, even among rice farmers who owned land, about two-thirds of the total food consumed was accounted for by purchases from the market, while 19 percent came from own production and 4 percent was received as gifts. Similar consumption patterns among rural groups were observed by Trairatvorakul in Thailand.[15]

Among the farming groups, the survey indicates a larger proportion of subsistence consumption among rice farmers than maize farmers. This is because most of the people in the sample were rice eaters, and maize is used more as livestock feed than for human consumption in most parts of the Philippines. The landless farm laborers depended on market purchases for 61 percent of their household food expenditures.

It is estimated that 21 percent of the food consumed by the families of boat-owning fishermen came from their own production. Hired fishermen depended on the market for a higher proportion of their household food supply than did boat-owning fishermen. Food received as wages composed 8 percent of the total food consumed by hired fishermen, the second highest percentage of all occupational categories. This reflects the practice of paying hired workers from the day's catch of fish.

Although the samples were all drawn from rural areas, about 48 percent of the households had nonfarming, nonfishing occupations. The main sources of livelihood for the major breadwinners in many households were urban-based or urban-related, despite their rural residences. For these groups, 85 percent of all food consumed came from purchases. About 10 percent of their food supply came from their own production, mostly from backyard fruit and vegetable gardens.

Allocation of the Food Budget by Food Group

Table 8 gives the breakdown of the average household food budget allocated to each food group. There were 124 food groups coded in the survey, and these were aggregated into the 12 main food groups reported in Table 8. The last one is the residual from the first 11 and is designated as "other foods."

For the entire sample, rice accounted for nearly 40 percent of total food expenditures, fish for 18.6 percent, and vegetables and fruits for 11.3 percent.

A comparison of the patterns of food expenditure across provinces indicates that minor variations occurred in rice expenditures, but major differences were found in nonstaple foods. Although South Cotabato is a maize-producing province, its population is basically rice-eating. This explains its lower food expenditures for maize compared to Abra, where part of the population eats maize during certain periods of the year. Abra spent about 2.8 percent of its food expenses on maize, the highest among the three provinces. As expected, the share spent for fish was highest in the coastal province of Antique—23 percent compared to only 13 percent in Abra. Abra's fish supply came mostly from freshwater sources, mainly out of the Abra River. Abra spent more on poultry, fruits, and vegetables than the other two provinces. The other food groups did not vary much by province.

The major differences in the pattern of food expenditures observed were across occupational categories. Certain food items were heavily consumed by the producers themselves. Rice, maize, fruits, and vegetables, for example, were most heavily consumed by farmers, tenants, and farm laborers,

[15] Prasarn Trairatvorakul, *The Effects on Income Distribution and Nutrition of Alternative Rice Price Policies in Thailand*, Research Report 46 (Washington, D.C.: International Food Policy Research Institute, 1984).

Table 8—Proportion of the food budget allocated to various foods, by province, survey round, occupation, and income group, 1983-84

Category	Per Capita Food Expenditures[a]	Rice	Maize	Bread	Cooking Oil	Poultry	Fish	Pork and Beef	Fruits and Vegetables	Other Foods[b]
	(pesos/month)					(percent)				
Entire sample	78	39.5	1.0	1.5	2.2	4.9	18.6	5.0	11.3	16.0
Province										
Abra	86	37.7	2.8	0.8	1.8	8.4	13.2	5.5	13.1	16.1
Antique	76	37.5	0.1	2.9	2.4	2.1	22.9	3.4	10.9	16.4
South Cotabato	73	43.5	0.1	0.8	2.5	8.1	20.6	4.8	9.9	9.7
Survey round										
May 1983	58	42.3	0.1	1.8	1.9	4.6	21.5	5.8	14.1	7.9
November 1983	62	37.2	0.8	1.6	2.0	3.6	17.5	4.8	12.5	20.0
May 1984	96	36.4	0.3	2.1	2.8	3.8	17.3	2.9	10.9	23.5
November 1984	97	41.3	2.3	1.4	1.9	5.3	17.2	4.9	9.4	15.3
Occupational categories										
Rice farmer landowner	88	38.8	1.3	1.9	1.9	5.9	17.4	6.4	12.2	14.2
Maize farmer landowner	75	42.8	1.5	0.8	2.1	8.9	20.4	5.6	11.2	6.7
Farmer, other crops	85	40.8	0.9	0.5	2.6	4.3	17.3	2.4	15.2	16.0
Tenant rice farmer	81	39.1	1.8	0.6	1.8	1.4	11.9	4.5	14.3	24.6
Tenant maize farmer	78	41.8	0.2	1.3	2.2	8.4	18.1	4.0	11.1	12.9
Tenant, other crops	80	42.1	1.8	0.1	1.9	3.9	7.3	1.5	12.4	29.0
Landless farm laborer	68	45.3	1.4	0.5	1.9	3.8	15.8	1.7	9.9	19.7
Wage earner	74	40.7	0.9	1.8	2.2	4.3	18.5	4.3	10.7	16.6
Professional/salaried	122	25.2	0.3	2.8	3.2	5.1	19.7	9.6	9.8	24.3
Fishermen, boat owners	76	40.8	1.2	1.5	1.9	1.6	21.1	1.1	7.2	23.6
Hired fishermen	78	42.2	0.0	3.8	2.2	0.5	25.3	2.1	9.5	14.9
Employed overseas	84	33.7	0.9	2.8	2.5	3.7	20.5	6.3	9.8	19.8
Occupation unclassified	79	34.5	0.4	2.6	2.3	2.9	21.1	5.2	9.1	21.9
Income group										
First quartile (lowest)	55	46.2	1.1	1.3	1.9	3.2	17.9	4.2	12.1	12.1
Second quartile	82	43.1	1.3	1.3	1.8	3.9	17.1	3.1	11.6	16.8
Third quartile	113	39.8	0.9	1.1	2.2	5.4	18.2	2.8	9.8	17.1
Fourth quartile	213	33.1	0.7	2.6	2.5	4.4	18.7	6.7	10.1	21.2

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

[a] Per capita food expenditures include the value of food acquired from all sources: purchases, own produce, and foods given as gifts and as wages.

[b] Other foods include cassava, sweet potato, sugar, milk, eggs, and others.

and fish and fish products by the boat-owning fishermen and the hired fishermen. The diets of professionals and overseas workers varied more, as indicated by the smaller proportions spent on staples and the increasing percentage allocated to foods such as meat, milk, eggs, bread, and cooking oil. Within the farming groups, the landless farm laborers had the least varied diet, spending most of their food budget on rice and maize. In general, the composition of the food budget of land-owning farmers was more varied than that of the tenant farmers.

Population groups forming the lowest quartile spent larger proportions of their budgets on staples, such as rice, maize, sweet potatoes, and cassava, and smaller proportions on milk, eggs, meat, and cooking oil. From a high of 46 percent in the lowest income quartile, rice's share of the food budget declined to 33 percent in the highest quartile. Expenditure shares of bread, pork, beef, and cooking oil were largest in the highest income quartile. Shares spent on fish did not appear to vary by income group. This may be because the higher income quartiles in the sample were still at the lower end of the income distribution of the Philippines as a whole.

Food Consumption

In the food-weighing procedure used to estimate food consumption, all food served to household members was weighed before meals and the leftovers after for a given 24-hour period, and each of these foods was converted into calorie equivalents.

Daily calorie consumption, which is based on the 24-hour weighing method, is estimated at 1,701 calories per AEU for the entire sample. This is about 374 calories less than the standard recommended by FNRI.[16] Thus, it appears that the sample area as a whole was deficient in calories. Average measures, however, tend to mask the deficiency levels for particular population groups. For purposes of this analysis, the calorie consumption and adequacy of the sample population was disaggregated by location (province), survey round, occupational grouping, and income group.

Statistics summarized in Table 9, using information from the 24-hour food weighing survey, suggest that the people in South Cotabato were worse off than those in the other two provinces. It was the only province where calorie deficits averaged more than 400 calories per day. As shown in Table 6, South Cotabato had the lowest per capita incomes, indicating a likely relationship between undernutrition and economic deprivation.

Caloric intakes vary significantly even within subsectors of socioeconomic groups based on occupation. For instance, within the farming sector, it is clear that rice farmers who are landowners have higher caloric intakes than farmers growing maize or other crops. It is, however, incorrect to conclude that all rice producers are relatively well-fed. It is evident from the results that the smaller rice producers, like tenant rice farmers, have large calorie deficiencies, and the problem is even more pronounced among farm laborers working in the rice sector: their calorie deficits are the highest of all occupational groups. The significant differences in caloric intakes among the various occupational subcategories within rice farming support the theory that the rice-farming sector is not homogeneous; hence, analysis of policies affecting the sector should explore the distributional patterns within.

The disaggregation of the fishing sector into fishermen who own boats and hired fishermen indicates varying degrees of deficiency between these groups. The significant difference in their means amplifies the

[16] The Philippine standards for calories were based on the assumption that energy expenditures for Filipinos differ from those of other people because of differences in body size and type, as well as duration of physical activities, rather than because of intrinsic physiological differences. FNRI's energy expenditure and intake studies based on the Philippine population formed the basis for the calorie requirement standards used in this study. A summary of the standards for all sex, age, and physiological status categories can be found in Philippines, Food and Nutrition Research Institute, *Publication No. 75* (Manila: FNRI, May 1977).

Table 9—Diet composition by food groups, survey round, occupation, and income group, 1983-84

Category	Daily Calories Per AEU[a]	Rice	Maize	Bread	Sweet Potatos/ Cassava	Sugar	Cooking Oil	Poultry	Fish	Pork and Beef	Milk and Eggs	Fruits and Vegetables	Other Foods
							(percent of total calories consumed)						
Entire sample	1,701	76.1	2.8	1.7	0.7	1.9	2.9	1.9	3.0	1.5	1.5	3.0	3.0
Province													
Abra	1,755	74.1	7.1	1.0	0.5	2.3	2.1	1.6	1.7	1.3	1.6	3.2	3.5
Antique	1,720	75.3	0.7	2.1	1.3	1.7	3.2	1.7	5.9	1.5	0.6	3.1	2.9
South Cotabato	1,613	78.5	0.8	1.3	0.2	1.9	3.4	2.3	3.0	2.1	1.5	2.9	2.0
Survey round													
May 1983	1,715	77.5	1.0	1.0	0.3	0.2	2.7	1.1	4.5	2.0	1.0	2.9	5.8
November 1983	1,676	76.5	3.5	1.2	0.5	0.9	3.1	1.7	3.5	1.5	1.1	2.8	3.7
May 1984	1,735	79.0	2.0	2.1	1.0	1.5	3.6	1.9	3.5	1.0	1.5	2.0	0.9
November 1984	1,675	75.0	7.0	1.4	1.0	1.9	1.4	1.5	2.0	1.0	2.5	3.6	1.7
Occupational categories													
Rice farmer landowner	1,956	75.6	3.1	1.5	0.3	1.2	2.1	1.2	3.1	1.4	0.8	2.8	6.9
Maize farmer landowner	1,671	77.4	7.0	0.4	0.2	0.7	2.5	2.3	3.2	1.4	0.5	2.4	2.0
Farmer, other crops	1,767	77.0	2.5	0.5	0.1	1.1	3.0	1.2	2.9	1.1	0.4	3.2	7.0
Tenant rice farmer	1,692	77.2	4.6	0.3	0.3	0.7	2.1	3.3	2.2	1.6	0.2	2.4	5.1
Tenant maize farmer	1,659	79.4	0.7	1.1	0.2	0.6	2.7	2.2	2.9	1.4	0.4	2.6	5.5
Tenant other crops	1,718	80.2	5.3	0.1	0.1	0.6	2.2	0.1	1.4	0.4	0.3	2.5	6.8
Landless farm laborer	1,580	81.6	2.9	0.3	0.1	0.7	1.9	1.0	2.7	0.6	0.4	2.3	5.5
Wage earner	1,668	82.2	2.6	1.1	0.1	0.9	2.3	1.0	3.7	1.1	0.5	2.7	1.8
Professional/salaried	1,899	66.9	0.9	2.1	0.3	1.8	4.9	1.6	4.5	3.5	1.5	3.1	8.9
Fishermen, boat owners	1,721	80.7	2.3	1.1	0.5	0.7	2.5	0.5	7.5	0.2	0.3	2.4	1.3
Hired fishermen	1,692	79.7	0.0	2.5	0.1	1.4	2.0	0.0	7.1	0.6	0.5	4.3	1.8
Employed overseas	1,634	74.2	1.8	1.6	0.2	1.6	3.3	0.8	4.3	1.5	0.9	3.1	6.7
Occupation unclassified	1,691	81.8	0.6	1.5	0.3	0.8	2.8	1.1	4.0	1.4	0.4	2.7	1.8
Income group													
First quartile (lowest)	1,627	79.1	2.9	0.2	1.3	0.5	1.9	1.4	3.9	1.0	0.5	3.2	4.1
Second quartile	1,709	78.0	1.9	0.3	0.9	1.2	2.7	1.5	3.7	1.1	0.6	3.1	5.0
Third quartile	1,696	77.1	1.0	1.9	0.2	1.8	3.2	2.3	3.4	1.9	1.8	2.7	2.7
Fourth quartile	1,771	72.6	0.5	2.9	0.1	2.9	4.0	2.5	3.6	2.9	3.0	2.7	2.3

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

[a] Daily calories per adult equivalent unit were based on 24-hour food weighing.

need to look at the patterns within population groups in order to understand the impact of particular policies. Among the nonfarming occupational groups, wage earners were particularly deficient in calories, while, as expected, the professionals and salaried workers had the lowest average deficits.

Diet Composition

A disaggregation of the sources of calories for the sample households illustrates the overwhelming dominance of rice in the diet, accounting for more than three-fourths of total calories. The dependence on rice holds true in all areas, in practically all seasons, for all occupational categories, and for all income groups. The overall dependence on one staple commodity also implies that, in general, there is little diversity in the diet.

The composition of the average diet varied slightly among the three provinces. Abra showed the least dependence on rice, but its consumption of maize was much higher than that of the other two provinces because maize is eaten in Abra during the lean months. The coastal province of Antique derived the highest proportion of its calories (and protein) from fish.

Meal patterns of a typical household in the sample consisted of staples such as rice (326 grams per capita daily), dried or fresh fish, *bagoong* or fish sauce, leafy vegetables such as *kangkong, malunggay, talong,* and mung beans, and fruit. As mentioned before, in areas where maize is grown, maize supplements rice as a staple, which is eaten as a rice-maize mix. Bread is eaten in the form of a roll made of wheat flour called *pan-de-sal,* which is usually eaten for breakfast. Pork, poultry, and beef are part of the meal only on occasion.

Household Calorie Acquisition

As shown in Table 10, average calorie acquisition for the sample as a whole, based on the flexible recall period (one week or one month), exceeded calorie consumption by 136 calories per AEU per day, or 7 percent. As mentioned earlier, there are several reasons for this slight divergence. First, because no food weighing was done on Saturdays and Sundays, food consumption estimates refer to an average daily consumption for the week based on actual consumption for only five days, Monday to Friday, whereas food acquisition covered all seven days of the week. Moreover, Philippine households usually consume more food during the weekend. Second, part of the difference may also be explained by the failure to take into account wastage in the estimates based on food acquisition.

Although it is not possible to determine the bias of each of the two estimates, and thus the "true" value, it may be hypothesized that the two estimates provide a lower and upper bound. It is also likely that the estimate based on acquisition is closer to the true value because it reflects consumption during all days of the week and because the method itself is unlikely to influence actual consumption.

There was also a slight seasonal variation in the composition of the diets in the sample. The relative importance of rice declined slightly during the lean month of November, compared to May, due to the increase in consumption of maize in Abra. A large proportion of Abra's population eats rice mixed with maize grits on a 60-40 or 70-30 ratio during the maize harvest months from August to November.

