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Report on

ALTERNATIVE NUTRITION/HEALTH INTERVENTION EFFECTS AND COST-EFFECTIVENESS

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PREFACE

An extensive longitudinal study of alternative nutrition/health interventions is reported here. The study is the result of collobrative efforts of the Nutrition Center of the Philippines, the National Nutrition Counsel of the Philippines, the University of Santo Tomas, the Virginia Polytechnic Institute and State University, and the United States Agency for International Development.

The primary focus of the study is on estimating intervention effects and on analysis of intervention cost-effectiveness. Chapters IV, V, VI, and VIII should be of particular interest to planners and policy formulators. Chapter IV reports our analysis of relationships between socioeconomic variables and nutritional status. Models enabling planners to further study and investigate these relationships are given. Intervention effects (statistically adjusted for socioeconomic differences) are reported in Chapter V. The corresponding analysis of cost-effectiveness if presented in Chapter VI.

PROJECT PERSONNEL

AND

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Many people have contributed to the success of this project in various important ways. Though their names are not all listed below, their contributions are gratefully acknowledged. The primary project personnel and their respective roles are listed below.

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TABLE OF CONTENTS

CHAPTER 1

BACKGROUND AND LITERATURE REVIEW

A better understanding of the factors which influence infant growth and development is urgently needed because of growing interest in reducing infant and preschool morbidity and mortality. The relative effect of various interventions and their costs are important for planning action programs.

The Philippine National Nutrition program recognizes that malnutrition problems among infants and young children must be attacked at the family level. The National Nutrition Council, which coordinates this program, has encouraged operational activities aimed at investigating least cost interventions for extending services from rural health units and other concerned agencies directly into the homes of families who are likely to have malnourished children. A nationwide nutrition survey conducted by the Food and Nutrition Research Institute (FNRI) (1) reported estimates of the degree of malnutrition among children in the Philippines. This report also further noted that nutrient intake levels were alarmingly low for households with low annual per capita income, heads who are farm workers, and hired fishermen. This was further complicated by low formal schooling of meal planners and large family sizes.

Through child weaning programs it has been clearly established that the age interval during which under-nutrition develops in infants corresponds to the periods when breast milk is no longer adequate, namely between about five or six months of age to 18 months of age. During this period, the infant is exposed to three major hazards. These are incomplete or inadequate supplementary food, water of questionable potability or

other insanitary conditions, and infectious diseases. Additionally, rural mothers generally have had minimum exposure to elementary lessons in maternal and child health. Therefore, nutrition and health education for mothers is also considered extremely important.

Considerable work has been reported in the literature on nutritional health delivery systems in different parts of the world. Attention has been focused on nutrition of infants and preschoolers because this is the age where nutrition deficiencies are most likely to be manifested. The infant and preschool children are most vulnerable to poor environmental and sanitary conditions, infectious diseases and poor quality of the diet. These conditions exist today in most of the developing countries and are responsible for the high infant mortality in these countries (2).

Though many studies in various countries have made attempts to estimate benefits of various intervention schemes, few have concentrated upon the cost effectiveness of nutrition/health delivery systems. These considerations led to the design and implementation of the study reported here. In addition to anthropometric data on subject infants, socioeconomic and other related data on the subject families were collected. It was hoped that such data, appropriately analyzed, would allow for a more accurate estimation of the true impact of the interventions upon the nutritional status of children in the study. Moreover, such data would be useful to national planners and program implementors of the Philippine Nutrition program in arriving at strategies for effectively dealing with socioeconomic and other ecological factors to which rural Filipino families are exposed and which influenced the growth and development of their infants.

Leon-Marie Andre (3) indicates that severe malnutrition calls for immediate curative action whereas moderate malnutrition requires essentially

indirect preventative action to prevent a certain percentage of moderate cases from developing into severe malnutrition. Indirect preventive action is aimed at: (a) Improving the availability of food (food production, processing of food stuffs, marketing, applied nutrition, etc.). (b) Improving the purchasing power and obtaining better utilization of the family budget (general education and nutrition, consumer education, family planning, etc.). (c) Improving food habits through food and nutrition education, food promotion campaigns, etc.). (d) Improving the family health status (immunization, safety of drinking water, hygienic disposal of excreta, drainage, water supply, etc.). These measures may be long term but the results are more lasting than those obtained through direct action.

In the study we report here, four major health/nutrition interventions have been considered in light of other studies undertaken in different parts of the world. Details on the study design and intervention definitions are given in Chapter 2. However, we will state here that we were primarily concerned with four major interventions along with all intervention combinations. They were: nutrition and health education, food supplementation, immunization, and sanitation.

Literature Review

Reddy et al.(4) stress the importance of nutrition education in an applied nutrition program in Tirupati and the surrounding rural areas of Chittoor District, Andhra Prodesh in India. The program started with a survey in Chandragiri, a rural community of Chittoor District. The selected families were interviewed and information was collected through a questionnaire. The information was related to sources of income, foods grown, and it's availability, infant and toddler feeding practices, the diet

pattern, food fads, food habits, cooking methods and existing nutritional deficiency signs among the preschool children. The results highlighted on nutritional deficiences prevalant among preschool children and the infant feeding practices and food used in the survey area. With available information, the most immediate needs of the families were assessed and a suitable program was devised with nutrition education and training of the rural mothers as the principal component.

Another reported study on nutrition education was conducted by Hunt et al.(5). Low income pregnant women of Mexican descent were studied to determine whether their food habits could be improved by nutrition education. Biochemical indices of nutritional status were also investigated. Twenty-four dietary recalls were obtained at an initial interview and again at a final interview after a nutrition education program which was offered to a randomly selected treatment group. Nutrition education consisted of planning nutritious meals using foods from the four basic food groups and methods of buying, storing and preparing these foods. A significant improvement in dietary intake, especially in protein, ascorbic acid, niacin, riboflavin and thiamine, was noted only in the treatment group. This suggests the effectiveness of nutrition education programs.

Food supplementation interventions have been used throughout the world. Numerous studies have been reported including Rao et al. (6) in nine villages of Hyderabad, India. Two hundred and eleven preschool children received a food supplement and 82 children received no such supplement. Their results indicated that those who were most severely malnourished benefited most from the nutritional supplementation program. Edozien et al.(7) cited a special supplemental food program administered by the U.S. Department of Agriculture, for women, infants and children.