Tenant farmers of cash crops, landless farm laborers, and fishermen had the least diverse diets, while the most diverse were, as expected, those of the professionals and salaried workers, the households of workers employed overseas, and the landowning rice farmers. Professionals depended less on cereals for their caloric needs and obtained a relatively higher proportion from such foods as bread, cooking oil, milk, meat, and eggs. The opposite was true for the low-income occupational groups, such as the landless farm laborers, who depended on rice for 82 percent of total caloric intakes.

Table 9 indicates the increasing diversification in the average diet as income increases. This is marked by the decreasing but still significant role of rice and maize in

Table 10—Calorie acquisition by food groups, survey round, occupation, and income group, 1983-84

Category	Daily Calorie Acquisition Per AEU	Rice	Maize	Bread	Sweet Potatos/ Cassava	Sugar	Cooking Oil	Poultry	Fish	Pork and Beef	Milk and Eggs	Fruits and Vegetables	Other Foods
							(percent of total calories acquired)						
Entire sample	1,837	62.7	5.7	1.7	1.6	3.7	3.1	2.0	3.6	1.1	1.8	5.6	7.4
Province													
Abra	1,818	55.4	16.2	1.5	2.2	3.1	2.8	1.7	0.9	1.2	1.3	6.0	7.7
Antique	1,915	65.8	1.1	1.9	0.9	4.0	3.3	1.8	6.5	0.8	1.7	4.7	7.5
South Cotabato	1,736	66.0	1.1	1.8	2.0	3.8	3.2	2.7	2.0	1.6	2.3	6.5	7.0
Survey round													
May 1983	1,777	64.4	1.6	2.2	1.9	4.6	3.4	1.6	4.4	1.5	2.0	5.0	7.4
November 1983	1,903	62.5	0.2	2.2	0.8	3.4	4.3	1.6	3.4	1.2	2.5	5.7	7.2
May 1984	1,911	63.6	2.6	1.4	2.3	3.5	3.6	2.2	3.5	1.0	1.5	7.1	7.7
November 1984	1,756	60.1	12.7	1.3	1.3	3.2	1.2	2.6	2.9	0.8	0.9	5.6	7.4
Occupational categories													
Rice farmer landowner	2,012	59.4	10.5	1.5	1.8	3.5	2.6	2.3	2.5	1.1	1.4	6.0	7.4
Maize farmer landowner	1,770	62.6	5.0	1.5	1.7	3.5	2.6	2.9	1.8	1.7	2.5	6.6	7.6
Farmer, other crops	1,899	65.4	2.9	1.7	0.9	3.5	4.2	2.9	2.1	1.3	1.4	5.8	7.7
Tenant rice farmer	1,914	55.7	14.8	1.3	1.7	3.0	2.6	2.7	1.2	1.2	1.7	6.8	7.3
Tenant maize farmer	1,849	62.5	3.4	1.6	2.2	3.7	3.4	2.6	1.9	1.3	1.7	7.7	8.0
Tenant other crops	1,857	57.3	12.0	1.3	2.4	3.2	3.0	1.9	1.3	1.2	0.7	6.3	9.4
Landless farm laborer	1,655	62.7	8.9	1.4	2.2	3.0	2.7	1.9	1.8	1.1	2.1	4.7	7.5
Wage earner	1,767	64.6	5.7	1.7	1.6	3.9	3.0	1.8	2.7	1.0	1.1	5.0	7.9
Professional/salaried	2,184	56.4	3.6	2.8	1.4	5.1	3.9	2.5	2.9	2.7	2.7	8.8	7.2
Fishermen, boat owners	1,926	62.1	4.2	1.6	1.1	2.8	3.1	1.7	10.1	0.5	1.0	4.7	7.1
Hired fishermen	1,877	68.1	0.3	1.8	0.7	3.3	6.5	1.5	8.5	0.7	1.1	3.1	4.4
Employed overseas	1,795	62.3	4.7	2.4	1.6	4.6	3.4	1.7	2.4	1.3	2.3	5.9	7.4
Occupation unclassified	1,849	63.9	4.5	1.9	1.7	4.0	3.4	1.9	2.6	1.2	1.8	6.0	7.1
Income group													
First quartile (lowest)	1,696	64.5	5.0	1.6	1.3	3.4	3.1	1.7	3.9	0.9	1.9	5.0	7.7
Second quartile	1,831	62.8	6.6	1.6	1.7	3.4	3.0	1.9	4.0	0.9	1.5	5.2	7.4
Third quartile	1,852	62.3	5.3	1.8	1.8	3.7	3.2	2.2	3.3	1.2	1.6	5.7	7.9
Fourth quartile	1,970	61.0	5.8	2.0	1.5	4.3	3.3	2.2	2.9	1.6	2.0	6.6	6.8

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

overall food consumption and the increasing relative importance of such calorie sources as bread, cooking oil, sugar, beef, pork, poultry, milk, and eggs. Although the poorest income group, as expected, derived the highest proportion of total calories from rice and maize, their diet was surprisingly high in fish, fruits, and vegetables. One possible explanation is that the lowest income group receives a relatively higher proportion of their nonstaple foods as wages (such as fish) or as gifts from neighbors (backyard produce of fruits and vegetables).

The share of calories from cooking oil for the highest income quartile was almost twice that of the lowest income group. The same trend can be observed for milk, eggs, pork, beef, and bread.

It appears that the 24-hour food weighing method overestimated the consumption of rice and underestimated the consumption of virtually all other commodities. This pattern was consistent for all population groups. As a consequence, the relative importance of rice in the diet is much lower if food acquisition data are used.

The difference between food acquisition and food consumption data is large for sugar, fruits and vegetables, and other foods.[17] It is conceivable that these commodities played a more important role in weekend meals and therefore were underrepresented in the 24-hour weighing. Or, sugar used in food preparation and in coffee may not have been fully accounted for in the food weighing, which focused on the main meals. Finally, fruits and vegetables consumed between meals may not have been fully reflected in the food weighing.

Maize acquired under flexible period recall is reported to be more than twice the amount of maize consumed under 24 hour weighing. This difference can be traced almost totally to maize in Abra, which was estimated to be 125 calories per AEU per day using the weighing method and 318 calories per AEU per day using recall. There is no obvious explanation for this difference.

Individual Calorie Intake and Adequacy

For a subsample composed of 140 households, individual food consumption data were collected, using a combination of techniques. Food weighing and observation techniques were used in determining intrafamilial distribution of food, while the recall method was used in determining food consumed outside the home. Data were collected for every member of the household over a 24-hour period, and the survey was repeated for the same households and members four times during the study period.

To assess whether a person consumed an amount more, less, or equal to the average calorie requirement, the study compares the calories consumed with the Philippine RDA for calories.[18] Table 11 provides data on calorie intake and calorie adequacy ratios (intake divided by requirements) by sex and age group for each of the four population quartiles. The mean calorie intake of preschool children was far below requirements, particularly for females, who obtained only 50 to 55 percent of their requirements. Male preschool children, although better off than their female counterparts, still consumed much less than the norm. The difference between adequacy rates for male and female preschoolers is statistically significant at the 5 percent level.

The calorie adequacy of adults above 18 years of age was higher than that for children and adolescents. There was no significant difference between the husbands' and wives' calorie adequacy, except when the wives were pregnant or lactating. Women who were pregnant or lactating at the time of the survey had adequacy ratios of 0.69 compared to 0.78 for all wives and

[17] Such differences were also found in Egypt. See 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).

[18] Philippines, National Nutrition Council, Nutrition Research Committee, *Philippine Recommended Dietary Allowances, Part I, Nutrients* (Manila: National Nutrition Council, 1976).

Table 11—Calorie intakes of groups of individual household members

Gender	Age	First Income Quartile			Second Income Quartile			Third Income Quartile		
		Daily Calorie Intake	Calorie Adequacy	Number of Observations[a]	Daily Calorie Intake	Calorie Adequacy	Number of Observations[a]	Daily Calorie Intake	Calorie Adequacy	Number of Observations[a]
	(years)		(percent)			(percent)			(percent)	
Male	1–6	873	0.59	115	877	0.61	89	817	0.59	114
Male	7–12	1,221	0.65	27	1,355	0.70	39	1,264	0.70	74
Male	13–18	1,675	0.67	16	1,520	0.60	29	1,356	0.53	28
Male	19–39	1,906	0.74	109	2,055	0.80	91	1,942	0.75	122
Male	40–64	1,986	0.83	19	2,074	0.86	23	2,118	0.89	33
Male	65 and older	1,914	0.97	5	968	0.52	3	2,251	1.14	6
Female	1–6	711	0.52	128	797	0.56	104	818	0.55	140
Female	7–12	1,114	0.58	52	1,197	0.62	71	1,171	0.61	81
Female	13–18	1,263	0.58	11	1,353	0.62	20	1,189	0.60	26
Female	19–39	1,607	0.73	123	1,648	0.76	100	1,581	0.75	141
Female	40–64	1,438	0.78	28	1,519	0.88	26	1,618	0.93	41
Female	65 and older	1,235	0.90	10	1,270	0.90	15	1,582	1.09	6
Male (household head)		1,955	0.77	116	2,117	0.84	98	2,032	0.81	130
Female (spouse)		1,591	0.73	134	1,598	0.76	110	1,625	0.80	143
Pregnant or lactating women		1,606	0.68	90	1,704	0.72	59	1,589	0.68	69

Gender	Age	Fourth Income Quartile			Total for Entire Sample		
		Daily Calorie Intake	Calorie Adequacy	Number of Observations[a]	Daily Calorie Intake	Calorie Adequacy	Number of Observations[a]
	(years)		(percent)			(percent)	
Male	1–6	902	0.63	125	868	0.60	443
Male	7–12	1,368	0.69	97	1,348	0.69	237
Male	13–18	1,374	0.55	32	1,455	0.58	105
Male	19–39	1,880	0.73	88	1,944	0.75	410
Male	40–64	1,969	0.82	41	2,035	0.85	116
Male	65 and older	1,717	0.88	11	1,795	0.92	25

(continued)

Table 11—Continued

Female	1–6	858	0.59	111	794	0.55	483
Female	7–12	1,197	0.64	65	1,173	0.61	269
Female	13–18	1,350	0.63	37	1,324	0.61	94
Female	19–39	1,682	0.81	132	1,628	0.76	496
Female	40–64	1,364	0.76	39	1,487	0.84	134
Female	65 and older	1,577	1.11	12	1,377	0.98	43
Male (household head)		2,020	0.80	101	2,028	0.80	445
Female (spouse)		1,691	0.83	135	2,152	0.78	522
Pregnant lactating women		1,737	0.72	47	1,646	0.69	265

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

Note: These are data from the four survey rounds combined.

[a] The number of observations is the number of persons times the number of interviews of each person.

0.80 for husbands. Again, the calorie adequacy rate tended to rise as household income increased for most groups. The patterns observed in this study essentially conform to those observed in other regions in the Philippines.[19]

These findings suggest that in order to reach nutritionally vulnerable household members, targeting households with malnourished preschoolers may be inadequate. School-age children and adolescents, particularly females, were as deficient in calories as preschoolers.

Nutritional Status of Preschool Children

Anthropometric data for all preschool children in the sample households provide the basis for determining their nutritional well-being relative to a particular growth standard. Four indicators of nutritional status are reported in Table 12: mean weight as a percent of standard, proportion of children below 75 percent of standard weight-for-age, proportion below 60 percent, and Z-scores of weight-for-age. Although a local Philippine weight standard is available, this portion of the study uses international standards developed by the National Center for Health Statistics of the United States in order to facilitate international comparisons of results.

Results reveal that one of every four children in the study areas is malnourished to either the second or third degree (less than the 75 percent cutoff suggested in the Gomez classification system). Malnutrition appears to have been higher in the province of Antique than in the two other sample provinces. The data suggest that malnutrition declined dramatically from 34 to 18 percent during the 17 months between the first and last survey round. The improvement in child weight relative to the standard is also reflected in the mean weight-for-age, which increased from 80.7 to 85.0 percent. The Z scores for weight-for-age are also consistent with nutritional improvement during the period.

The incidence of child malnutrition varied according to the occupational group of the parents. The highest percentage of malnourished children belonged to families of hired fishermen (40 percent), boat-owning fishermen (30 percent), tenant farmers of nonfood crops (28 percent), maize farmers (24 percent), wage earners (23 percent), and landless farm laborers (22 percent). The groups that were relatively well off were the children of professionals and salaried workers and landowning rice farmers—the occupational groups with the highest incomes (see Table 6). These results indicate that income and sources of income are factors that account for differences in nutritional status across occupational groups. The analysis of nutritional level by income group also bears out this observation. It shows that 15.9 percent of children in the highest income quartile were malnourished, compared with 29.8 percent of children belonging to the lowest income quartile. Z-scores of weight-for-age and mean weight for-age show similar improvements as income increases.

[19] Robert E. Evenson, Barry M. Popkin, and Elizabeth K. Quizon, "Nutrition, Work and Demographic Behavior in Rural Philippine Households," in *Rural Households in Asia*, ed. Hans B. Binswanger et al. (Singapore: Singapore University Press, 1980); Melba B. Aligaen and Cecilia A. Florencio, "Intra-Household Nutrient Distribution and Adequacy of Food and Nutrient Intake of Filipino Urban Households," *Philippine Journal of Nutrition* (January-March 1980): 11-19; and Rosario Valenzuela, "A Study on Nutrient Distribution within the Family and Factors Affecting Nutrient Intake," University of the Philippines, Diliman, 1977 (mimeographed).

Table 12—Nutritional status of preschool children, 1983-84

Category	Number of Observations	Mean Weight as a Percent of Standard Weight-for-Age	Mean Z-Scores of Weight-for-Age	Percentage of Malnourished Children	
				Second Degree[a]	Third Degree[b]
		(percent)		(percent)	
Entire sample[c]	353	83.12	-1.64	23.16	1.84
Province[c]					
Abra	803	83.85	-1.58	20.33	1.00
Antique	1,336	82.71	-1.71	26.24	1.81
South Cotabato	914	83.09	-1.60	20.85	2.65
Survey round					
May 1983	768	80.74	-1.87	29.88	4.42
November 1983	766	83.18	-1.60	24.40	1.36
May 1984	770	83.90	-1.57	20.99	0.53
November 1984	749	85.03	-1.47	16.82	0.90
Occupational categories[c]					
Rice farmer landowner	194	86.28	-1.33	20.27	1.72
Maize farmer landowner	228	82.97	-1.70	22.92	3.65
Farmer, other crops	83	84.94	-1.48	17.14	0.95
Tenant rice farmer	94	82.37	-1.70	22.56	0.00
Tenant maize farmer	138	84.22	-1.43	18.01	1.90
Tenant, other crops	53	80.97	-1.82	27.06	1.18
Landless farm laborer	258	83.47	-1.63	21.54	1.03
Wage earner	801	83.09	-1.64	22.05	1.78
Professional/salaried	100	86.53	-1.31	14.87	1.03
Fishermen, boat owners	410	81.23	-1.87	30.63	2.38
Hired fishermen	35	80.03	-2.03	41.42	2.86
Employed overseas	233	83.86	-1.63	20.94	0.49
Occupation unclassified	426	82.75	-1.64	24.78	2.83
Income group[c]					
First quartile (lowest)	763	81.35	-1.84	29.20	2.92
Second quartile	763	82.06	-1.73	26.35	1.80
Third quartile	763	83.40	-1.64	21.98	1.49
Fourth quartile	764	86.07	-1.34	14.86	1.19

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

Note: The z score is a method used in standardizing the distribution of actual weight of the child relative to the standard weight for a child of that sex and age. The standards devised by the U.S. National Center for Health Statistics (NCHS) were used in the study.

[a] Second degree malnutrition includes those children between 60 and 75 percent of the standard weight for age.

[b] Third degree malnutrition includes children weighing less than 60 percent of the standard weight for age.

[c] These data are for all survey rounds combined.