Participating infants, children under four years of age, and pregnant and nursing women were investigated initially, and again after receiving food supplements which consisted of iron fortified infant formula, iron fortified infant cereals and fruit juices for the infants, and milk, cheese, iron fortified cereal, eggs, and fruit juices for the children and women. Their results demonstrated an increase in weight gain during pregnancy and in birth weight as well as acceleration of growth and a reduction in the anemia rate of all participant categories except women in the first and second trimesters of pregnancy. King et al. (8) reported their evaluation of the effectiveness of mothercraft centers operating in Haiti during the period 1964 to 1975. They reported the greatest benefit as preventive, particularly against severe malnutrition for younger siblings.

Other studies have been reported with similar objectives. Between 1968 and 1975, Kielman et al. (9) reported studies in 10 villages in the Punjab, North India in which they examined interactions between nutrition and infections as they affected preschool child growth, morbidity, and mortality. Both longtudinal and cross-sectional survey data were collected. This study was specifically designed to first define the malnutrition and infection problem, as had been done in the three-village study in Guatemala between 1959 and 1964 (10, 11), and then to examine the cost benefits of alternative solutions. They had a particular interest in testing the effectiveness of an auxillary based population-wide preschool nutrition and health care program as opposed to the traditional health care program. The nutrition component included anthropometric surveilance, food supplement, and nutrition education. The medical component included immunizations, health education, morbidity surveillance and early diagnosis and

treatment. Data were collected on almost 3,000 children under three years of age. The results tended to confirm the Guatemala study. The nutrition intervention resulted in the highest average body weights at 17 months of age, followed by a combined nutrition/medical care intervention. Growth was poorest in the control villages. The treatment villages also demonstrated reduced mortality rates.

The relation of nutrition to diarrheal disease control was an outgrowth of a socio-demographic study of causal factors of protein-calorie malnutrition in young children (12, 13) in Candelaria, Columbia. In this study a food supplement was provided to malnourished children and mothers received instruction on use of the food supplement as well as general health and nutrition education. Although a direct cause and effect relationship was not demonstrated, the results revealed a declining prevalence of diarrheal disease as nutritional recuperation was accomplished through the food supplement and mother education program. The authors concluded that one of the most effective ways of controlling diarrheal diseases in preschool children is that of improving nutrition, due to the lack of any effective immunization program.

Other reported studies primarily concerned with control of infectious diseases through immunization and environmental sanitation have also been reported. Donoso (14) indicated that if programs designed to increase the supply of food are carried out without decreasing the high exposure to infection agents (by improving sanitation, housing, water supply, etc.) and without increasing the host resistance (by vaccination, prompt and adequate medical assistance), returns in terms of reducing the high rates of protein-calorie malnutrition, especially of the more advanced and complicated forms, will be much lower than might be expected. Briscoe (15)

attempted to develop a framework for evaluating the effect of infection on the intake and efficiency of use of food by children under five years old in poor countries. He found that nine percent of the food available to a cohort of children in Bangladesh is not used for maintance growth or activity of these children who survived to their fifth birchday. The amount of food that is not used effectively may be reduced to about 3% in a hypothetical situation where all sources of infection are eliminated but other conditions remained unchanged. The estimates suggest that the most important factors contributing to this inefficiency are reduced intake through food withdrawal and anorexia and high mortality in younger children. The prevention of measles surely plays a role in preventing the familiar infection-malnutrition spiral. Environmental changes apparently have been more important than medical advances in reducing mortality in 18th century Europe and in developing countries in the 20th century (15, 16, 17). Because of health changes eminating from improvements in water supply and sanitation affect most of the spectrum of infections that influence nutritional status, these are attractive options in attempting to reduce malnutrition through the control of infections.

The effects of different water use patterns on health are not well known. Some studies have shown that the use of increased quantities of better quality water reduce the incidence of fecal-oral diseases (15, 18, 19). Other studies apparently have indicated that the use of uncontaminated drinking water has not affected the incidence of classic water born diseases (15, 20, 21).

The importance of water in the control of gastrointestinal infections has also been reported in other studies (22, 23, 24, 25) with the conclusion that although an abundant and safe water supply is essential for

decreasing the incidence of diarrhea, there are still many gaps in our knowledge of the role of well-water in promoting health. In the Bangladesh study (23) a safe water supply had no apparent affect on the cholera attack rate in young children.

With regard to immunization interventions, a study by the US National Academy of Science (26) noted that with the exception of severe protein-calorie malnutrition, nutritional deprivation had relatively little suppressive effect on the immunity of the host and that vaccines designed to effect such a response probably would be effective in malnourished children. They concluded, however, that more research is needed to clarify the nutrition and immunization relationship. A direct growth-depressive effect of immunization on infants under six months of age was noted in a rural community (27). DPT, BCG, and polio vaccinated preschoolers (470 subjects) were studied and compared with controls (non-vaccinated). For subjects under six months of age, the vaccines produced a significant reduction in weight-for-age when compared with the controls. In those children under 80% of standard weight a greater growth depression was noted than among children above 80% following polio and smallpox immunization. In this study it was concluded that immunization should be given to infants below six months only if an epidemic is anticipated or if it will be difficult or costly to accomplish such programs at an older age.

From the above mentioned literature,as well as considerable literature not mentioned here, it is clear that considerably more information is needed and much is yet to be learned concerning quantitative gains and impacts as well as relationships between various major nutrition/health interventions. It is our hope that this study will in some ways assist in our understanding of the impact of several interventions on young children as well as possible relationships between major interventions considered in this report.

CHAPTER 2

STUDY DESIGN AND DEFINITION OF INTERVENTIONS

Four primary interventions are considered in this study, along with all intervention combinations and a control population. The four primary interventions consisted of (a) nutrition and health education for the mother (b) supplementary food for the subject child (c) sanitation, and (d) immunizations. The interventions and combination of interventions will be more precisely defined below. The analysis will report the data in the form of nine interventions as follows:

1. Control
2. Nutrition/health education
3. Nutrition/health education and immunization
4. Nutrition/health education and supplementary food
5. Nutrition/health education and sanitation
6. Nutrition/health education and immunization and supplementary food
7. Nutrition/health education and supplementary food and sanitation
8. Nutrition/health education and immunization and sanitation
9. Nutrition/health education and immunization and supplementary food and sanitation

These eight interventions and the control were randomly allocated to eighteen villages with each intervention administered in two different villages for purposes of replication.

Project Site and Implementation Plan

The University of Santo Tomas School of Medicine, St. Martin de Porres Socio-Medical Center in the municipality of San Jose del Monte, Bulacan, served as the project field headquarters. This is located about 40 kilometers northeast of Manila, Philippines. Eighteen barangays (villages) in San Jose del Monte and four nearby municipalities, all in Bulacan (Angat, Norzagaray, Pandi and Sta. Maria) were selected out of a total of approximately 80 barangays. Selection of the potential study barangays was based upon several criteria. The principle among these were accessability by four-wheel drive jeep, willingness to cooperate by local leaders and residents, uniformity in terms of overall socioeconomic status, and minimal previous exposure to intervention programs of the type involved in this study.

The experimental plan included monthly administration of interventions in each household and bimonthly collection of anthropometric and morbidity-mortality data on infants and the family to be utilized as measures of intervention impacts. There were three basic phases of data analysis and data collection. They were the (a) baseline stage, where extensive data were collected on the subject infant and the family (prior to beginning of interventions at age five months), (b) intervention data analysis (age five months through age 17 months), and (c) follow-up data analysis (quarterly collection of data for a 12 month period following termination of interventions). In addition to the above requirements, potential barangays to be included in the study were to be of sufficient size to assure availability over a two year period of 20 to 40 (average of 30) subjects available for the almost 2-1/2 year period from baseline through follow-up.

In the above selection process the doctors, nurses, midwives and sanitarians comprising the municipal health staffs in the five towns were given

a thorough briefing of the research plan. They in turn cooperated and provided valuable inputs in the selection of the barangays.

The local government units at the barangay level were also involved since the barangay captain, his council, and a village school teacher usually comprised the nucleus of local leaders through which the Philippine Nutrition Program activities are implemented. Thus, in the selection process a further criteria was the presence of an active barangay infrastructure or willingness of the local leaders to initiate such an organization.

Selection of Subjects

Criteria for selection of the 20 to 40 subjects in each of the 18 barangays were: absence of congenital anomalies, willingness of parents to cooperate, and normalcy of the subject infants with respect to body weight for age (approximately within two standard deviations of the standard weight for age).

The initial subjects selected for participation in each barangay were identified on the basis of the above criteria during the first visit of the project research staff. These subjects ranged in age from less than one month to four or five months. Subsequent selection of subjects coincided with the monthly visits of the research staff for delivery of the planned intervention. In this manner, 544 subjects completed the study during a three year period from 1975 to 1978 and with follow-up observations extending into 1979.

Baseline Data Collection

The instrument used to collect baseline socioeconomic data and other data deemed important and impacting on infant growth was field tested and revised before its use in the study. Problems relating to respondents

level of education and language problems (dialects) were anticipated and questionnaires adjusted accordingly. All data were coded and transferred for statistical and computer analysis at the Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

The Intervention Delivery System

Each research team, which delivered the planned interventions on a one-to-one basis to the participants, consisted of a physician and a medical researcher who could be a nurse, a nutritionist or a medical technologist. The medical researchers were utilized in delivery of interventions of food, sanitation, and education interventions and the physicians were primarily utilized in the health and immunization interventions and to provide immediate medical attention in the village when needed. Both medical researchers and physicians participated in the routine anthropometric measurements made on the subjects each month. The work load varied and intensified with time as more subjects came into the study. At its maximum the total research staff consisted of 14 personnel, including two drivers and a secretary.

In order to insure uniformity in the delivery of interventions, all lessons and guidelines were drawn up in detail and each intervener received special instructions from the field coordinator before each site visit on the exact procedure to be followed in the one-on-one delivery of the interventions. All instructions were conducted within the home of the subject family while the intervention was being delivered.

It should be noted that education was common to all 16 experimental barangays. It was deemed particularly important that this intervention be thoroughly standarized. To achieve this objective, the lesson plans were protected with plastic coating and their contents routinely rehearsed by

all interveners involved before going to the field. A detailed 10 page data form was completed on each subject on alternate months, beginning at age five months and ending at 17 months when interventions were terminated. Similar plastic coated detailed lesson plans and guidelines were developed for delivery of each of the other interventions.

Follow-Up Plans

As mentioned above, all interventions ceased when the subject child reached 17 months of age. The interveners, however, continued their visits to the households when the subject child was 20, 23, 26 and 29 months of age for follow-up observations and for anthropometric and morbidity-mortality data collection. In this way the majority of the subjects were followed through 26 months of age and a lesser number through 29 months of age. A two-page data form was used to record the data collected during the follow-up phase.

Data Collection

In addition to completion of a detailed baseline data instrument for each participating family and anthropometric data (weight, height, arm, chest and head circumference) on the subject child at each visit of the research team, data were collected on mortality and morbidity and on food, nutrition, and dietary knowledge and practices as reflections of the impact of education and other interventions.

Description of the Interventions

The supplementary food intervention consisted of a food packet (Nutripak) developed for the Philippine Nutrition Program. Three formulations of the nutripak were available at the choice of each family. Each formulation had

rice, powdered milk and oil, and then the choice for protein content was between mongobeans, ground fish or ground mini-shrimp. In addition, Type 1 and Type 2 Nutripak formulations were utilized in the following way: Type 1 Nutripaks were given to subjects until they reached one year of age and Type 2 Nutripaks were given from one year until termination of the supplementary food intervention. Throughout the 12 month intervention period, 15 Nutripaks were distributed per month so that the subject child could be offered one-half of a Nutripak per day for an approximate 25% of the calorie and protein requirements. The table below shows the calorie and protein content for the three formulations and for Type 1 and Type 2 Nutripaks.

Type 1	Mongobeans	Ground fish	Ground mini-shrimp
Kilo-Calories	458	422	432
Protein	13 gm.	16 gm.	17 gm.
Type 2			
Kilo-Calories	717	659	662
Protein	19 gm.	20 gm.	17 gm.