7

A COMPARATIVE ANALYSIS OF THE EFFECTS OF THE FOOD PRICE SUBSIDY SCHEME

In this chapter the effects of each of the two components of the scheme—price subsidy and nutrition education—are estimated based on direct comparisons between households that received these components and households that did not. As explained earlier, the first survey round was done before the scheme was implemented and the fourth round after the scheme was completed. To avoid the effects of seasonal variations, the third round was done exactly one year after the first and the fourth round one year after the second. Thus, a direct comparison between rounds one and three should yield an estimate of the impact of the scheme provided no other changes took place during the year that influenced the outcome variable. But such changes may have occurred. Therefore a control subsample—one that was not a part of the scheme—is needed. Assuming that any external changes were the same for the control subsample and the subsample participating in the scheme, these external effects can be isolated from the effects of the scheme.

This is the approach used here. Means for control and treatment groups for each survey round and means for survey rounds one and three and two and four were tested statistically for significant differences. Then the changes in the treatment groups from the price subsidy and the nutrition education program were estimated using the methods presented in Chapter 5. Estimates are provided for the impact on household food expenditures, calorie acquisition, and calorie consumption, as well as calorie adequacy of groups of individuals, and mean weight and height for age of preschoolers.

Household Food Expenditures

Household food expenditures increased greatly for all household groups because food prices rose steeply during the study period (Table 13). The increase was larger for households receiving the subsidy, that is, about 9 percent—approximately the size of the subsidy—after the scheme had been in effect for 10 months (Table 14). These households continued to spend more on food after the scheme was discontinued. Households receiving both the subsidy and nutrition education showed the largest increase, but nutrition education without the subsidy does not seem to have influenced food expenditures. Clearly, enhancement of purchasing power of the poor and improvement of their nutrition-related knowledge are strongly complementary. The effect of one is greatly influenced by the presence of the other.

Household Food Acquisition

Household calorie acquisition increased with the introduction of the subsidy and fell back almost to presubsidy levels when the subsidy was discontinued (Table 15). Households receiving the subsidy increased their daily calorie acquisition by about 250 calories per AEU, while the calories acquired by households in the control group actually declined by almost 30 calories per AEU per day. On the assumption that this fall was caused by factors (primarily price increases) that also influenced the subsidized households, the impact of the subsidy was judged to be about 280 calories per AEU per day, including the decrease avoided. Thus, households receiving the subsidy acquired about 19 percent more calories than they would have without the subsidy (Table 16). Although food acquisition fell when the scheme ended, it was still about 11 percent above prescheme levels after adjusting for effects of external factors. Thus, it appears that the

Table 13—Weekly food expenditures for each subsample and survey round

Subsample/Levels of Significance	Survey Round 1	2	3	4	Levels at Which Means are Significantly Different[a]: Between Rounds 1 and 3	Between Rounds 2 and 4
Subsample receiving subsidy	20.0	24.2	36.5	34.0	0.001	0.001
With nutrition education	20.4	25.0	36.6	34.2	0.001	0.001
Without nutrition education	19.5	23.3	36.3	33.7	0.001	0.001
Subsample not receiving subsidy	20.4	21.9	34.2	32.9	0.001	0.001
With nutrition education	21.4	22.5	35.8	34.6	0.001	0.001
Without nutrition education	19.4	21.3	32.3	31.3	0.001	0.001
Subsample receiving nutrition education	20.9	23.8	36.2	34.4	0.001	0.001
Subsample receiving no nutrition education	19.5	22.3	34.5	32.5	0.001	0.001
Levels at which means are significantly different[a]						
Subsidy versus no subsidy						
Total sample	n.s.	0.001	0.05	n.s.	0.001	0.001
Subsample receiving nutrition education	n.s.	0.005	n.s.	n.s.	0.001	0.001
Subsample receiving no nutrition education	n.s.	0.05	0.05	0.05	0.001	0.001
Nutrition education versus nutrition education	0.01	n.s.	n.s.	0.05	0.001	0.001

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

[a] Significance is based on t-test; n.s. means not significant at the 0.10 level.

Table 14—Change in household food expenditures due to price subsidy or nutrition education

Scheme	Time of Measurement: Two Months After Initiation of Scheme	Ten Months After Initiation of Scheme	Two Months After Termination of Scheme
	(percent)		
Subsidy versus no subsidy			
Total sample	12.7	8.9	5.4
Subsample receiving nutrition education	16.6	7.2	3.7
Subsample receiving no nutrition education	8.8	11.8	7.1
Nutrition education versus no nutrition education	−0.4	−2.1	−1.2

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

Notes: Percentages of change in food expenditures are in comparison to the baseline and corrected for exogenous changes reflected in the control sample. Changes are estimated on the basis of direct comparisons between control and treatment populations. The value of the subsidy was 9.25 percent of food expenditures of households receiving subsidies in survey round 2 and 8.5 percent in round 3.

Table 15—Daily calorie acquisition for each subsample and survey round

Subsample/Levels of Significance	Survey Round 1	2	3	4	Levels at Which Means are Significantly Different: Between Rounds 1 and 3	Between Rounds 2 and 4
Subsample receiving subsidy	1,742	2,038	2,009	1,788	0.001	0.001
With nutrition education	1,798	2,063	2,029	1,746	0.001	0.001
Without nutrition education	1,686	2,013	1,989	1,831	0.001	0.001
Subsample not receiving subsidy	1,836	1,793	1,802	1,710	n.s.	0.050
With nutrition education	1,889	1,844	1,873	1,778	n.s.	0.050
Without nutrition education	1,784	1,742	1,731	1,643	n.s.	n.s.
Subsample receiving nutrition education	1,844	1,954	1,951	1,762	0.050	0.001
Subsample receiving no nutrition education	1,735	1,878	1,860	1,737	n.s.	0.005
Levels at which means are significantly different						
Subsidy versus no subsidy						
Total sample	0.050	0.001	0.001	0.050		
Subsample receiving nutrition education	n.s.	0.001	0.005	n.s.		
Subsample receiving no nutrition education	n.s.	0.001	0.001	0.001		
Nutrition education versus no nutrition education	n.s.	n.s.	0.005	n.s.		

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Note: Levels of significance are based on t test; n.s. means not significant at the 0.10 level.

Table 16—Change in daily calorie acquisition due to price subsidy or nutrition education

Scheme	Time of Measurement: Two Months After Initiation of Scheme	Ten Months After Initiation of Scheme	Two Months After Termination of Scheme
		(percent)	
Subsidy versus no subsidy			
Total sample	20.9	18.6	11.2
Subsample receiving nutrition education	17.8	14.0	3.4
Subsample receiving no nutrition education	21.6	21.0	17.3
Nutrition education versus no nutrition education	-2.1	-1.3	-4.6

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Notes: Percentages of change are in comparison to the baseline and corrected for exogenous changes reflected in the control sample. Changes are estimated on the basis of direct comparisons between control and treatment populations.

scheme had a long-term effect on food acquisition over and above the effect of the income transfer itself. This effect does not seem to originate with nutritional education, which, if anything, had a negative effect on calorie acquisition.

Household Calorie Consumption

According to data from 24-hour food weighing, household calorie consumption by subsidized households increased slightly, although these changes were not statistically significant. During the same period, calories consumed by nonsubsidized households decreased significantly (Table 17). Thus it appears that the subsidy effectively countered a decrease stemming from other factors and resulted in calorie consumption about 10 percent above what it would have been without the subsidy (Table 18). The negative effects of external factors are fully reflected in the calorie consumption of the subsidized households after the scheme was discontinued. Whereas consumption levels of the two groups were significantly different during the latter part of the scheme, this difference disappeared as soon as the scheme was terminated, leaving both groups consuming less than before. Nutrition education appears to have had little or no effect on calorie consumption as measured by 24-hour food weighing.

Calorie Consumption by Individuals

The calorie adequacy rate increased during the period of the subsidy and fell after the subsidy was terminated for virtually all members of subsidized households (Tables 19 and 20). But adult males and females appear to have gained considerably more from the scheme than children. Some of the adults' relative gain seems to have been maintained after the scheme was discontinued. However, school-aged children, who did gain some from the scheme, were considerably worse off after the scheme was terminated than before it was initiated. There is no obvious explanation for this phenomenon.

Table 17—Daily household calorie consumption for each subsample and survey round

Subsample/Levels of Significance	Survey Round 1	2	3	4	Levels at Which Means are Significantly Different: Between Rounds 1 and 3	Between Rounds 2 and 4
Subsample receiving subsidy	1,741	1,676	1,788	1,651	n.s.	n.s.
With nutrition education	1,724	1,669	1,804	1,613	0.050	n.s.
Without nutrition education	1,757	1,684	1,772	1,688	n.s.	n.s.
Subsample not receiving subsidy	1,751	1,763	1,639	1,689	0.001	0.050
With nutrition education	1,791	1,814	1,636	1,717	0.001	n.s.
Without nutrition education	1,710	1,710	1,641	1,661	n.s.	n.s.
Subsample receiving nutrition education	1,738	1,742	1,720	1,665	n.s.	0.050
Subsample receiving no nutrition education	1,734	1,697	1,707	1,675	n.s.	n.s.
Levels at which means are significantly different						
Subsidy versus no subsidy						
Total sample	n.s.	0.050	0.001	n.s.		
Subsample receiving nutrition education	n.s.	0.005	0.001	0.050		
Subsample receiving no nutrition education	n.s.	n.s.	0.001	n.s.		
Nutrition education versus no nutrition education	n.s.	n.s.	n.s.	n.s.		

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Notes: Levels of significance are based on t-test; n.s. means not significant at the 0.10 level.

Table 18—Change in daily household calorie consumption due to price subsidy or nutrition education

Scheme	Time of Measurement		
	Two Months After Initiation of Scheme	Ten Months After Initiation of Scheme	Two Months After Termination of Scheme
		(percent)	
Subsidy versus no subsidy			
Total sample	-4.4	9.7	-1.7
Subsample receiving nutrition education	-4.4	14.5	-2.4
Subsample receiving no nutrition education	-4.2	5.9	-1.1
Nutrition education versus no nutrition education	2.4	0.5	-0.8

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Notes: Percentages of change are in comparison to the baseline and corrected for exogenous changes reflected in the control sample. Changes are estimated on the basis of direct comparisons between control and treatment populations.

According to this measurement, nutrition education had a significant and positive effect on the calorie adequacy of most groups, especially pregnant and lactating women, when provided along with food subsidies. No impact is detected when nutrition education was provided alone, confirming once again the importance of providing nutrition education together with expanded purchasing power.

Nutritional Status

The weight-for-age of the preschoolers in the sample relative to standard weight-for-age increased during the study period (Table 21). The increase was largest for preschoolers in the households that participated in the subsidy scheme (Table 22). Based on these comparisons, it may be concluded that the scheme improved the average weight of the preschoolers relative to the standards. The effects continued for at least two months beyond the termination of the scheme. Nutrition education does not appear to have contributed to these improvements.

Table 23 shows changes in the height-for-age of the preschoolers studied. A general increasing trend was found in all groups. The increase was slightly larger among preschoolers from subsidized households. Thus, it appears that the scheme caused an increase in height of 2.7 percent during the first 10 months of its existence. The effect was slightly higher in the group receiving both subsidy and nutrition education than in those receiving only one of those components (Table 24).

Table 19—Individual calorie adequacy by age and gender for each subsample and survey round

Survey Round/ Sample	Adults					Children					
				All 14 Years		1-7 Years		7-14 Years		All	
	Husbands	Wives	Pregnant/ Lactating Women	Male	Female	Male	Female	Male	Female	Male	Female
	(percent)										
Survey round 1											
Subsidized											
With education	0.73	0.78	0.65	0.75	0.79	0.55	0.56	0.66	0.61	0.67	0.66
Without education	0.70	0.74	0.70	0.73	0.78	0.60	0.57	0.72	0.77	0.67	0.69
Nonsubsidized											
With education	0.96	0.88	0.71	0.90	0.81	0.55	0.57	0.64	0.59	0.73	0.71
Without education	0.85	0.71	0.56	0.74	0.69	0.67	0.46	0.64	0.51	0.69	0.59
Survey round 2											
Subsidized											
With education	0.88	0.86	0.76	0.85	0.86	0.63	0.62	0.65	0.68	0.73	0.73
Without education	0.78	0.87	0.77	0.79	0.82	0.62	0.61	0.65	0.65	0.68	0.71
Nonsubsidized											
With education	0.85	0.78	0.67	0.79	0.76	0.56	0.53	0.69	0.55	0.68	0.63
Without education	0.68	0.72	0.60	0.62	0.69	0.60	0.3[illegible]	0.41	0.47	0.58	0.55
Survey round 3											
Subsidized											
With education	0.88	0.84	0.79	0.82	0.85	0.66	0.61	0.72	0.69	0.74	0.73
Without education	0.82	0.82	0.77	0.81	0.85	0.60	0.62	0.61	0.56	0.68	0.72
Nonsubsidized											
With education	0.77	0.76	0.73	0.75	0.77	0.55	0.54	0.66	0.55	0.66	0.66
Without education	0.80	0.76	0.62	0.69	0.71	0.62	0.54	0.65	0.58	0.65	0.63
Survey round 4											
Subsidized											
With education	0.72	0.80	0.71	0.68	0.80	0.65	0.52	0.61	0.52	0.66	0.64
Without education	0.70	0.74	0.72	0.72	0.80	0.71	0.67	0.68	0.58	0.70	0.70
Nonsubsidized											
With education	0.85	0.80	0.71	0.81	0.77	0.60	0.62	0.74	0.64	0.71	0.69
Without education	0.88	0.76	0.71	0.82	0.76	0.68	0.45	0.72	0.71	0.72	0.64

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

Table 20—Change in calorie adequacy for selected groups of individuals due to price subsidy or nutrition education

Scheme	Husbands			Wives			Adult Males			Adult Females		
	a	b	c	a	b	c	a	b	c	a	b	c
	(percent)											
Subsidy versus no subsidy												
Total sample	36.4	37.9	5.8	20.7	15.0	3.9	28.0	26.2	−5.4	9.2	9.1	−1.4
Subsample receiving nutrition education	36.2	50.3	11.4	24.4	24.7	12.8	29.1	31.2	0.7	16.0	13.2	6.5
Subsample receiving no nutrition education	39.3	24.5	−3.4	15.9	3.5	−6.6	29.2	19.0	−11.0	5.1	5.9	−6.9
Nutrition education versus no nutrition education (total sample)	9.4	−6.0	−8.2	−9.9	−10.9	−6.2	3.0	−6.1	−13.2	−1.4	−3.9	−6.3

Scheme	Pregnant or Lactating Women			Male Children 1-7 Years			Female Children 1-7 Years		
	a	b	c	a	b	c	a	b	c
	(percent)								
Subsidy versus no subsidy									
Total sample	13.2	8.0	−4.6	14.2	12.3	11.8	23.0	4.7	1.4
Subsample receiving nutrition education	23.9	18.2	9.2	12.5	20.0	8.3	19.1	15.0	−14.6
Subsample receiving no nutrition education	2.7	−0.7	−18.9	15.4	8.1	16.6	29.6	−7.3	20.2
Nutrition education versus no nutrition education (total sample)	−3.3	0.6	−8.6	14.5	16.4	4.7	5.8	−8.8	−7.1

Scheme	Male Children 8-14 Years			Female Children 8-14 Years			All Males			All Females		
	a	b	c	a	b	c	a	b	c	a	b	c
	(percent)											
Subsidy versus no subsidy												
Total sample	9.6	−5.8	−17.4	4.7	−11.9	−35.5	19.4	13.4	0.1	16.7	7.4	−7.3
Subsample receiving nutrition education	−8.7	5.8	−20.1	19.6	21.3	−21.4	17.0	22.2	1.3	24.7	19.0	−0.2

(continued)

Table 20—Continued

Subsample receiving no nutrition education	40.9	−16.6	−16.1	−8.4	−36.1	−45.9	20.7	7.7	0.1	10.4	−2.3	−6.5
Nutrition education versus no nutrition education (total sample)	32.3	14.6	1.6	18.1	16.0	−4.8	9.5	1.5	−5.6	0.1	−4.5	−7.3

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.

Notes: Percentage of change in food expenditures are in comparison to the baseline and corrected for exogenous changes reflected in the control sample. Changes are estimated on the basis of direct comparisons between control and treatment populations. The value of the subsidy was 9.25 percent of food expenditures of households receiving subsidies in survey round 2 and 8.5 percent in round 3. a is the survey round 2 months after initiation of the scheme; b is the survey round 10 months after initiation of the scheme; and c is the survey round 2 months after termination of the scheme.