Detailed instructions guided the mothers in the proper use of the Nutripak which was fed as a gruel and further fortified with home prepared pureed leafy green vegetables. The Nutripaks supplied to each subject were replenished each month.

The sanitation intervention consisted of two primary components. (a) Use of safe drinking water supply for the subject, home prepared from a chlorine solution of locally available Clorox or Purex and (b) introduction of water sealed toilets in the target households when they did not

exist. In addition, more detailed advice and instructions were given on the importance of maintaining cleaniness in and around the home than that contained in the education intervention which was common to all experimental groups. Project funds were used to provide the toilet bowls with the expectation that the individual families would find the means to construct an appropriate shelter and pit. As it ultimately turned out, the sanitation component pertaining to the toilet bowls did not work out very satisfactorily. First of all, a relatively high proportion already had toilets with only 67 toilet bowls being delivered. Only approximately one-third of the toilet bowls delivered were actually installed due to the fact that participants were unable to cover the cost or because of lack of sufficient water supply. The water chlorination was administered by providing participant families with a set of materials and instructions as follows: (a) a 100 ml bottle of Clorox or Purex replenished each month; (b) a dropper to use in mixing Clorox with water; (c) standardization of the number of the Clorox drops suitable for their own water container; (The solution used in the intervention was 10 drops of clorox solution per gallon of water.) and (d) an on the scene demonstration of the chlorination process.

The immunization intervention consisted of PPD, BCG, DPT_1, DPT_2, DPT_3 and measles. PPD, BCG and DPT vaccines were locally available and routinely procurred through the Bureau of Laboratories, Ministry of Health, Bureau of Animal Industry, Alabang Rizal. Through most of the study period, the measles vaccine was donated by the Civic Action Team, Clark Air Force Base, US Air Force. During the final four months of the project, measles vaccine (about 50 doses) was purchased from a local drug firm which regularly imported measles vaccine to satisfy local market demand generated

mostly by private physicians. The immunization schedule which follows was administered as closely as possible: (a) PPD was given as soon as possible after age one month;(b) BCG was administered as soon as possible after a negative PPD injection;(c) DPT_1 was administered at age one month or as soon as possible with DPT_2 and DPT_3 following at one to two month intervals (if more than two months was missed between the DPT series, due to various reasons, the series was started over); and (d) measles vaccine was administered at approximately age one year (10 to 14 months) if the child had not had a history of measles (several histories of measles were in fact found among the study subjects prior to age one year).

In addition to the immunizations given above, additional instruction was given to the mother with respect to disease prevention and treatment. It should be noted that this reinforcement and additional instruction was in addition to health education which was given to every subject family. Also, each subject family had to sign a release form before immunizations were given.

The Survey Sample and Environment

Table 2.1 displays the number of subjects in the study from each of the 18 barangays (villages). The barangays varied in total population from about 400 to more than 4000. All but one were within 40 minutes drive from the town center. Kaybanban was the most remote at about 80 minutes drive. Although all were classified as predominately rural rice farming barangays, there were nevertheless distinct differences. Some of these differences are summarized in Table 2.2. The majority of the barangays were judged to have inadequate water supply and generally poor environmental sanitation. Generally, access was fair except for the two villages receiving the combination of all interventions. Rural health

stations were present in less than one-half of the barangays and about one-half of the barangays practiced faith healing to some extent, with no apparent relationship between presence or absence of a health station. From Table 2.1 it is seen that of 658 participants, 114 did not complete their interventions or participation, 12 of these being in control barangays. Table 2.3 summarizes the reasons for drop-outs. Over one-half dropped out of the study because of out-migration, nearly 20% terminated participation because of refusal of the interventions. Interestingly, 75% of those who refused an intervention were in barangays where immunization was one of the primary interventions. No dropouts occurred in the two food intervention barangays. Ten percent of the subjects were excluded from the analysis because they were underweight for age when interventions began. Of the ten percent who were terminated from the study because of death (11 deaths), eight deaths were due to severe diarrhea.

Additional observations and conjectures related to the success and receptiveness of the various interventions will be discussed in the analysis and interpretation chapters of this report.

TABLE 2.1

SUBJECTS BY VILLAGE AND INTERVENTION

Village (Barangay)	Intervention[a]	Pop 1975 Census	No. Households	Aug. HH size	No. of Subjects		
					Initial	Drop-outs	Final
Bulac	C	1623	301	5.4	47	7	40
Siling Bata	C	795	146	5.4	26	5	21
Partida	E	405	75	5.4	24	7	17
Gaya-Gaya	E	4194	759	5.5	45	8	37
Dulong Bayan	EI	1287	221	5.8	43	0	43
Camangyanan	EI	914	165	5.5	26	8	18
Pulong Yantok	EF	787	149	5.3	33	9	24
Santa Cristo	EF	1859	326	5.7	47	6	41
Siling Matanda	ES	1135	204	5.6	36	5	31
Muzon	ES	2789	453	6.1	37	6	31
Malibong Bata	EIF	834	137	6.1	39	5	34
San Mateo	EIF	2162	367	5.9	39	11	28
Tigbe	EFS	1140	186	6.1	44	4	40
Manggahan	EFS	605	106	5.7	21	1	20
Santa Cruz	EIS	969	160	6.1	30	8	22
Balasing	EIS	1493	255	5.9	48	9	39
Bagong Barrio	EIFS	1156	202	5.7	34	3	31
Kaybanban	EIFS	2166	387	5.6	39	12	27
	Total				658	114	544

[a] C = Control; E = Education; F = Food; S = Sanitation; I = Immunization.