Table 21—Mean weight-for-age of all preschoolers for each subsample and survey round

Subsample/Levels of Significance	Survey Round				Levels at Which Means are Significantly Different	
	1	2	3	4	Between Rounds 1 and 3	Between Rounds 2 and 4
	(percent)					
Subsample receiving subsidy	77.3	81.2	84.4	84.9	0.001	0.001
With nutrition education	79.9	81.5	83.9	85.3	0.001	0.005
Without nutrition education	74.4	80.9	85.1	84.6	0.001	0.005
Subsample not receiving subsidy	84.3	84.2	82.2	83.3	n.s.	n.s.
With nutrition education	82.8	81.6	81.0	81.6	n.s.	n.s.
Without nutrition education	85.7	86.4	83.4	84.9	0.050	0.050
Subsample receiving nutrition education	80.4	81.0	82.7	83.7	0.001	0.010
Subsample receiving no nutrition education	81.4	83.5	84.2	84.6	0.001	0.001
Levels at which means are significantly different						
Subsidy versus no subsidy						
Total sample	0.05	n.s.	0.005	0.005		
Subsample receiving nutrition education	0.05	n.s.	n.s.	0.050		
Subsample receiving no nutrition education	n.s.	n.s.	0.005	0.050		
Nutrition education versus no nutrition education	n.s.	n.s.	n.s.	n.s.		

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Notes: Levels of significance are based on t-test; n.s. means not significant at 0.10 level.

Table 22—Change in weight-for-age of preschoolers due to price subsidy or nutrition education

Scheme	Time of Measurement		
	Two Months After Initiation of Scheme	Ten Months After Initiation of Scheme	Two Months After Termination of Scheme
	(percent)		
Subsidy versus no subsidy			
Total sample	5.3	12.1	11.3
Subsample receiving nutrition education	3.5	7.3	8.3
Subsample receiving no nutrition education	8.0	17.4	14.9
Nutrition education versus no nutrition education	−1.7	0.7	−0.3

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Notes: Percentages of change are in comparison to the baseline and corrected for exogenous changes reflected in the control sample. Changes are estimated on the basis of direct comparisons between control and treatment populations.

Table 23—Mean height-for-age of all preschoolers for each subsample and survey round

Subsample/Levels of Significance	Survey Round 1	2	3	4	Levels at Which Means are Significantly Different: Between Rounds 1 and 3	Between Rounds 2 and 4
	(percent)					
Subsample receiving subsidy	89.8	91.3	93.4	93.2	0.001	0.001
With nutrition education	89.2	90.7	93.7	93.0	0.001	0.005
Without nutrition education	90.7	91.9	93.2	93.3	0.010	n.s.
Subsample not receiving subsidy	91.8	92.0	93.0	92.4	0.050	n.s.
With nutrition education	92.8	93.4	94.7	94.4	0.050	n.s.
Without nutrition education	90.9	90.8	91.4	90.7	n.s.	n.s.
Subsample receiving nutrition education	90.7	91.8	94.1	93.6	0.001	0.010
Subsample receiving no nutrition education	90.8	9[illegible].4	92.4	92.2	0.010	n.s.
Levels at which means are significantly different						
Subsidy versus no subsidy						
Total sample	0.005	n.s.	n.s.	n.s.		
Subsample receiving nutrition education	0.001	0.001	n.s.	n.s.		
Subsample receiving no nutrition education	n.s.	n.s.	0.050	0.001		
Nutrition education versus no nutrition education	n.s.	n.s.	0.010	0.050		

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Notes: Levels of significance are based on t test; n.s. means not significant at the 0.10 level.

Table 24—Change in height-for-age of preschoolers due to price subsidy or nutrition education

Scheme	Time of Measurement: Two Months After Initiation of Scheme	Ten Months After Initiation of Scheme	Two Months After Termination of Scheme
		(percent)	
Subsidy versus no subsidy			
Total sample	1.4	2.7	3.1
Subsample receiving nutrition education	1.0	2.9	2.5
Subsample receiving no nutrition education	1.4	2.2	3.1
Nutrition education versus no nutrition education	0.5	2.0	1.6

Notes: Percentages of change are in comparison to the baseline and corrected for exogenous changes reflected in the control sample. Changes are estimated on the basis of direct comparisons between control and treatment populations.

8

A MULTIVARIATE ANALYSIS OF THE EFFECTS OF THE FOOD SUBSIDY SCHEME

Direct static comparisons may not yield reliable results because the effects of the scheme are not effectively separated from the effects of other factors.[20] Therefore, in this chapter comparative analysis is supplemented with empirical results of multivariate analysis, employing the analytical methodology presented in Chapter 5.

A comparison of the food consumption patterns between the first (baseline) survey and the subsequent survey rounds indicates that the rationed subsidies for rice were inframarginal for about 90 percent of the recipient households. On average, rice acquisition per capita was estimated at 118 kilograms annually before the subsidy was introduced, whereas the per capita ration was only 60 kilograms per year. For cooking oil, however, the rationed quantity was extramarginal. On average, per capita intake of cooking oil was about 2.20 kilograms per year, while the subsidized quantity was estimated at 4.70 kilograms per year.

Effects on Household Food Expenditures and Calorie Acquisition

The parameters of equation (3) in Chapter 5 are estimated by ordinary least squares from the pooled sample from the four survey rounds. The regression results are reported in the Appendix, Table 34, and the parameter estimates for the key variables are summarized in Table 25. The estimated price and income elasticities and the MPC's are reported in Table 26. As shown in Table 25, changes in household income significantly affected both food expenditures and calorie acquisition. Furthermore, the subsidy seems to have had an impact on these household variables over and above the effect expected from the real income embodied in the subsidy. Changes in the price of rice did not have a significant effect on either food expenditures or calorie acquisition. Changes in the price of cooking oil affected food expenditures as well as calorie acquisition significantly. No significant effect of the nutrition education component of the scheme was detected.

The estimated income elasticity for total food expenditures, which was about 0.68, is in the plausible range and is similar to those obtained in studies of Sri Lanka (0.72), Thailand (0.65), Egypt (0.69), and Bangladesh (0.67).[21] The calorie acquisition elasticity of 0.33 is about half of the food expenditure elasticity, indicating that even poor rural households have a tendency to shift to higher-priced sources of calories as incomes increase.[22] Thus, the average increase in household incomes of 8.0 percent brought about by the rice and oil subsidy is estimated to have caused an increase of 5.6 percent

[20] Per Pinstrup Andersen, "An Analytical Framework for Assessing Nutrition Effects of Policies and Programs," *Food Policy*, ed. Charles K. Mann and Barbara Huddleston (Bloomington: Indiana University Press, 1985), pp. 55-66.

[21] David E. Sahn, "Malnutrition and Food Consumption in Sri Lanka: An Analysis of Changes from 1969 to 1982," International Food Policy Research Institute, Washington, D.C., 1986 (mimeographed); Trairatvorakul, *Effects on Income Distribution and Nutrition;* Alderman and von Braun, *Effects of the Egyptian Food Ration and Subsidy System;* and Odin K. Knudsen and Pasquale L. Scandizzo, *Nutrition and Food Needs in Developing Countries*, Staff Working Paper 328 (Washington, D.C.: World Bank, 1979).

[22] This value is about the same as the average estimated by Alderman for a number of countries (Harold Alderman, *The Effect of Food Price and Income Changes on the Acquisition of Food by Low-Income Households* [Washington, D.C.: International Food Policy Research Institute, 1986]).

Table 25—Key coefficients for household food expenditure and food acquisition regressions

Independent Variable	Dependent Variable			
	Household Food Expenditures		Household Calorie Acquisition	
	Model A-1	Model A-2	Model B-1	Model B-2
	(pesos/AEU/day)		(calories/AEU/day)	
Log income	2.20 (57.82)[a]	2.16 (56.72)[a]	633.29 (27.37)[a]	623.07 (27.00)[a]
Subsidy	0.03 (7.30)[a]	0.16 (4.96)[a]	8.94 (3.32)[a]	68.23 (3.34)[a]
Price of rice	0.006 (0.37)	0.006 (0.34)	-12.11 (-1.12)	-12.22 (1.12)
Price of cooking oil	0.012 (4.11)[a]	0.004 (1.49)	-5.98 (3.51)[b]	7.45 (5.14)[a]
Nutrition education	-0.02 (-0.73)	-0.02 (-0.86)	22.67 (1.28)	21.86 (1.24)
Regression R^2	0.73	0.72	0.38	0.38
N	2,509	2,509	2,509	2,509

Notes: The adult equivalent unit (AEU) is a method used to convert the consumption of persons of different ages and sex to standard consumption units. The complete set of coefficients is given in the Appendix, Table 34. The figures in parentheses are t ratios.

[a] Significant at the 5 percent level.

[b] Significant at the 10 percent level.

in total food expenditures and 2.6 percent in calorie acquisition if the income transfer from the subsidy is treated the same as other income.

The estimated price elasticities for rice of −0.006 to −0.020 and −0.020 to −0.050 for cooking oil seem low, but these should not be confused with own-price elasticities. The price elasticities shown in Table 26 are price elasticities for total food expenditures and total calories, and they show the net effect after substitutions among commodities have taken place. Therefore, they would be expected to be lower than direct price elasticities for individual foods.

One of the issues addressed in this study—whether the subsidy scheme influences household food consumption over and above the effect of the income transfer as measured by the income elasticity above—is tested and evaluated using two different model specifications (see Chapter 5). As reported in Table 25, the subsidy component of the pilot scheme positively affects both household food expenditures and calorie acquisition: it is highly significant. The effect detected by the subsidy term is over and above the price and income effects. The effect of the nutrition education component of the pilot scheme is weak but positive. Although significant at only a 0.20 level, it appears important as a complementary intervention in the scheme. To further explore the effects of nutrition education on households, interaction between nutrition education and the subsidy—that is, both schemes operating simultaneously—are tested in regressions. Such tests indicate no differential effects of nutrition education-subsidy interaction on calorie and food acquisition.

The estimates of absolute effects can be gleaned from the MPCs and the price and income elasticities. The MPC results show that an additional P 1.00 of subsidy income would add P 0.69-0.98 to food expenditures. The 0.50 MPC for expenditures on food from all income sources other than subsidies is within the range usually found in poor rural areas in the developing world.

Table 26—Parameters for estimating the impact of the pilot subsidy scheme on household food expenditures and calorie acquisition

Independent Variable	Dependent Variable			
	Household Food Expenditures		Household Calorie Acquisition	
	Model A-1	Model A-2	Model B-1	Model B-2
Marginal propensity to consume				
All income net of subsidy	0.50[a]	0.53[a]	142[b]	153[b]
Subsidy income	0.98[a]	0.69[a]	363[b]	222[b]
Consumption parameters				
Income elasticity (net of subsidy)	0.66	0.70	0.32	0.34
Rice price elasticity	-0.01	-0.01	-0.02	-0.02
Oil price elasticity	-0.04	-0.04	-0.04	-0.04
Nutrition education effects	0.02	0.02	22.67	21.86

Notes: See the Appendix, Table 34, for a complete set of regression coefficients. The adult equivalent unit (AEU) is a method used to convert the consumption of persons of different ages and sex into standard consumption units.

[a] Pesos per AEU per day.

[b] Calories per AEU per day.

The difference in the MPC between cash and subsidy incomes is also large for calories. Thus, the marginal propensity to increase calorie consumption from subsidy income is about twice that of the MPC for all other sources of income. In absolute terms, every additional peso of subsidy increases calorie consumption by 222-363 calories per AEU. The impact of an additional peso of other income is about 150 calories per AEU.

Different MPCs for different sources of household income have also been found in other studies of consumption behavior in both developed and developing countries. In Kerala, India, there is evidence that participation in rice subsidy programs increased the MPCs of some households.[23] Several studies on the consumption effect of food stamps on U.S. households indicate that the MPC for subsidy transfer is twice to three times that of the MPC for money income.[24]

The behavioral change that caused a higher MPC for subsidy income cannot be fully explained. Perhaps the scheme generated an increased awareness among participants about food and nutrition needs over and above the explicit nutrition education intervention that accompanied the price subsidy. It is conceivable that mothers' awareness of the nutritional objectives of the scheme helped realign family budget priorities. In the pilot scheme, there was a strong persuasive element introduced by efforts to draw mothers into nutrition education classes administered by the extension workers.

Another plausible explanation is that the use of rice and oil as the food commodities in the scheme altered food budgets in such a way that the caloric content per unit of the household's food bundle was increased. Per capita daily calories acquired from rice increased from 326 grams prior to the subsidy to 423 grams when the subsidy was in force. Daily calories acquired from cooking oil increased by 30 percent. This raised the MPC for calories for some of the families. The calorie density per kilogram of rice and oil is about twice that of foods in the average food bundle of the study

[23] Shubh Kumar, *The Impact of Subsidized Rice on Food Consumption and Nutrition in Kerala*, Research Report 5 (Washington, D.C.: International Food Policy Research Institute, 1979).

[24] Senauer and Young, "Impact of Food Stamps on Food Expenditures."

households. Thus, in designing a project it is important to consider not only the economic value of the subsidized good but also its nutritive value if the program is to be nutritionally effective.

Evaluated at their mean values, the total energy increase from the scheme is equivalent to 130-138 calories per AEU per day. This calorie effect combines net income effects, price effects, and effects caused by higher MPCs for subsidy. The scheme's total impact on calories is equivalent to 7 percent of the calories consumed per person in the study households. In terms of food expenditures, the scheme effectively increased total food budgets by P 0.27-0.34 per AEU per day, basically the same as the average transfer value of the subsidy, which was P 0.31 per AEU per day.

Household income can be influenced by decisions regarding the allocation of time of each household member to various activities, including income earning. Food subsidies may cause a change in time allocation in general and in the allocation of time to income-earning activities in particular. Thus, it may be hypothesized that the subsidies reduced the time allocated to income-earning activities. This implies substitution between the real income embodied in the subsidies and household income from other sources.

Such substitution is ignored in the models used here and, if it is significant, the models overestimate the effect of the subsidies. To explore whether such a substitution occurred, the household income variable was replaced by predicted wage rates for the husband and wife of each household, and the models were rerun. Neither the size of the coefficient of the subsidy variable nor its level of significance changed appreciably. Furthermore, when the number of hours worked in income-earning activities and household incomes excluding the subsidy value were regressed on the value of the subsidy and a set of other variables, no significant effect of the subsidy on hours worked or household incomes from sources other than the subsidies was detected. Thus, it appears that the use of household incomes as an explanatory variable is acceptable for estimating the effect of the scheme.

Effects of Other Factors

The regression of food expenditures on household size gives negative and significant results, indicating that the presence of more family members reduces food consumption per AEU. Household size is generally more closely related to food expenditures than to calorie acquisition.

The education of the wife is strongly correlated with food expenditures, after controlling for incomes and nutrition education: the more educated the wife, the more she is likely to spend on food for the household. Perhaps she purchases more expensive calories, such as processed foods, because the opportunity cost of time spent on food preparation increases with education. Or perhaps higher education leads to a better understanding of the importance of adequate nutrition. Evidence from Nicaragua and elsewhere indicates that women's schooling plays a substantial role in family nutrition.[25] Higher education of the husband does not appear to affect food expenditures or calorie acquisition significantly.

Participation in food assistance programs such as those administered by Catholic Relief Services, CARE, and the World Food Programme significantly affected food expenditures and calorie acquisition among the study households (Appendix Table 34). The quantities received by households from such programs are not included in the estimates of total food expenditures or calories, and the significant and negative sign demonstrates that food from these programs was substituted for food from other sources.

The regressions show that a large share of total household income earned by women is associated positively with food expenditures and negatively with calorie acquisition (Appendix Table 34). This is consistent with

[25] Jere Behrman and Barbara Wolfe, "More Evidence on Nutrition Demand: Income Seems Overrated and Women's Schooling Underemphasized," *Journal of Development Economics* 14 (January-February 1984): 105-128.

the hypothesis that households where the opportunity cost of women's time is high tend to purchase more expensive calories—such as processed foods—to reduce food preparation time.

The degree to which households supply their own food is partly captured by the OWNFARM and OWNGARDEN variables. These variables significantly and positively affect calorie acquisition. The positive sign on total calorie effects indicates that households with a higher ratio of own-produce, all things being equal, tend to acquire more calories. Under the definition the calorie acquisition term covers calories from both purchased and own-produced foods.

Effects on Consumption of Rice, Oil, Fish, and Maize

The subsidy component of the scheme had a positive and significant effect on the consumption of rice, oil, and fish and a negative effect on the consumption of maize (Table 27). The MPC for rice from total household income, excluding the subsidy, is estimated to be 68 calories or slightly more than one-half of the MPC for total calories. The MPC from subsidy income is 210 calories compared to 226 for total calories. Thus, the increase in total calorie consumption brought about by the subsidy is almost totally accounted for by increasing rice consumption. The MPC for oil is 20 calories from the subsidy and 8 calories from other incomes.

The income elasticity is estimated to be about 0.2 for rice, 0.4 for oil, and 0.5 for fish, while it is negative but nonsignificant for maize. Own-price elasticities for rice and maize are negative but not significantly different from zero. Own-price elasticities for oil and fish are estimated to be about -0.6 and -0.8, respectively. Thus, price subsidies for extramarginal quantities of oil would be expected to increase oil consumption by 6 percent for each 10 percent reduction in its price. The nutrition education component of the scheme appears to have had a positive and significant impact on rice consumption.

Effects on Calorie Consumption by Preschool Children

As reported in Table 28 and in the Appendix, Table 36, calorie demand equations for individual preschoolers yielded statistically significant coefficients for the income and subsidy variables.

The scheme resulted in an additional effect on calories consumed by preschoolers over and above the effect operating through increases in the households' incomes and calorie consumption. This may be partly explained by the families' increased awareness of the nutritional problems of children. The regular monitoring of children's weights, conducted as part of the experiment, may have increased the mothers' awareness, especially since the nutrition education campaign stressed the importance of correct child feeding practices.

According to the demand models, the impact of the pilot scheme on daily calorie consumption of preschoolers between ages 13 and 83 months was 31-55 calories per child—about 3 to 6 percent of the average calorie intake of preschoolers in the sample. These figures are below the average estimated for the household both in absolute terms and relative to individual calorie requirements. For the household, the average effects per AEU were in the neighborhood of 136-138 calories per day.

Effects on the Nutritional Status of Children

Whether the calorie increases for preschool children resulting from the subsidy scheme translated into child growth is a critical question from a policy standpoint. An increase in calorie consumption may be viewed not as a measure of the ultimate outcome of policy, but rather as a measure of an intermediate outcome. This distinction is often critical in measuring the impact of a program. Indexes of child health and nutritional well-being are considered by many to be important indicators of current economic welfare of developing countries. It is one set of measures of the quality of

Table 27—Key coefficients and parameters for estimating the impact of the pilot subsidy scheme on the acquisition of rice, maize, oil, and fish

Independent Variable	Dependent Variable: Calorie Acquisition Per AEU Per Day			
	Rice	Maize	Oil	Fish
Log income per AEU (including subsidy)	333.13 (9.29)[a]	−32.67 (−0.96)	28.55 (6.50)[a]	39.64 (6.14)[a]
Dummy for subsidy	122.02 (3.89)[a]	−104.79 (−3.53)[a]	12.22 (3.18)[a]	52.40 (9.27)[a]
Price of rice	−5.81 (−0.35)	33.87 (2.15)[a]	−1.62 (−0.79)	4.10 (1.37)
Price of maize	7.89 (0.65)	−11.12 (−0.97)	0.54 (0.36)	0.22 (0.10)
Price of oil	−10.66 (−4.76)[b]	7.97 (3.77)[a]	−4.22 (−15.41)[a]	−0.77 (−1.90)[b]
Price of fish	−3.90 (−1.23)	−5.51 (−1.82)	−0.43 (−1.09)	−7.57 (−13.20)[a]
Nutrition education	78.14 (2.28)[a]	14.92 (0.58)	3.01 (0.91)	−4.27 (−0.88)
R^2	0.15	0.16	0.23	0.34
Number of observations	2,131	2,131	2,131	2,131
Marginal propensity to consume[c]				
All incomes (net of subsidy)	88	−9	8	10
Subsidy income	210	−113	20	63
Consumption parameters				
Income elasticity (net of subsidy)	0.23	−0.18	0.38	0.52
Price elasticity				
Rice	−0.01	0.55	−0.06	0.16
Maize	$3.0 \cdot 10^{-4}$	−0.004	$4.0 \cdot 10^{-4}$	$1.7 \cdot 10^{-3}$
Oil	−0.08	0.49	−0.62	−0.11
Fish	−0.02	−0.24	−0.05	−0.78
Nutrition education effects	78.14[a]	14.92	3.01	−4.27
Impact of subsidy on acquisition (calories per AEU per day)	227	−108	15	56

Notes: The numbers in parentheses are t-values. The adult equivalent unit (AEU) is a method used to convert the consumption of persons of different ages and sex into standard consumption units.
[a] Significant at the 5 percent level.
[b] Significant at the 10 percent level.
[c] Calories per AEU per peso.

life, which is itself a policy objective. A child's good health and nutritional status significantly influence his or her intelligence, health, and nutritional status as an adult and have a direct impact on adult productivity and earnings.[26]

The current state of knowledge on how to measure the effects of an intervention program on child nutritional status is quite poor, partly because of the difficulty in modeling the interactions among biological, behavioral, cultural, environmental, and socioeconomic factors that influence the nutritional status and health of children. It is quite possible, for example, that an increase in calories may increase energy

[26] Barbara Wolfe and Jere Behrman, "Determinants of Child Mortality, Health, and Nutrition in a Developing Country," *Journal of Development Economics* 11 (No. 1, 1982): 163 193.

Table 28—Regressions of calorie intake of children aged 13 to 83 months

Independent Variable	Dependent Variable: Calorie Intake Per Day			
	Model A-1	Model A-2	Model B-1	Model B-2
Log income per AEU per day	140.39 (3.64)[a]	129.05 (3.35)[a]	...	...
Household calorie acquisition per AEU per day	...	...	0.10 (3.34)[a]	0.09 (3.02)[a]
Subsidy	11.34 (3.64)[a]	100.27 (3.31)[a]	9.87 (2.87)[a]	88.35 (2.87)[a]
Price of rice	68.60 (1.91)[b]	45.87 (1.37)	63.36 (1.76)[b]	43.71 (1.31)
Price of cooking oil	-0.34 (-0.54)	-0.25 (-0.40)	-0.37 (-0.58)	-0.28 (-0.44)
Nutrition education	-55.97 (-1.90)[b]	-55.48 (-1.88)[b]	-62.14 (2.10)[a]	-61.21 (-2.07)[b]
R^2	0.43	0.43	0.43	0.43

Note: See the Appendix, Table 36, for the complete set of regressions. The numbers in parentheses are t-values.
[a] Significant at the 5 percent level.
[b] Significant at the 10 percent level.

expenditures and thereby improve the well-being of the child without changing anthropometry. There are also many measurement problems associated with anthropometric variables. In most cases, regression analyses based on cross-sectional data give very low R^2, indicating an insubstantial knowledge of factors that influence nutritional status or an inability to quantify and incorporate these factors into regression analysis.

The anthropometric data in this study—weight, height, and age of preschool children—were collected monthly from a panel of children from study households prior to and during the time the scheme was in force.

As opposed to the various food-related measures of outcome used in calorie regressions, anthropometric indicators reflect both food- and health-related factors. Thus, the statistical estimate of effect must be able to control for factors such as age, sex, birth order, breast-feeding, morbidity, and child care, which, along with household variables such as family size, education of parents, and accessibility to clean water are expected to influence the nutritional status of preschoolers.

A complete list of the explanatory variables used in the regressions and the estimated coefficients is given in the Appendix, Tables 37 to 41. Table 29 shows the key coefficients for estimating the impact of the scheme, using the five indicators of nutritional status as dependent variables.

Increases in household incomes appear to have a positive effect on all five anthropometric indicators. This effect is highly significant for the short-term indicators, weight and weight-for-age. The subsidy does not seem to influence nutritional status over and above the effect of the income from the subsidy. The nutrition education component of the scheme appears to have had a positive impact on both short- and long-term indicators.

As shown in the Appendix, Tables 37-41, a number of other variables appear to influence the nutritional status of preschoolers. These include diarrhea in the recent past, birth order, access to clean drinking water, and household size.

Table 29—Key coefficients for nutritional status regressions

Dependent Variable	Independent Variables					Regression R^2
	Log Income Per AEU Per Day	Subsidy	Price of Rice	Price of Cooking Oil	Nutrition Education	
Weight						
Percent of total income	0.68 (3.33)[a]	0.03 (1.44)	−0.04 (−0.23)	$46 \cdot 10^{-4}$ (1.37)	0.25 (1.59)	0.72
Dummy	0.68 (3.28)[a]	−0.12 (−0.76)	−0.21 (−1.17)	$59 \cdot 10^{-4}$ (1.77)[b]	0.21 (1.30)	0.72
Weight as a percent of standard weight-for-age						
Percent of total income	3.78 (2.77)[a]	0.21 (1.71)[b]	0.30 (0.23)	0.02 (1.08)	2.27 (2.17)[b]	0.14
Dummy	3.70 (2.70)[a]	−0.70 (−0.05)	−0.92 (−0.77)	0.03 (1.52)	1.94 (1.86)[b]	0.14
Z-scores of weight-for-age						
Percent of total income	0.42 (2.43)[a]	0.03 (1.97)[a]	0.01 (0.06)	$87 \cdot 10^{-5}$ (0.31)	0.28 (2.08)[a]	0.12
Dummy	0.41 (2.35)[a]	−0.11 (−0.79)	−0.17 (−1.12)	$23 \cdot 10^{-4}$ (0.81)	0.23 (1.71)[b]	0.12
Z-scores of weight-for-height						
Percent of total income	0.24 (1.40)	0.04 (2.48)[b]	0.43 (2.68)[b]	$11 \cdot 10^{-5}$ (−0.04)	−0.17 (−1.29)	0.11
Dummy	0.21 (1.25)	0.10 (0.75)	0.28 (1.87)[b]	$91 \cdot 10^{-5}$ (0.33)	−0.20 (−1.51)	0.10
Height as a percent of standard height-for-age						
Percent of total income	1.11 (1.38)	−0.03 (−0.37)	−2.03 (−2.71)[a]	−0.02 (−1.20)	2.01 (3.29)[a]	0.16
Dummy	1.16 (1.45)	−0.82 (−1.31)	−2.16 (−3.11)[a]	−0.02 (−1.33)	1.94 (3.17)[a]	0.17

Notes: See the Appendix, Table 36, for the complete set of regressions. The numbers in parentheses are t-values.
[a] Significant at the 5 percent level.
[b] Significant at the 10 percent level.

9

COST-EFFECTIVENESS ANALYSIS

Food price subsidy schemes are but one of many instruments that governments use to alleviate calorie-protein deficiencies and to improve nutrition among poor households. In the Philippines, existing interventions focus on growth monitoring, extension of nutrition education to mothers, and direct supplemental feeding of malnourished children. Several other schemes that are health-related (such as immunization, mother and child health care, oral rehydration) and community-based schemes, such as home and community gardens, have been implemented with varying degrees of cost and effectiveness.[27] Although these interventions have reached a significant proportion of the high-risk population, their impact and relative cost-effectiveness are not clear.

In this chapter the cost-effectiveness of the pilot subsidy scheme will be measured in absolute terms and relative to other nutrition-related intervention programs or policies. Cost comparisons often suffer from lack of adequate data, particularly regarding the net effects of programs. Varying degrees of methodological rigor also make meaningful comparisons among the various types of interventions and programs difficult. For these reasons, the following analysis deals mostly with determining the cost-effectiveness of the scheme itself. Comparative analyses with other nutrition-related interventions will be included to the extent permitted by availability of estimates of the effectiveness of other programs.

Program Cost

The fiscal cost of operating the food price subsidy scheme is given in Table 30. The items reflected are, strictly speaking, government financial or fiscal costs, as they refer to explicit budgetary costs. Economic or implicit costs of the subsidies and the transaction costs incurred by beneficiaries are ignored.

The fiscal cost of the subsidy scheme consists of three main components: the cost of the price subsidy, the cost of the incentive paid to retailers, and the cost of administration and management.

The cost of the price subsidy is computed as the price discount allowed for rice and cooking oil multiplied by the subsidized quantity. The price discount is the difference between the market price and the subsidized price paid by the participating households. As shown in Table 30, this component accounted for about 84 percent of the total fiscal costs. To compensate retailers for added costs, the scheme offered an incentive of 7 percent of the gross sales of the program commodities to the accredited retailers. The reliance of the subsidy scheme on the private trade network for its procurement and distribution effectively saved the government the costs of the provision of warehousing, distribution outlets, and vehicles. The administrative overhead covered salaries and benefits for the extension workers and paraprofessional workers, the cost of travel of monitoring staff, salaries of central office project administration, office overhead, vehicles, and costs of printing the discount cards. It is difficult to estimate the cost of the nutrition education component separately from the administrative overhead for the subsidy operations because extension staff members performed both as subsidy monitoring officers and as nutrition educators. If person-hours were the mea-

[27] Stewart Blumenfeld et al., *PL 480 Title II: A Study of the Impact of Food Assistance Programs in the Philippines* (Washington, D.C.: U.S. Agency for International Development, 1982).

Table 30—Fiscal costs of the pilot food price subsidy scheme and their distribution

Province/ Subsidy	Cost Per Month				Pilot Population Coverage	Fiscal Cost Per Capita		
	Subsidy Cost	Retailers' Incentive	Administrative Cost	Total Program Cost		Monthly	Annually	Annually
	(pesos)					(pesos)		(U.S. $)
Abra Rice and oil	16,595 (83.5)	1,430 (7.2)	1,856 (9.3)	19,881 (100.0)	2,829	7.03	84.36	7.67
Antique Rice and oil	18,958 (83.9)	1,633 (7.2)	2,001 (8.9)	22,592 (100.0)	2,615	8.64	103.68	9.43
Antique Oil	4,941 (72.7)	221 (3.3)	1,634 (24.0)	6,796 (100.0)	1,797	3.78	45.36	4.12
South Cotabato Rice and oil	13,861 (82.8)	1,195 (7.1)	1,686 (10.1)	16,742 (100.0)	1,912	8.76	105.12	9.56
Average all areas	49,414 (83.4)	4,258 (7.2)	5,543 (9.4)	59,215 (100.0)	6,816	8.69	104.28	9.48

Source: Based on data collected by the International Food Policy Research Institute, Philippines National Nutrition Council, and the Philippines Ministry of Agriculture, "Pilot Food Subsidy Survey, 1983/84," Philippines.
Note: The numbers in parentheses are percentages of the total cost.

sure, however, the extension staff spent 60 percent of project time on subsidy monitoring and 40 percent for nutrition education.

Administrative costs accounted for 9.4 percent of the total cost of the pilot scheme. It is likely that in a national program, several layers of supervisory infrastructure, from the central offices down to the region, province, and village levels, would be necessary. This heavy supervisory infrastructure would likely put pressure on the implementing and coordinating agencies (in this case, the Ministry of Agriculture and the National Nutrition Council). Such burdens are associated with larger fiscal outlays for salaries and office overhead. It is estimated that these outlays would add 25 percent to the administrative costs shown in Table 30.

Cost-Effectiveness Measures

In estimating cost-effectiveness, three main factors are considered: the size of the net program benefits to intended beneficiaries, the extent of leakage associated with the different levels of targeting, and program costs. Estimates of the net effects of the scheme given in Chapter 8 are summarized in Table 31. It must be noted that these estimates are computed at the mean for all participating households and children within these households. The leakage issues have been discussed in Chapter 5 and will not be repeated here.