TABLE 2.2

SOME CHARACTERISTICS OF THE VILLAGES IN THE STUDY AREA[a]

Village (Barangay)	Inter-vention	Rural Health Station	Adequacy of water supply	Condition of access highways	Attitude toward Project	Density of Houses	Gen. Environ-mental Cleanliness	Other Remarks
Bulac	C	No	1	1	2	3	3	Faith healing minimum
Siling Bata	C	Yes	3	2	2	1	3	50% follow faith healer
Parlida	E	Yes	3	3	1	1	2	Very hilly terrain little rice product
Gaya-Gaya	E	Yes	3	1	2	1	3	Mothers are vendors
Dulong Bayang	E1	Yes	1	2	1	2	1	No faith healing
Camangyanan	E1	No	2	2	2	1	3	Seasonal cropping water melon
Pulong Yantok	EF	No	1	1	1	1	1	No faith healing
Santo Cristo	EF	Yes	3	1	2	2	2	Air pollution from cement welding
Siling Matanda	ES	No	3	3	2	2	2	Minimum faith healing
Muzar	ES	No	3	1	2	2	3	Family Solidarity strong
Malibond Bata	EIF	No	1	3	1	3	3	30% use of faith healer
San Mateo	EIF	No	3	2	2	1	3	"malaria endemic"
Tigbe	EFS	No	3	3	2	2	3	Faith healer present
Manggahan	EFS	No	1	2	2	1	3	Faith healer present
Santa Cruz	EIS	No	3	2	2	1	3	Deaths blamed on immunization
Balasing	EIS	No	1	2	2	3	1	Minimum faith healing
Bagong Barrio	IEFS	Yes	1	3	2	2	1	No faith healing
Kaybanban	EIFS	Yes	3	3	2	1	3	Faith healer present

[a] 1 = Good; 2 = Fair; 3 = Poor.

TABLE 2.3

REASONS FOR DROP-OUTS OF PARTICIPANTS

Intervention	Out-Migration	Under-Weight	Non-Interest or Unknown	Refusal of Intervention	Death (Cause)
C	8	1	2[a]	1	0
E	10	1		4	
EI	1		2	4	1 (congenital heart disease)
EF	13				2 (Diarrhea)
ES	6	3		2	
EIF	9		3	1	3 (Diarrhea)
EFS	3		1		1 (Unknown)
EIS	6	2		7	2 (Diarrhea)
EIFS	7	2	1	3	2 (Broncho-pneumonia)
EIFS	7	2	1	3	2 (Diarrhea)
Totals	63 (55.3)[b]	9 (7.9)	9 (7.9)	22 (19.3)	11 (9.6)

[a]Congenital defects. [b]Percent of total drop-outs.

CHAPTER 3

BASELINE STUDY

A rather extensive baseline study was completed on the family and subject child before interventions began. The baseline study form is given in the appendix of this report. These data played a major role in the analysis given in subsequent chapters, enabling us to make statistical adjustments for factors influencing the subject children's growth which were not part of the planned interventions. In this chapter we present and discuss summaries of the more important baseline data.

The mean weights, heights, and ages of the subjects at the time of the baseline study are shown in Table 3.1. The anthropometric measurements and standard errors observed suggest that the sample population was relatively normal at baseline in terms of weight for age, the measure to be used to monitor project interventions. Body weight distributions are shown in Table 3.2. There are clearly some noteable differences. In the control group, 15.0% of the subjects were above 120% of standard weight as compared to an average of 8.3% for all interventions.

For the subjects simultaneously receiving all interventions 15.5% were 80% or less of standard weight, as compared to the average of 8.4% for all interventions. Some treatment groups (EFS and EIFS, in particular) tended to have subjects low in body weight at baseline compared to the sample as a whole.

Infant feeding practices are shown in Table 3.3. Pure bottle feeding at the baseline stage appeared to be most widely practiced in the barangays receiving all interventions (EIFS) and in those barangays receiving education and immunization (EI). Pure bottlefeeding tended to be

TABLE 3.1

MEAN BODY WEIGHTS, HEIGHT, AND AGES OF SUBJECTS AT BASELINE BY INTERVENTIONS

Intervention	Subjects	Sex M	Sex F	Weight (kg.)	%Std. Wt.	Height (cm.)	Age (Mos.)
C	60	44	56	5.2	104.4	57.7	2.1
					(17.5)[a]	(5.3)	(1.6)
E	54	49	51	5.2	101.4	57.7	2.3
					(17.1)	(5.4)	(1.5)
EI	61	49	51	4.9	99.7	57.0	2.1
					(13.8)	(4.9)	(1.6)
EF	65	48	52	5.4	101.4	58.6	2.7
					(17.5)	(5.7)	(1.6)
ES	63	41	59	5.2	100.2	58.3	2.4
					(14.6)	(4.4)	(1.4)
EIF	62	56	44	4.6	101.5	56.0	1.5
					(14.3)	(5.4)	(1.5)
EFS	60	42	58	4.5	98.5	56.1	1.6
					(14.9)	(4.8)	(1.4)
EIS	61	60	40	5.1	100.4	57.2	2.2
					(12.2)	(5.5)	(1.4)
EIFS	58	46	54	4.7	94.5	57.0	2.2
					(13.4)	(4.7)	(1.6)

[a](.) denotes standard error of mean.

TABLE 3.2

PERCENTAGE DISTRIBUTION OF PERCENT OF STANDARD WEIGHT OF SUBJECTS BY INTERVENTIONS

Intervention	≤ 80	81 - 90	91 - 100	101 - 110	111 - 120	> 120	Total
C	8.4	26.7	16.7	13.3	20.0	15.0	11.0
	(5)	(16)	(10)	(8)	(12)	(9)	(60)
E	5.6	24.1	27.8	14.8	14.8	13.0	9.9
	(3)	(13)	(15)	(8)	(8)	(7)	(54)
EI	4.9	19.7	26.2	24.6	18.0	6.6	11.2
	(3)	(12)	(16)	(25)	(11)	(4)	(61)
EF	6.1	18.5	20.0	35.4	12.3	7.7	12.0
	(3)	(12)	(13)	(23)	(8)	(5)	(65)
ES	9.5	17.5	27.0	23.8	12.7	9.5	11.6
	(6)	(11)	(17)	(15)	(8)	(6)	(63)
EIF	8.1	16.1	27.4	17.7	17.7	12.9	11.4
	(5)	(10)	(17)	(11)	(11)	(8)	(62)
EFS	13.3	26.7	21.7	20.0	15.0	3.3	11.0
	(8)	(16)	(13)	(12)	(9)	(2)	(60)
EIS	4.9	19.7	34.4	21.3	14.8	4.9	11.2
	(3)	(12)	(21)	(13)	(9)	(3)	(61)
EIFS	15.5	24.1	34.5	12.1	1.7	1.7	10.7
	(9)	(14)	(20)	(7)	(1)	(1)	(58)
Total	8.4	21.3	26.1	20.1	15.3	8.3	100.0
	(42)	(116)	(142)	(112)	(83)	(45)	(544)

[a](.) denotes number of subjects.