Cost-effectiveness indicators are developed in this study for alternative program goals. (Estimation procedures are described in Chapter 5.) Therefore, a program design with a goal to improve the nutrition of malnourished preschool children can be compared with a design where the goal is to improve the nutrition of all household members.

Fiscal Cost of Transferring U.S. $1.00

If the goal of the program is to efficiently transfer purchasing power, the fiscal cost of transferring U.S. $1.00 may be an appropri-

Table 31—Estimated net impact of the pilot subsidy scheme on food acquisition and nutrition

Variable	Model	Estimated Net Impact[a]
Household		
Food expenditure	Percent of total income	P 0.27 per AEU per day
	Dummy	P 0.34 per AEU per day
Calorie acquisition	Percent of total income	136 calories per AEU per day
	Dummy	138 calories per AEU per day
Individuals (preschoolers)		
Calorie intake	Percent of total income	31 calories per day
	Dummy	55 calories per day
Weight	Percent of total income	0.12 kilograms
	Dummy	0.14 kilograms

[a] The net impact is computed at the mean.

ate indicator of cost-effectiveness. As discussed in Chapter 5, this indicator is at best a crude measure of cost-effectiveness from a nutritional standpoint because several sources of leakage are present.

The cost of transferring U.S. $1.00 to all households participating in the subsidy scheme is calculated at U.S. $1.19 in 1984 prices (Table 32). This estimate assumes that all participating households are the target of the program. However, some recipient households are not nutritionally deficient. If the definition of the targets includes only those households that consume less than 80 percent of the recommended calories, the fiscal cost of transferring U.S. $1.00 rises to U.S. $1.63 under the assumption that program benefits accruing to households above the 80 percent cutoff constitutes a leakage. It is estimated from the consumption surveys that about 27 percent of the participating households were above the 80 percent cutoff line.

If the goal is to reach only those households with malnourished preschool children, the cost of transferring U.S. $1.00 increases by a factor of three because the extent of leakage from an untargeted program would be high. About one-third of the study households had at least one malnourished child. The rest of the households are considered nontarget under this assumption.

Fiscal Cost of Increasing Food Acquisition by 100 Calories per AEU per Day

If all households in the targeted villages are defined as program beneficiaries, it would cost U.S. $6.75 annually to increase the daily caloric intake by 100 calories per AEU (Table 32). This estimate is based on net impact, as it already accounts for substitution effects (see the discussion in Chapter 8). In order to bring the average calorie acquisition of households in the study areas to recommended levels, it would cost the government about U.S. $25 per AEU per year.

If the program is intended only for households with calorie acquisition of less than 80 percent of the recommended levels, then the subsidy received by households above this cutoff may be considered a leakage in a scheme targeted by area. Given the size of the leakage, it is estimated that it would cost U.S. $7.40 to increase the calorie intake of households below the 80 percent cutoff by 100 calories per AEU per day for one year. If the program goal is to reach only those households with malnourished preschool children, the annual fiscal cost would increase to U.S. $13.66 per AEU, inasmuch as two-thirds of the households do not have malnourished preschool chil-

Table 32—Cost-effectiveness indicators

Indicator	All Participating Households (H_1)	Households Consuming Less Than 80 Percent of RDA (H_2)	Households With Malnourished Children (H_3)	All Participating Preschool Children (C_1)	Preschool Children Consuming Less Than 80 Percent of RDA (C_2)	Malnourished Preschool Children (C_3)
			(U.S. $)			
Fiscal cost of transferring $1.00	1.19	1.63	3.61	n.a.	n.a.	n.a.
Annual fiscal cost per AEU of a net increase in food acquisition of 100 calories per AEU per day	6.75	7.40	13.66	n.a.	n.a.	n.a.
Annual fiscal cost per AEU of eliminating the calorie gap[a]	25.18	27.60	50.95	n.a.	n.a.	n.a.
Annual fiscal cost per preschooler of a net increase of 100 calories per individual preschool child per day	n.a.	n.a.	n.a.	26.00	45.12	74.41
Annual fiscal cost per preschooler of increasing the weight of preschool children by 1 kilogram[b]	n.a.	n.a.	n.a.	76.59	87.31	101.86

Notes: n.a. means not applicable. The adult equivalent unit (AEU) is a method used to convert the consumption of persons of different ages and sex into standard consumption units. Costs are given in 1984 prices.

[a] The mean calorie deficiency in the study households is estimated at 373 calories per AEU per day.

[b] The mean weight of children in the sample was 13.3 kilograms, which on average for all survey rounds is 86.9 percent of standard.

dren; hence, benefits to such households would be considered leakage.

Fiscal Cost of Increasing Preschoolers' Daily Calorie Consumption by 100 Calories

The analysis has shown that preschool children are at great nutritional risk because their share of the family food basket is small relative to their RDA. Hence, it is important to examine the range of cost required to raise their calorie intakes to a particular consumption level.

Based on the impact on calorie consumption for the preschool child derived from the individual demand equations in Chapter 5, it is estimated that it would cost the government U.S. $26 annually to increase the average daily intake of preschoolers by 100 calories per day per preschooler. This figure is roughly four times the cost of achieving the same level (100 calories) of benefit on average for all household members. The higher cost reflects the large share of additional household food consumption that will be captured by members other than preschoolers. The average calorie increment at the household level will also exceed the increment accruing to preschoolers within the same household because the distribution is uneven, and that will also be reflected in the cost.

Not all preschool children within the targeted villages are equally at risk of malnutrition. Some are more predisposed to the problem than others because of the varying amounts of calories consumed. If the scheme's objective is to reach only those children consuming less than 80 percent of RDA, then the benefits accruing to children above this cutoff are considered leakage. This translates to a higher cost: it is estimated that it would cost U.S. $45 per child to increase the daily calorie intake of preschoolers currently below the 80 percent cutoff by 100 calories for a one-year period.

If the program target is defined to include only the malnourished children, then the cost escalates to U.S. $74 per 100 calories because the leakage (benefits accruing to well-nourished children and other household members) is considerably higher.

Fiscal Cost of Increasing the Weight of Preschoolers

The expected effects of the scheme on child weight are summarized in Table 31. A net increment of 0.12 kilograms was the contribution of the scheme to the growth of children between 13-83 months. Such an impact represents 1.0 percent of the average body weight of the sample preschoolers. These estimates are based on actual ex-post data of a continuous and sustained level of participation in the subsidy scheme among the study children.

The incremental weight gain of children reported in Table 31 represents the average net impact produced by the scheme. In order to increase a child's weight by 1 kilogram, it would cost the government U.S. $76 annually. This assumes that all of the children in the study area are program targets. If the goal is to improve the weight of only malnourished children, the fiscal cost of increasing child weight by 1 kilogram increases to U.S. $101, since benefits derived by children who are not malnourished can be considered leakage.

The average weight of the preschool children in the sample was 13.3 kilograms, which is about 2.0 kilograms below the standard weight-for-age. Thus, the above increase of 1 kilogram would reduce the average gap by about one-half.

Improving Cost-Effectiveness

The preceding sections have clearly demonstrated that cost-effectiveness hinges on the method of targeting. The geographic-area targeting scheme that was used in the pilot subsidy scheme provides benefits to all households in the target areas irrespective of nutritional status and food deficiency. This implies that the cost-effectiveness of the scheme could be increased by targeting those households expected to be high-risk. Once the area is identified, a second level

of screening of participants could target those households that need the subsidy. According to the cost-effectiveness indicators in Table 32, the cost of increasing the acquisition of a given amount of food by households with at least one malnourished preschooler could be reduced by half if the program were targeted to those households only.

The use of child weight as a targeting criterion may be feasible in the Philippine setting because of the extensive child weighing program carried out nationwide since 1975, called Operation *Timbang*. The use of growth monitoring for targeting would entail the additional cost of periodic weighing. However, this cost is very small and can be disregarded in cost-effectiveness estimates.

It is important to emphasize that targeting a price subsidy scheme is practical only at the household level. The presence of a malnourished child may be used to identify target households, but efforts to target the benefits of the scheme exclusively to the individual child are not likely to be successful.

Cost-Effectiveness Relative to Other Programs

It may be misleading to compare relative cost-effectiveness of alternative programs unless the context in which these programs are evaluated is based on a comparable set of objectives, targeting, coverage, timing of inputs, and duration of program and project organization. Given the state of the art in the evaluation of nutrition and health programs, including the shortage of data, any comparison, at best, can only detect general indications of relative cost effectiveness.

Relative cost-effectiveness should be evaluated in terms of particular program goals. Hence, if the program goal is to deliver a certain number of calories, the measure of relative cost-effectiveness could give the cost of transferring, say, 1,000 calories. Alternatively, the measure could be given in terms of the cost to deliver U.S. $1.00 worth of subsidy if the concern is income transfer efficiency. However, these are crude measures from the point of view of nutrition because they do not account for leakages (see Chapter 5).

A more refined measure is the fiscal cost of a certain net increase in daily consumption by malnourished individuals. It should, however, be emphasized that in order to get meaningful results, calculations should be based on the net calorie impact, that is, net of substitution effects. However, few available program evaluations estimate substitution.

Cost effectiveness indicators for several programs are reported in Table 33. The annual fiscal cost of a net increase in calorie consumption by 100 calories per day is available as a net figure only for the Philippine pilot subsidy scheme and for the Sri Lankan food stamp program.[28] The cost-effectiveness measures for other programs reported in Table 33 are estimated on the basis of gross calorie estimates of impact, and thus they overestimate the actual increase in consumption. The costs reported are not strictly comparable, although they give some guidance on relative cost-effectiveness. Except for the Philippine pilot subsidy and Sri Lankan food stamp program, the cost-effectiveness figures for the programs reported do not estimate leakage through sharing and substitution.

The results indicate that the Philippine pilot subsidy scheme is relatively more cost-effective than any of the programs listed in Table 33. The food stamp program in Sri Lanka is almost as cost effective, but all the other programs are considerably less cost-effective. The cost of a gross transfer of 100 calories per person per day by any of the other programs is more than twice that of the Philippine program. However, these results must be interpreted in a proper context. Each of the programs cited has particular goals and methods of targeting; each uses different food commodities, and each

[28] Edirisinghe, *The Food Stamp Scheme in Sri Lanka.*

Table 33—Cost-effectiveness comparison with other programs

Program	Annual Cost Per Beneficiary	Food Transfers in Calories Per Person Per Day	Fiscal Cost to Deliver 1,000 Calories	Fiscal Cost to Deliver $1.00 Subsidy	Fiscal Cost of Transferring 100 Calories Per Day Per Person For One Year[a]	Fiscal Cost of a Net Increase of 100 Calories Per Day Per Person For One Year[b]
			(U.S. $)			
Philippines						
Pilot food price subsidy scheme, 1984	9.18	272 (gross)[a] 136 (net)[b]	0.11 (gross) 0.22 (net)	1.19	3.38	6.75
Sri Lanka						
Food stamp, 1982	8.60	228 (gross)[a] 98 (net)[b]	0.10 (gross) 0.24 (net)	n.a.	3.77	8.77
Brazil						
Food subsidy (PINS), 1980	21.32	300[a]	0.30	1.21	7.11	n.a.
Brazil						
Preschool feeding and nutrition education, 1980	46.48	500[a]	0.53	2.38	9.29	n.a.
Colombia						
Food subsidy, 1981	35.04	300[a]	0.79	1.58	11.68	n.a.
Indonesia						
Feeding program, 1982	56.01	n.a.	n.a.	2.48	. . .	n.a.
Mexico						
Milk subsidy, 1983	38.16	248[a]	n.a.	n.a.	15.38	n.a.
Tamil Nadu, India						
Weighing and feeding, 1982	33.10	300[a]	n.a.	1.74	11.03	n.a.
Philippines						
Mother and child health	31.00	n.a.	0.25	n.a.	. . .	n.a.
School feeding	11.50	n.a.	0.42	n.a.	. . .	n.a.
Day care	19.20	n.a.	n.a.	n.a.	. . .	n.a.
Mothercraft center	400.00	n.a.	n.a.	n.a.	. . .	n.a.

Sources: For Sri Lanka, Neville Edirisinghe, *The Food Stamp Scheme in Sri Lanka: Costs, Benefits, and Options for Modification*, Research Report 58 (Washington, D.C.: International Food Policy Research Institute, 1987); for Brazil, Colombia, Indonesia, and India, World Bank, Population, Health, and Nutrition Department, *Nutrition Review* (April 1984); for other programs in the Philippines, S. Blumenfeld et al., *PL 480 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); and for Mexico, Eileen Kennedy, C. Overholt, and Lawrence Haddad, "Effect of a Milk Subsidy on Distribution of Benefits Within the Household," International Food Policy Research Institute, Washington, D.C., 1984.

Note: n.a. means not available.

[a] This is the amount of calories transferred if substitution is not accounted for.

[b] This is based on the marginal propensity to consume, accounting for substitution.

is implemented on a different scale. While only pilot programs have been implemented for the Philippine, Colombian, and Brazilian schemes, the Sri Lankan scheme has been in operation for a longer period on a national scale. The Tamil Nadu, India, program is narrowly targeted to malnourished children, while some of the other programs are not. Thus, the cost of transferring a certain amount of calories may not be an appropriate measure of the impact on nutrition.

As expected, the fiscal cost of transferring $1.00 worth of subsidy is determined largely by the degree of targeting. The Philippine scheme, which uses geographical area targeting, shows the lowest cost. The preschool feeding programs in Brazil, Indonesia, and India had the highest cost because these are the most tightly targeted among those reported in Table 33.

Among the factors that contribute to the relatively lower cost of delivery of the Philippine pilot subsidy scheme, the commodity mix is quite important. Besides being locally produced, rice and oil are the cheapest source of calories in the country, and they are available in almost all parts of the country. These foods are bought in raw form, unlike the expensive processed weaning foods used in the Colombian food subsidy program.

Another crucial factor is the substantially lower percentage of administrative costs—about 9.4 percent of the total cost. These costs are low because targeting by geographical area eliminates the burdensome and costly screening of beneficiaries found in some of the other programs. In addition, the administrative costs in the Philippine program are an add-on type of cost because the delivery system is built upon an already existing infrastructure of extension officers.

10

CONCLUSIONS

It is evident that the pilot subsidy scheme was successful in increasing food consumption among participating households. Although distribution of the additional food within the households favored adults, preschool children consumed more calories and showed improvement in their nutritional status. Increases in food consumption came mostly from the increases in purchasing power resulting from the price subsidies on rice and cooking oil. Furthermore, the marginal propensity to spend on food out of the real income embodied in the price subsidies appears to be considerably higher than the marginal propensity to spend on food out of other income. The lower oil prices resulted in substitution of oil for other commodities. Finally, the effects of the nutrition education component were positive and strong for children but weak on the household level.

The scheme resulted in net increases in calories acquired by households of 136-138 calories per AEU per day, which is about 7 percent of current calorie consumption; calorie consumption by preschoolers of 31-55 calories per child per day; and the weight of preschoolers of 0.12-0.14 kilograms. Eighty-four percent of the cost of the scheme was the subsidy itself. Administrative costs accounted for about 9 percent and the incentive payment to retailers to assure efficient distribution of subsidized food was about 7 percent.

The results of the assessment of cost effectiveness can be summarized as follows. The fiscal cost of each U.S. $1.00 transferred to participating households is estimated to be U.S. $1.19. However, if only the transfers received by households with malnourished preschoolers are considered a benefit, whereas transfers received by other households are considered leakage, the cost increases to U.S. $3.61. Similarly, the annual cost of a net increase in calorie consumption of 100 calories per AEU per day among all households is estimated to be U.S. $6.75 per AEU, increasing to U.S. $13.66 if only food received by households with malnourished preschoolers is considered of interest to the scheme.

The annual cost of eliminating calorie deficiencies in the study population is estimated to be U.S. $25 per AEU. Adding 1 kilogram to the weight of each preschooler is estimated to cost U.S. $76 per year. If only weight gains among the malnourished are counted as benefits, the cost increases to U.S. $101 per year.

Comparisons with other programs show that the cost-effectiveness of the Philippine pilot subsidy scheme was extremely favorable, primarily because costs were kept low through geographical targeting based on growth monitoring, the use of existing private sector retail outlets for the distribution of subsidized foods, and the use and expansion of existing local bureaucratic structures.

If the sole goal of the scheme were to expand food consumption by households with malnourished preschoolers and to improve the nutritional status of these preschoolers, the cost-effectiveness of the scheme would be significantly improved by a two-step targeting procedure based on growth monitoring. The first step would be to identify target villages with a high concentration of underweight preschoolers. This was the approach used in this scheme. The second step would be to target individual households in the selected villages and to remove from the scheme those households that do not include preschoolers at high nutritional risk. According to the estimates here, a second targeting step would reduce the cost of providing benefits to high-risk preschoolers to less than one-half the cost of the scheme when untargeted within the village.

Low calorie adequacy rates among pre-

schoolers, both in absolute terms and relative to the adequacy rates of adults, clearly justify focusing on this age group. However, adequacy rates of school-age children and adolescents were almost as low. Other studies have shown similar results.[29] If this finding is of general validity throughout the country, it raises serious questions about the usefulness of targeting nutrition programs to preschoolers alone. It might be more appropriate to use a two-step targeting procedure based on growth monitoring of all children, not just preschoolers.

A strong relationship between malnutrition and incomes is found in this study. Certain low-income occupational groups—landless farm workers, some wage earners, and tenant farmers, for example—are much more likely to be malnourished than others. This is primarily because their purchasing power is limited. Efforts to expand food consumption and improve the nutritional status of preschoolers in those groups through nutrition education are unlikely to be successful unless accompanied by expanded purchasing power.

Although nutrition education clearly plays a role in expanding food consumption by preschoolers, such expansion is more likely to come about as part of an overall increase in household food consumption. Efforts to reallocate an inadequate amount of food among household members so that preschoolers receive a larger share are unlikely to be successful in households operating under severe income constraints. Furthermore, such reallocation may endanger the survival of the household as a whole by further eroding the income-earning capabilities of economically active adult members who must have enough energy to work productively. However, as this study shows, nutrition education may be effective in assuring that a larger share of additional income is spent on food for the household members most at risk of malnutrition.

[29] Valenzuela, "Nutrient Distribution Within the Family"; and Allgaen and Florencio, "Intra-Household Nutrient Distribution."

APPENDIX: SUPPLEMENTARY TABLES

Table 34—Regression results for household food expenditures and food acquisition

Independent Variable	Household Food Expenditures Per AEU Per Day		Household Calorie Acquisition Per AEU Per Day	
	Model A-1	Model A-2	Model B-1	Model B-2
Intercept	0.151 (1.39)	0.255 (2.37)	984.29 (14.89)	998.38 (15.35)
Log income per AEU (including subsidy)[a]	2.202 (57.82)	2.167 (56.72)	633.95 (27.38)	623.07 (27.01)
Subsidy in percent of income	0.032 (7.30)	...	8.94 (3.32)	...
Subsidy dummy	...	0.168 (4.96)	...	68.23 (3.35)
Log of household size	−0.051 (−7.83)	−0.054 (−7.70)	−5.92 (−1.40)	−5.98 (−1.41)
Education of husband	0.002 (0.49)	0.0004 (0.08)	−5.52) (−1.97)	−6.07 (−2.17)
Education of wife	0.017 (3.63)	0.016 (3.24)	−1.92 (−0.65)	−2.46 (−0.83)
Nutrition education dummy PNP[b]	0.023 (0.63)	0.062 (1.68)	−13.68 (−0.61)	−3.76 (−0.17)
Pilot[c]	−0.021 (−0.73)	−0.025 (−0.86)	22.67 (1.29)	21.86 (1.24)
Food assistance dummy	0.056 (1.86)	0.052 (1.73)	39.45 (2.16)	36.26 (1.98)
Percent women's income	0.001 (1.81)	0.001 (1.58)	−1.03 (−2.50)	−1.06 (−2.56)
Price of rice	0.006 (0.37)	0.006 (0.34)	−12.11 (−1.12)	−12.23 (−1.13)
Price of oil	0.012 (4.11)	0.004 (1.39)	−5.98 (−3.51)	−7.45 (−5.14)
Dummy for Antique Province	−0.059 (−1.47)	−0.069 (−1.71)	248.40 (10.18)	245.04 (10.04)
Dummy for South Cotabato Province	−0.135 (−3.75)	−0.110 (−3.05)	26.96 (1.23)	33.06 (1.52)
Own farm dummy	0.013 (0.40)	0.009 (0.28)	98.46 (5.02)	98.79 (5.03)
Own garden dummy	−0.035 (−1.06)	−0.009 (−0.28)	27.50 (1.36)	33.17 (1.66)
F	378.65	371.77	87.19	87.21
R^2	0.73	0.72	0.38	0.38

Notes: Figures in parentheses are t ratios. The number of observations for each model was 2,509. Models A-1 and B-1 specify the subsidy variable in terms of the proportion of subsidy to total income; Models A-2 and B-2 specify the subsidy variable in terms of a zero-one dummy for the presence of subsidy.

[a] Income is approximated by total expenditures in all regressions.

[b] This dummy is for the Philippine Nutrition Program (PNP), a government program begun in 1974.

[c] This dummy is for the nutrition education program held in conjunction with the pilot food price subsidy study.

Table 35—Regression results for acquisition of rice, maize, oil, and fish

Independent Variable	Rice	Maize	Oil	Fish
		(calories/AEU/day)		
Intercept	785.36 (6.28)	319.63 (2.70)	112.72 (7.37)	82.13 (3.65)
Log income per AEU (including subsidy)[a]	333.13 (9.29)	−32.67 (−0.96)	28.55 (6.50)	39.64 (6.14)
Subsidy dummy	122.02 (3.89)	−104.79 (−3.53)	12.22 (3.18)	52.40 (9.27)
Log of household size	87.08 (2.03)	−6.23 (−0.15)	−24.97 (−4.76)	−40.08 (−5.19)
Education of husband	−8.94 (−2.07)	−1.71 (−0.42)	0.51 (0.97)	−2.51 (−3.22)
Education of wife	−6.50 (−1.43)	2.02 (0.47)	0.95 (1.71)	1.11 (1.36)
Nutrition education dummy				
PNP[b]	78.14 (2.88)	14.92 (0.58)	3.01 (0.91)	−4.27 (−0.88)
Pilot[c]	17.50 (0.51)	100.36 (3.10)	7.33 (1.75)	8.88 (1.44)
Food assistance dummy	105.44 (3.73)	−49.04 (−1.83)	−2.63 (−0.76)	8.41 (1.65)
Percent women's income	−0.59 (−0.92)	−1.22 (−2.04)	−0.01 (−0.16)	−0.22 (−1.90)
Price of rice	−5.81 (−0.35)	33.87 (2.15)	−1.62 (−0.79)	4.10 (1.37)
Price of maize	7.89 (0.65)	−11.12 (−0.97)	0.54 (0.36)	0.22 (0.10)
Price of oil	−10.66 (−4.76)	7.97 (3.77)	−4.22 (−15.41)	0.77 (1.90)
Price of fish	−3.90 (−1.23)	−5.51 (−1.83)	−0.43 (−1.09)	−7.57 (−13.20)
Dummy for Antique Province	331.52 (8.04)	−446.72 (−11.46)	−0.11 (−0.02)	101.19 (13.63)
Dummy for South Cotabato Province	62.12 (1.83)	−485.15 (−15.14)	10.99 (2.65)	9.22 (1.51)
Own-farm dummy	73.92 (2.45)	80.98 (2.83)	−1.65 (−0.45)	−7.07 (−1.30)
Own-garden dummy	13.15 (0.43)	61.95 (2.11)	−3.16 (−0.84)	−4.89 (−0.88)
F	21.56	23.41	36.95	65.01
R^2	0.15	0.16	0.23	0.34

Note: Figures in parentheses are t-ratios. The number of observations was 2,132.
[a] Income is approximated by total expenditures in all regressions.
[b] This dummy is for the Philippine Nutrition Program (PNP), a government program begun in 1974.
[c] This dummy is for the nutrition education program held in conjunction with the pilot food price subsidy study.

Table 36—Regression results for calorie intake of children aged 13 to 83 months

Independent Variable	Model A-1	Model A-2	Model B-1	Model B-2
Intercept	-948.70 (-4.78)	-843.35 (-4.40)	849.39 (-4.41)	-761.75 (-4.07)
Log income per AEU (including subsidy)[a]	140.39 (3.64)	129.05 (3.35)	...	...
Subsidy in percent of income	11.34 (3.31)	...	9.87 (2.87)	...
Subsidy dummy	...	100.27 (3.31)	...	88.35 (2.87)
Education of husband	-9.74 (-2.39)	-10.54 (-2.58)	-8.23 (-2.04)	-9.03 (-2.23)
Education of wife	-4.52 (-0.97)	-6.50 (-1.39)	-4.16 (-0.89)	-5.88 (-1.27)
Sex of child	122.02 (4.50)	124.95 (4.61)	122.49 (4.51)	125.06 (4.61)
Log age in months	395.59 (12.04)	391.57 (11.88)	395.70 (12.01)	392.18 (11.87)
Currently breastfed dummy	70.54 (1.72)	65.58 (1.60)	64.81 (1.58)	60.78 (1.48)
Past breastfed dummy	-75.53 (-1.91)	-71.10 (-1.81)	-72.90 (-1.84)	-69.33 (-1.76)
Nutrition education dummy PNP[b]	-42.74 (-1.19)	-45.75 (-1.27)	-36.16 (-1.01)	-39.20 (-1.09)
Pilot[c]	-55.97 (-1.90)	-55.48 (-1.88)	-62.14 (-2.10)	-61.21 (-2.07)
Child care time in hours of wife	-0.36 (-0.30)	-0.21 (-0.17)	0.16 (0.13)	0.25 (0.21)
Diarrhea dummy	-38.44 (-0.86)	-29.93 (-0.67)	-41.55 (-0.92)	-33.75 (-0.75)
Fever dummy	-79.91 (-2.50)	-68.32 (-2.15)	-67.55 (-2.12)	-58.18 (-1.84)
Food assistance dummy	20.69 (0.72)	20.14 (0.70)	4.97 (0.17)	5.71 (0.20)
Percent children below 6 years	1.47 (1.41)	1.00 (0.97)	1.31 (1.25)	0.91 (0.88)
Dummy for Antique Province	211.60 (4.73)	207.82 (4.65)	168.44 (3.79)	168.41 (3.79)
Dummy for South Cotabato Province	-37.98 (-1.06)	-29.04 (-0.81)	-52.03 (-1.45)	-43.13 (-1.21)
Birth order	-19.34 (-1.15)	-23.82 (-1.41)	-16.43 (-0.97)	-20.61 (-1.22)
Water quality dummy	55.24 (1.81)	43.06 (1.40)	60.94 (2.00)	49.91 (1.63)
Household size	-1.95 (0.11)	-4.05 (-0.23)	-10.19 (-0.59)	-7.50 (-0.43)

(continued)

Table 36—Continued

Independent Variable	Model A-1	Model A-2	Model B-1	Model B-2
Percent women's income	0.02 (0.02)	−0.13 (−0.14)	0.10 (0.11)	−0.04 (−0.04)
Price of rice	−68.60 (−1.91)	−45.87 (−1.37)	−63.36 (−1.76)	−43.71 (−1.31)
Price of cooking oil	−0.34 (−0.54)	−0.25 (−0.40)	−0.36 (−0.58)	−0.28 (−0.44)
Household calorie acquisition	...	...	0.10 (3.34)	0.09 (3.02)
F	15.84	15.84	15.69	15.68
R^2	0.43	0.43	0.43	0.43

Notes: Figures in parentheses are t-ratios. The number of observations for each model was 2,509. Models A-1 and B-1 specify the subsidy variable in terms of the proportion of subsidy to total income; Models A-2 and B-2 specify the subsidy variable in terms of a zero one dummy for the presence of subsidy.

[a] Income is approximated by total expenditures in all regressions.

[b] This dummy is for the Philippine Nutrition Program (PNP), a government program begun in 1974.

[c] This dummy is for the nutrition education program held in conjunction with the pilot food price subsidy study.

Table 37—Regression results for weight of children aged 13 to 83 months

Independent Variable	Proportional Model	Zero-One Dummy Model
Intercept	−5.80 (−5.49)	−5.27 (−5.15)
Log income per AEU (including subsidy)[a]	0.68 (3.33)	0.68 (3.28)
Subsidy in percent of income	0.03 (1.44)	...
Subsidy dummy	...	−0.13 (−0.76)
Education of husband	0.0024 (0.11)	−0.0041 (0.19)
Education of wife	0.03 (1.04)	0.03 (1.04)
Sex of child	1.01 (7.00)	1.02 (7.05)
Log age in months	4.41 (25.11)	4.44 (25.16)
Currently breastfed dummy	−0.19 (−0.86)	−0.21 (−0.93)
Past breastfed dummy	−0.51 (−2.42)	−0.43 (−2.04)
Nutrition education dummy		
PNP[b]	0.02 (0.09)	0.05 (0.25)
Pilot[c]	0.25 (1.59)	0.21 (1.30)

(continued)

Table 37—Continued

Independent Variable	Proportional Model	Zero-One Dummy Model
Child care time in hours of wife	0.004	−0.00005
	(0.06)	(−0.08)
Diarrhea dummy	−0.47	−0.48
	(−1.96)	(−2.01)
Fever dummy	−0.16	−0.12
	(−0.91)	(−0.73)
Food assistance dummy	0.0029	0.04
	(0.02)	(0.25)
Percent children below 6 years	−0.0037	−0.0051
	(−0.66)	(−0.92)
Dummy for Antique Province	−0.36	−0.37
	(−1.52)	(−1.57)
Dummy for South Cotabato Province	−0.07	−0.06
	(−0.39)	(−0.30)
Birth order	−0.35	−0.35
	(−3.89)	(−3.88)
Water quality dummy	−0.48	−0.47
	(−2.96)	(−2.83)
Household size	−0.44	−0.44
	(−4.73)	(−4.62)
Price of rice	−0.04	−0.21
	(−0.23)	(−1.17)
Price of cooking oil	−0.0046	−0.0059
	(−1.37)	(−1.77)
F	56.51	56.27
R^2	0.72	0.72

Notes: Figures in parentheses are t-ratios. The number of observations was 509. The proportional model specifies the subsidy variable as a proportion of the subsidy to total income, whereas the dummy model specifies one for the presence of the subsidy, zero otherwise.

[a] Income is approximated by total expenditures in all regressions.

[b] This dummy is for the Philippine Nutrition Program (PNP), a government program begun in 1974.

[c] This dummy is for the nutrition education program held in conjunction with the pilot food price subsidy scheme.

Table 38—Regression results for weight as a percent of standard weight-for-age, children aged 13 to 83 months

Independent Variable	Proportional Model	Zero-One Dummy Model
Intercept	87.35	91.34
	(12.45)	(13.42)
Log income per AEU (including subsidy)[a]	3.78	3.70
	(2.77)	(2.70)
Subsidy in percent of income	0.21	...
	(1.71)	
Subsidy dummy	...	−0.70
		(−0.65)

(continued)

Table 38—Continued

Independent Variable	Proportional Model	Zero-One Dummy Model
Education of husband	0.04 (0.25)	0.05 (0.33)
Education of wife	0.22 (1.34)	0.22 (1.31)
Sex of child	1.77 (1.84)	1.83 (1.90)
Log age in months	−5.47 (−4.69)	−5.27 (−4.49)
Currently breastfed dummy	0.40 (0.27)	0.27 (0.18)
Past breastfed dummy	−4.38 (−3.13)	−3.80 (−2.72)
Nutrition education dummy		
PNP[b]	0.20 (0.16)	0.41 (0.32)
Pilot[c]	2.26 (2.17)	1.94 (1.85)
Child care time in hours of wife	0.0076 (0.18)	0.0012 (0.03)
Diarrhea dummy	−3.35 (−2.10)	−3.44 (−2.15)
Fever dummy	−0.54 (−0.47)	−0.29 (−0.26)
Food assistance dummy	0.04 (0.04)	0.29 (0.29)
Percent children below 6 years	−0.002 (−0.05)	−0.01 (−0.35)
Dummy for Antique Province	−2.39 (−1.53)	−2.49 (−1.59)
Dummy for South Cotabato Province	−0.02 (−0.01)	0.12 (0.10)
Birth order	−1.91 (−3.19)	−1.91 (−3.19)
Water quality dummy	−2.94 (−2.71)	−2.84 (−2.59)
Household size	−2.60 (−4.17)	−2.54 (−4.06)
Price of rice	−0.30 (−0.23)	−0.92 (−0.77)
Price of cooking oil	−0.02 (−1.08)	−0.03 (−1.52)
F	3.66	3.52
R^2	0.14	0.14

Notes: Figures in parentheses are t-ratios. The number of observations was 509. The proportional model specifies the subsidy variable as a proportion of the subsidy to total income, whereas the dummy model specifies one for the presence of subsidy, zero otherwise.