TABLE 3.3

FEEDING PRACTICES OF THE SUBJECTS AT BASELINE, BY INTERVENTION

Intervention	% Breast	% Bottle	% Mixed	% No Answer	% Total
C	60.0 (36)[a]	15.0 (9)	25.0 (15)	0.0 (0)	11.0 (60)
E	42.3 (23)	13.0 (7)	40.7 (22)	3.7 (2)	9.9 (54)
EI	39.3 (24)	31.2 (19)	27.9 (17)	1.6 (1)	11.2 (61)
EF	47.7 (31)	12.3 (8)	38.5 (25)	1.5 (1)	12.0 (65)
ES	42.9 (27)	20.6 (13)	36.5 (23)	0.0 (0)	11.6 (63)
EIF	41.9 (26)	11.3 (7)	46.8 (29)	0.0 (0)	11.4 (62)
EFS	40.0 (24)	13.3 (8)	46.7 (28)	0.0 (0)	11.0 (60)
EIS	34.4 (21)	18.0 (11)	47.5 (29)	0.0 (0)	11.2 (61)
EIFS	34.5 (20)	29.3 (17)	36.2 (21)	0.0 (0)	10.7 (58)
Total	42.7 (232)	18.2 (99)	38.4 (209)	0.7 (4)	100.0 (544)

[a](.) denotes number of subjects.

low in barangays receiving food (EF, EIF, and EFS), averaging no more than two-thirds of the average value of 18.2% observed for all interventions. Overdilution of formula with water (2:1 or more) was practiced by about one-third of the pure-bottle feeders (Table 3.4). Excessive dilution was most common among the controls.

As is shown in our later analysis, the socioeconomic variables which impacted most strongly on infant growth and development were income, educational attainment of parents, and family size. These variables will therefore be examined for differences between treatments. Table 3.5 summarizes income distribution. Clearly, barangays receiving the food intervention tended to have low incomes compared to non-food treatment groups. Three of the four food intervention groups (EF, EFS, and EIFS) exceeded the overall average in the low-income category of less than 2000 pesos annually. Three of the four food interventions were also characterized by considerably less than average representation in the high income category. The control and education interventions were characterized by a considerably above average representation in the high income category. Number of children in the household (Table 3.6) likewise revealed significant differences among treatment groups. Small family size characterized the control group. Again, three of the four food interventions (EF, EIF, and EIFS) were characterized by large family size (five or more children). Data on age of the mother is shown in Table 3.7. No consistent patterns were noted that would suggest important differences between treatments. The two extremes appear to be the low percentage of young mothers in the education (E) intervention and the high percentage in the EIS intervention.

As seen in Table 3.8, all food interventions were considerably below the average in the category of formal schooling for the mother beyond

TABLE 3.4

FORMULA DILUTION PRACTICED AMONG BOTTLE-FED SUBJECTS BY INTERVENTION AT BASELINE

Intervention	Percentage Distribution for Ratio of Water to Milk				
	3:1	2:1	1:1	1:1.5 & 1:2	Total
C	16.7 (4)	41.7 (10)	41.7 (10)	0.0 (0)	8.1 (24)
E	16.7 (5)	26.7 (8)	50.0 (15)	5.1 (2)	10.2 (30)
EI	0.0 (0)	21.1 (8)	76.3 (29)	2.6 (1)	12.8 (38)
EF	13.3 (4)	23.3 (7)	56.7 (17)	6.7 (2)	10.1 (30)
ES	14.3 (5)	25.7 (9)	51.4 (18)	5.7 (2)	11.7 (35)
EIF	6.1 (2)	33.3 (11)	45.5 (15)	12.1 (4)	11.1 (33)
EFS	8.8 (3)	29.4 (6)	64.7 (22)	8.8 (3)	11.4 (34)
EIS	2.7 (1)	8.1 (3)	83.8 (31)	2.7 (1)	12.4 (37)
EIFS	10.5 (4)	26.3 (10)	55.3 (21)	7.9 (3)	12.8 (38)
Total	9.4 (28)	24.2 (72)	59.7 (178)	7.0 (21)	100.0 (298)

[a](.) denotes number of subjects.

TABLE 3.5

PERCENTAGE DISTRIBUTION OF AVERAGE ANNUAL FAMILY INCOME (PESOS) BY INTERVENTIONS

Intervention	<2000	2000 - 3999	≥4000	Total
C	26.7 (16)[a]	28.3 (17)	45.0 (27)	11.0 (60)
E	16.7 (9)	25.9 (14)	57.4 (31)	9.9 (54)
EI	16.4 (10)	47.5 (29)	36.1 (22)	11.2 (61)
EF	36.9 (24)	37.0 (24)	26.1 (17)	12.0 (65)
ES	30.2 (19)	46.0 (29)	23.8 (15)	11.6 (63)
EIF	27.4 (17)	48.4 (30)	24.2 (15)	11.4 (62)
EFS	38.4 (23)	26.7 (16)	35.0 (21)	11.0 (60)
EIS	24.6 (15)	41.0 (25)	34.4 (21)	11.2 (61)
EIFS	34.5 (20)	43.1 (25)	22.4 (13)	10.7 (58)
Total	28.1 (153)	38.4 (209)	33.4 (182)	100.0 (544)

[a](.) number of subjects.

TABLE 3.6

PERCENTAGE DISTRIBUTION OF NUMBER OF CHILDREN IN THE HOUSEHOLD BY INTERVENTION[a]

Intervention	≤2	3 - 4	≥5	Total
C	50.0*	33.3	16.7	11.0**
	(30)[b]	(20)	(10)	(60)
E	24.1	40.8	35.1	9.9
	(13)	(22)	(19)	(54)
EI	54.1	26.3	19.6	11.2
	(33)	(16)	(12)	(61)
EF	26.2	41.5	32.3	12.0
	(17)	(27)	(21)	(65)
ES	42.9	22.3	34.8	11.6
	(27)	(14)	(22)	(63)
EIF	21.0	37.1	41.9	11.4
	(13)	(23)	(26)	(62)
EFS	45.0	25.0	40.0	11.0
	(27)	(15)	(19)	(60)
EIS	47.6	36.1	16.3	11.2
	(29)	(22)	(10)	(61)
EIFS	34.5	20.7	44.8	10.7
	(20)	(12)	(26)	(58)
Total	38.4	31.4	30.2	100.0
	(209)	(171)	(164)	(544)

[a]Grandparents were the most common household members aside from the parents and their children in the 31% of household where other adults resided. Seven percent of families had as many as six or more household members other than the immediate family. [b](.) number of subjects.