[a] Income is approximated by total expenditures in all regressions.

[b] This dummy is for the Philippine Nutrition Program (PNP), a government program begun in 1974.

[c] This dummy is for the nutrition education program held in conjunction with the pilot food price subsidy scheme.

Table 39—Regression results for height as a percent of standard height-for-age, children aged 13 to 83 months

Independent Variable	Proportional Model	Zero-One Dummy Model
Intercept	100.56	100.81
	(24.42)	(25.35)
Log income per AEU (including subsidy)[a]	1.11	1.16
	(1.38)	(1.45)
Subsidy in percent of income	−0.03	...
	(−0.37)	
Subsidy dummy	...	−0.82
		(−1.31)
Education of husband	0.13	0.13
	(1.50)	(1.59)
Education of wife	0.09	0.11
	(0.97)	(1.09)
Sex of child	0.47	0.46
	(0.83)	(0.82)
Log age in months	−2.29	−2.22
	(−3.35)	(−3.23)
Currently breastfed dummy	−0.53	−0.53
	(−0.63)	(−0.63)
Past breastfed dummy	−1.51	−1.40
	(−1.84)	(−1.72)
Nutrition education dummy		
PNP[b]	0.03	0.10
	(0.04)	(0.13)
Pilot[c]	2.01	1.94
	(3.29)	(3.17)
Child care time in hours of wife	0.01	0.008
	(0.44)	(0.33)
Diarrhea dummy	−1.49	−1.57
	(−1.60)	(−1.68)
Fever dummy	0.19	0.17
	(0.28)	(0.25)
Food assistance dummy	−1.91	−1.85
	(−3.21)	(−3.10)
Percent children below 6 years	0.04	0.04
	(1.66)	(1.71)
Dummy for Antique Province	0.54	0.53
	(0.59)	(0.58)
Dummy for South Cotabato Province	1.38	1.34
	(1.87)	(1.83)
Birth order	−0.50	−0.47
	(−1.43)	(−1.35)
Water quality dummy	−3.07	−2.97
	(−4.84)	(−4.65)
Household size	−0.78	−0.75
	(−2.12)	(−2.05)
Price of rice	−2.03	−2.16
	(−2.71)	(−3.11)

(continued)

Table 39—Continued

Independent Variable	Proportional Model	Zero-One Dummy Model
Price of cooking oil	−0.02 (−1.20)	−0.02 (−1.33)
F	4.32	4.41
R^2	0.16	0.17

Notes: Figures in parentheses are t-ratios. The number of observations was 509. The proportional model specifies the subsidy variable as a proportion of the subsidy to total income, whereas the dummy model specifies one for the presence of the subsidy, zero otherwise.
[a] Income is approximated by total expenditures in all regressions.
[b] This dummy is for the Philippine Nutrition Program (PNP), a government program begun in 1974.
[c] This dummy is for the nutrition education program held in conjunction with the pilot food price subsidy scheme.

Table 40—Regression results for z-scores for weight-for-age, children aged 13 to 83 months

Independent Variable	Proportional Model	Zero-One Dummy Model
Intercept	−1.03 (−1.15)	−0.44 (−0.51)
Log income per AEU (including subsidy)[a]	0.42 (2.42)	0.41 (2.35)
Subsidy in percent of income	0.03 (1.97)	...
Subsidy dummy	...	−0.11 (−0.79)
Education of husband	0.0099 (0.54)	0.01 (0.62)
Education of wife	0.01 (0.02)	0.01 (0.64)
Sex of child	0.30 (2.46)	0.31 (2.52)
Log age in months	−0.60 (−4.05)	−0.57 (−3.82)
Currently breastfed dummy	−0.04 (−0.24)	−0.06 (−0.34)
Past breastfed dummy	−0.48 (−2.68)	−0.39 (−2.20)
Nutrition education dummy		
PNP[b]	−0.02 (−0.12)	0.01 (0.08)
Pilot[c]	0.28 (2.08)	0.23 (1.71)
Child care time in hours of wife	0.0060 (1.26)	0.0059 (1.07)
Diarrhea dummy	−0.34 (−1.66)	−0.35 (−1.71)

(continued)

Table 40—Continued

Independent Variable	Proportional Model	Zero-One Dummy Model
Fever dummy	−0.10	−0.06
	(−0.69)	(−0.44)
Food assistance dummy	0.11	0.15
	(0.89)	(1.18)
Percent children below 6 years	−0.004	−0.005
	(−0.77)	(−1.11)
Dummy for Antique Province	−0.20	−0.21
	(−1.00)	(−1.07)
Dummy for South Cotabato Province	0.19	0.21
	(1.17)	(1.30)
Birth order	−0.21	−0.22
	(−2.89)	(−2.80)
Water quality dummy	−0.40	−0.39
	(−2.89)	(−2.75)
Household size	−0.29	−0.28
	(−3.60)	(−3.47)
Price of rice	−0.010	−0.17
	(−0.006)	(−1.12)
Price of cooking oil	−0.0009	−0.0023
	(−0.31)	(−0.81)
F	3.15	2.98
R^2	0.12	0.12

Notes: Figures in parentheses are t-ratios. The number of observations was 509. The proportional model specifies the subsidy variable as a proportion of the subsidy to total income, whereas the dummy model specifies one for the presence of the subsidy, zero otherwise.

[a] Income is approximated by total expenditures in all regressions.

[b] This dummy is for the Philippine Nutrition Program (PNP), a government program begun in 1974.

[c] This dummy is for the nutrition education program held in conjunction with the pilot food price subsidy scheme.

Table 41—Regression results for z-scores for weight-for-height, children aged 13 to 83 months

Independent Variable	Proportional Model	Zero-One Dummy Model
Intercept	−2.00	−1.46
	(−2.27)	(−1.71)
Log income per AEU (including subsidy)[a]	0.24	0.21
	(1.40)	(1.25)
Subsidy in percent of income	0.04	...
	(2.48)	
Subsidy dummy	...	0.10
		(0.75)
Education of husband	−0.02	−0.02
	(−0.95)	(−0.97)
Education of wife	0.0076	0.004
	(0.37)	(0.20)

(continued)

Table 41—Continued

Independent Variable	Proportional Model	Zero-One Dummy Model
Sex of child	0.14 (1.21)	0.16 (1.29)
Log age in months	−0.09 (−0.63)	−0.08 (−0.55)
Currently breastfed dummy	0.10 (0.53)	0.08 (0.42)
Past breastfed dummy	−0.18 (−1.04)	−0.13 (−0.70)
Nutrition education dummy		
PNP[b]	0.05 (0.29)	0.06 (0.38)
Pilot[c]	−0.17 (−1.29)	−0.20 (−1.51)
Child care time in hours of wife	−0.0029 (−0.54)	−0.003 (−0.59)
Diarrhea dummy	−0.13 (−0.63)	−0.12 (−0.60)
Fever dummy	−0.13 (−0.91)	−0.09 (−0.61)
Food assistance dummy	0.39 (3.03)	0.41 (3.18)
Percent children below 6 years	−0.0079 (−1.70)	−0.01 (−2.10)
Dummy for Antique Province	−0.52 (−2.64)	−0.53 (−2.70)
Dummy for South Cotabato Province	−0.29 (−1.87)	−0.27 (−1.68)
Birth order	−0.16 (−2.13)	−0.17 (−2.21)
Water quality dummy	0.26 (1.92)	0.25 (1.82)
Household size	−0.18 (−2.36)	−0.18 (−2.31)
Price of rice	−0.43 (−2.68)	−0.28 (−1.87)
Price of cooking oil	−0.0001 (−0.04)	−0.0009 (−0.33)
F	2.87	2.58
R^2	0.11	0.10

Notes: Figures in parentheses are t-ratios. The number of observations was 509. The proportional model specifies the subsidy variable as a proportion of the subsidy to total income, whereas the dummy model specifies one for the presence of the subsidy, zero otherwise.

[a] Income is approximated by total expenditures in all regressions.

[b] This dummy is for the Philippine Nutrition Program (PNP), a government program begun in 1974.

[c] This dummy is for the nutrition education program held in conjunction with the pilot food price subsidy scheme.

BIBLIOGRAPHY

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

Alderman, Harold, and von Braun, Joachim. *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.

Aligaen, Melba B., and Florencio, Cecilia B. "Intra-Household Nutrient Distribution and Adequacy of Food and Nutrition Intake of Filipino Urban Households." *Philippine Journal of Nutrition* (January-March 1980): 11-19.

Behrman, Jere, and Wolfe, Barbara. "More Evidence on Nutrition Demand: Income Seems Overrated and Women's Schooling Underemphasized." *Journal of Development Economics* 14 (January-February 1984): 105-128.

Benus, J; Kmenta, J.; and Shapiro, H. "The Dynamics of Household Budget Allocation to Food Expenditures." *Review of Economics and Statistics* 58 (No. 2, 1976): 129-138.

Blumenfeld, Stewart; Flores, Maria B.; Mack, M.; Norton; and Pooley. *PL 480 Title II: A Study of the Impact of Food Assistance Programs in the Philippines.* Washington, D.C.: U.S. Agency for International Development, 1982.

Bouis, Howarth. "Rice Policy in the Philippines." Ph.D. dissertation, Stanford University, 1982.

Carloni, Alice S. "Sex Disparities in the Distribution of Food Within Rural Households." *Food and Nutrition* 7 (1981): 3-12.

Deaton, Angus, and Muellbauer, John. *Economics and Consumer Behavior.* New York: Cambridge University Press, 1980.

Edirisinghe, Neville. *The Food Stamp Scheme in Sri Lanka: Costs, Benefits, and Options for Modification.* Research Report 68. Washington, D.C.: International Food Policy Research Institute, 1987.

Evenson, Robert E.; Popkin, Barry M.; and Quizon, Elizabeth K. "Nutrition, Work and Demographic Behavior in Rural Philippine Households." In *Rural Household Studies in Asia.* Edited by Hans P. Binswanger, Robert Evenson, Cecilia A. Florencio, and Benjamin White. Singapore: Singapore University Press, 1980.

Fraker, Thomas; Devaney, Barbara; and Cavin, Edward. "An Evaluation of the Effect of Cashing Out Food Stamps on Food Expenditures." *American Economic Review* 76 (May 1986): 230-234.

Friedman, Milton. *A Theory of the Consumption Function.* Princeton: Princeton University Press, 1957.

Hassan, Nazmul, and Ahmad, Kamaluddin. "Intra-Familial Distribution of Food in Rural Bangladesh." *Food and Nutrition Bulletin* 6 (No. 4, 1984): 34-42.

Hymans, S., and Shapiro, H. "The Allocation of Household Income to Food Consumption." *Five Thousand American Families—Patterns of Economic Progress,* Vol. II. Edited by J. Morgan. Ann Arbor: University of Michigan Press, 1975.

Knudsen, Odin K., and Scandizzo, Pasquale L. *Nutrition and Food Needs in Developing Countries.* Staff Working Paper 328. Washington, D.C.: World Bank, 1979.

Kumar, Shubh. *The Impact of Subsidized Rice on Food Consumption and Nutrition in Kerala.* Research Report 5. Washington, D.C.: International Food Policy Research Institute, 1979.

Mellor, John W. "Food Aid and Nutrition." *American Journal of Agricultural Economics* 62 (December 1980): 979-983.

Philippines, Food and Nutrition Research Institute. *Publication No. 75.* Manila: FNRI, 1977.

Philippines, Food and Nutrition Research Institute, National Science and Technology Authority. *Second Nationwide Nutrition Survey, Philippines, 1982.* Manila: NSTA, 1984.

Philippines, Food and Nutrition Research Institute and National Nutrition Council. *Recommended Dietary Allowances for Filipinos.* Manila: FNRI, 1976.

Philippines, Ministry of Agriculture, National Nutrition Council and the National Economic and Development Authority. *The Philippine Food and Nutrition Plan for the 80s.* Manila: Ministry of Agriculture, 1980.

Philippines, National Economic and Development Authority. *Philippine Statistical Yearbook.* Manila: NEDA, 1985.

Philippines, National Nutrition Council, Nutrition Research Committee. *Philippine Recommended Dietary Allowances, Part I, Nutrients.* Manila: National Nutrition Council, 1976.

Pimoz, E., and Viteri, F. "Understanding Health and Nutrition Behavior Through the Study of Household Decision Making and Intra-Household Resource Distribution." Washington, D.C.: Pan-American Health Organization, 1983.

Pinstrup-Andersen, Per. "An Analytical Framework for Assessing Nutritional Effects of Policies and Programs." In *Food Policy.* Edited by Charles K. Mann and Barbara Huddleston. Bloomington: Indiana University Press, 1985.

Pinstrup-Andersen, Per, ed. *Consumer-Oriented Food Subsidies: Costs, Benefits, and Policy Options for Developing Countries.* Baltimore: Johns Hopkins University Press for International Food Policy Research Institute, forthcoming.

Prais, S. J., and Houthakker, H. S. *The Analysis of Family Budgets.* New York: Cambridge University Press, 1971.

Reutlinger, Shlomo, and Katona-Apte, Judith. *The Nutritional Impact of Food Aid: Criteria for the Selection of Cost-Effective Foods.* Washington, D.C.: World Bank, 1984.

Sahn, David E. "Malnutrition and Food Consumption in Sri Lanka: An Analysis of Changes from 1969 to 1982." International Food Policy Research Institute, Washington, D.C., 1986 (mimeographed).

Senauer, Ben; Garcia, Marito; and Jacinto, Elizabeth. "Determinants of Intrahousehold Allocation of Food in Rural Philippines." *American Journal of Agricultural Economics* (forthcoming, February 1988).

Senauer, Ben, and Young, Nathan. "The Impact of Food Stamps on Expenditures: Rejection of the Traditional Model." *American Journal of Agricultural Economics* 68 (February 1986): 37-43.

Silverio, Simeon G. *The Neighborhood Sari-Sari Store.* Institute of Philippine Culture Poverty Series 2. Quezon City, Philippines: Ateneo de Manila University, 1975.

Trairatvorakul, Prasarn. *The Effects on Income Distribution and Nutrition of Alternative Rice Price Policies in Thailand.* Research Report 46. Washington, D.C.: International Food Policy Research Institute, 1984.

Valenzuela, Rosario. "A Study on Nutrient Distribution within the Family and Factors Affecting Nutrient Intake." University of the Philippines, Diliman, 1977 (mimeographed).

Valenzuela, Rosario; Florencio, Cecilia; and Guthrie, H. "Distribution of Nutrients Within the Family." *Nutrition Report International* 19 (No. 4, 1979).

West, Donald A., and Price, David W. "The Effects of Income, Assets, Food Programs, and Household Size on Food Consumption." *American Journal of Agricultural Economics* 58 (1976): 725-730.

Wolfe, Barbara, and Behrman, Jere. "Determinants of Child Mortality, Health, and Nutrition in a Developing Country." *Journal of Development Economics* 11 (1982): 163-193.

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