TABLE 3.7

PERCENTAGE DISTRIBUTION FOR AGE OF THE MOTHER (YEARS) BY INTERVENTION[a]

Intervention	≤20	21 - 30	≥31	Total
C	11.7	55.0	33.3	11.0
	(7)[b]	(33)	(20)	(60)
E	7.4	53.7	38.9	9.9
	(4)	(29)	(21)	(54)
EI	11.5	67.2	21.3	11.2
	(7)	(41)	(13)	(61)
EF	10.8	53.9	35.4	12.0
	(7)	(35)	(23)	(65)
ES	12.7	57.1	30.1	11.6
	(8)	(36)	(19)	(63)
EIF	14.5	43.6	41.9	11.4
	(9)	(27)	(26)	(62)
EFS	10.0	60.0	30.0	11.0
	(6)	(36)	(18)	(60)
EIS	18.0	60.7	21.3	11.2
	(11)	(37)	(13)	(61)
EIFS	15.5	46.6	38.0	10.7
	(9)	(27)	(22)	(58)
Total	12.5	55.3	32.1	100.0
	(68)	(301)	(175)	(544)

[a]Age of fathers followed a similar pattern. They were slightly older with only 2.6% being <20 years. [b](.) number of subjects.

TABLE 3.8

PERCENTAGE DISTRIBUTION FOR YEARS OF FORMAL EDUCATION OF THE MOTHERS BY INTERVENTION

Intervention	0 - 4	5 - 6	7 or more	Total
C	20.0 (12)[a]	55.0 (33)	25.0 (15)	11.0 (60)
E	40.7 (22)	42.6 (23)	16.7 (9)	9.9 (54)
EI	21.3 (13)	34.4 (21)	44.3 (27)	11.2 (61)
EF	23.1 (15)	61.5 (40)	15.4 (10)	12.0 (65)
ES	34.9 (22)	46.0 (29)	19.0 (12)	11.6 (63)
EIF	33.9 (21)	53.2 (33)	12.9 (8)	11.4 (62)
EFS	41.7 (25)	45.0 (27)	13.3 (8)	11.0 (60)
EIS	26.2 (16)	52.5 (32)	21.3 (13)	11.2 (61)
EIFS	34.5 (20)	53.4 (31)	12.1 (7)	10.7 (58)
Total	30.5 (166)	49.4 (269)	20.0 (109)	100.0 (544)

[a](.) number of subjects.

elementary grades. Three of the four food interventions (EIF, EFS, and EIFS) were thus above average in frequency of mothers who had only a primary school education or less. Controls were characterized by a small frequency of low education levels and a high frequency of high education levels. Somewhat similar trends were evident in the distribution among interventions of the educational attainment of fathers (Table 3.9) but the differences were not as great. Other socioeconomic variables such as sex, type feeding, etc. will also be examined in our supplement to this report on further analysis.

Table 3.10 presents the gestational records and child deaths. The 543 mothers of the subjects, at the time of the baseline survey, had experienced 2,002 full-term births, of which 102 had died. Of the 31 premature births, 14 were still-born and 11 of the 17 premature live births had died.

As would be expected from the data on number of children in the households (Table 3.6), mothers in the food intervention villages had experienced the largest number of pregnancies (Table 3.10). They also accounted for over one-half of the fatalities among full-term offspring and for an equally large proportion of the natural abortions.

This summary of the characteristics of participant families clearly reveals that the intervention groups were by no means socioeconomically uniform (Table 3.11). Food intervention barangays tended to be characterized by low educational attainment of mothers, large family size, and low income. All of these factors can be expected to impact negatively on the physical growth and development of the subjects.

Other variables examined demonstrated no apparent significant differences between interventions. Briefly, about one-half of the dwellings

TABLE 3.9

PERCENTAGE DISTRIBUTION FOR YEARS OF FORMAL EDUCATION OF THE FATHERS BY INTERVENTION

Intervention	0 - 4	5 - 6	7 or more	Total
C	25.0 (15)[a]	41.7 (25)	33.3 (20)	11.0 (60)
E	31.5 (17)	35.2 (19)	33.3 (18)	9.9 (54)
EI	16.4 (10)	39.3 (24)	44.3 (27)	11.2 (61)
EF	21.5 (14)	47.7 (31)	30.8 (20)	12.0 (65)
ES	31.7 (20)	38.1 (24)	30.1 (19)	11.6 (63)
EIF	35.5 (22)	43.5 (27)	37.1 (23)	11.4 (62)
EFS	35.0 (21)	43.3 (26)	21.6 (13)	11.0 (60)
EIS	27.9 (17)	41.0 (25)	31.1 (19)	11.2 (61)
EIFS	43.1 (25)	36.2 (21)	20.6 (12)	10.7 (58)
Total	29.6 (161)	40.8 (222)	29.6 (161)	100.0 (544)

[a](.)number of subjects.

TABLE 3.10

GESTATIONAL RECORDS AND CHILD DEATHS AMONG THE SUBJECT MOTHERS BY INTERVENTION

Intervention	No. of Subjects	No. of pregnancies			No. of Fatalities		
		Full-Term	Pre-Mature live	Still-births	Abortions (Natural)	Full-Term	Pre-Mature
C	60	180	0	1	10	11	1
E	54	245	1	3	7	15	4
EI	61	173	2	0	5	7	2
EF	65	248	3	1	15	8	4
ES	63	230	6	0	14	8	2
EIF	62	289	3	0	18	23	1
EFS	59	208	1	2	11	12	3
EIS	61	185	1	4	3	6	5
EIFS	58	244	0	3	10	12	3
Totals	543	2002	17	14	93	102	25

TABLE 3.11

TREATMENT GROUPS AS RELATED TO IMPORTANT VARIABLES IMPACTING UPON CHILD GROWTH

Variable	Combined Treatment Groups		
	Food Supplement (N = 245) (%)	Immunization (N = 242) (%)	Sanitation (N = 242) (%)
Mother's education			
≥ 7 years	13.5	22.7	16.5
Father's education			
≥ 7 years	27.8	33.5	26.0
Age of Mother			
≥ 31 years	36.3	30.5	29.8
Household size			
≥ 5 children	37.6	30.5	31.8
≤ 2 children	31.4	39.3	42.6
Income			
≤ ₱2000	34.3	25.6	31.8
Weight of subject at baseline			
(≤ 90% of std.)	30.6	28.1	31.8

were of native materials (nipa, bamboo, or wood) and one-half used cement and GI sheets in construction. About 50% of the dwellings had only one sleeping room, an additional 32% had two such rooms. Artesian (shallow) wells served as the drinking water source for 64% of the households, followed by private pumps (18%) and a waterpipe system (8%). Drinking water was stored in covered jars for 81% of the homes and 10% stored water in pitchers.

Fifty-two percent of the families were classified as agricultural workers, 19.3% as casual, 8.5% as industrial, 5.0% as commercial and 8.3% as professional or civil service. Relative to environmental sanitation, 31.6% of the families had water-sealed toilets, 27.2% had open pit type, and 26.5% had none. Eighty-four percent burned their garbage whereas only 9.2% buried it and 4.0% let it scatter.

Eighty-eight percent of the families were Roman Catholic and 5.2% were Protestants. Relative to gestational history, 15.7% of the subjects were delivered in hospitals with the remainder delivered in their homes. Ninety-six percent were delivered full-term, 2.2% pre-mature, and 1.6% post-mature. Eighty-three percent were delivered within six hours after labor began and 90% of fetal membranes ruptured spontaneously. Midwives (38.9%), traditional birth attendants (36.0%), and doctors (23%) accounted for 98% of attendants at birth.

CHAPTER 4

MODELING AND ANALYSIS OF SOCIOECONOMIC VARIABLES

Before interventions began at age five months, a comprehensive baseline study was completed for each subject child as well as the family. Soon after our preliminary statistical analysis it became quite clear that analysis of interventions could not be adequately completed without a substantial investigation of the effects upon the subject child of various socioeconomic factors. After preliminary data analysis on family characteristic variables related to the nutritional status of the subject children, a subset of those variables measured during the baseline study was ultimately selected. This chapter will be primarily concerned with the relationship between the subject child's nutritional status and the following family characteristic variables: mother's formal education, father's formal education, total family income, mother's age, number of children in the family, percent of standard weight of the subject child at the baseline stage, percent of standard weight of the subject child at the first intervention stage (age five months), and height of the child at the first intervention. All of the above family characteristic variables were significantly related to the subject child's nutritional status at least at some stage between the 5th and 29th month of life during which data collection was carried out. Typically the variables considered were statistically related to nutritional status at certain ages and not related at other ages.

In the analysis which follows we have pooled all subject children into one large data set. It should be pointed out that by doing this we have essentially confounded an average intervention effect in the analysis of the family characteristics. However, this effect has very little bearing

upon our analysis since, first of all, it is a total average effect, and secondly, the intervention effects are shown to be small relative to the effect of the major socioeconomic variables. Hence, for practical purposes we can assume that our analysis of the covariates which follows is not significantly influenced by intervention effects.

In the first part of this chapter, we will look at various comparisons of the raw (unadjusted) data by grouping according to defined levels of several socioeconomic indicators. These will be considered separately at two levels and at three levels. Tables and graphs illustrating the covariate effect are given. In the latter part of the chapter some analytical results are given with respect to model building for the purpose of predicting a subject child's percent of standard weight for age based upon family characteristic data collected at the baseline stage. As will be illustrated, these models and their predicted values can be used to evaluate the impact of certain family characteristics upon the child's nutritional status. They also yield quantifiable estimates of the benefit to a child of various family characteristic or socioeconomic improvements. All of this chapter will be concerned with growth of the subject child in terms of percent of standard weight for age from baseline (prior to age five months) through the follow-up period (approximate age of 30 months).

Analysis of Unadjusted Data

All of the analysis in this section is with respect to the average value of the percent of standard weight at a given age. Hence, in interpreting the tables and graphs, one should keep in mind that the values represent an average response for all of the children combined as opposed to a single child response. However, in terms of program evaluation, the

average response is probably more useful than attempting to measure the effect for a specific child with specified characteristics. In the tables which follow, the unadjusted averages are based upon grouping the children according to categorized levels of the various socioeconomic factors. Some of the tables will group the children into two levels which generally represent the lower one-half and upper one-half, with respect to the variable specified. Other tables will categorize the children by three levels of the socioeconomic variables. In these cases, one can assume that approximately one-third of the subject children will be represented in each of the three levels. The boundary points for the cases of two levels and three levels are defined in Table 4.1. Throughout this report we will use the following notation in various tables.

PSWT0 - percent of standard weight for age at baseline (intervention number 0).

PSWT1 - percent of standard weight for age at beginning of interventions (intervention one).

EDM - number of years of formal education of the mother.

EDF - number of years of formal education of the father.

INC - annual family income (in hundreds of pesos).

MAGE - age in years of subject child's mother.

NO. CHILDREN - number of children in family excluding subject child.

HT1 - height of subject child at beginning of interventions (intervention one).

Table 4.2 gives the average unadjusted means for six of the family characteristics categorized by two levels at intervention numbers one, three, five and seven, and during the follow-up. The approximate age of the children at these intervention numbers are respectively, 5 months, 9 months,

13 months, 17 months, 20 months, 23 months, 26 months and 29 months. We note from this table at intervention number one that except for percent of standard weight at baseline (which probably represents different birth weights) the average percent of standard weight for age essentially does not differ at the two levels of the socioeconomic factors. Differences do however begin to show by intervention three and in some cases become considerably wider as the subject child gets older approaching age 29 months. For example, at intervention seven (age 17 months) the average value for children of the better educated mothers is three percentage points higher than for the lower educated mothers. Higher income families have subject children approximately two percentage points higher than lower income families. Essentially no difference seems to be demonstrated between younger versus older mothers. Approximately two percentage points difference is shown for families having small versus large number of children and about one and one-half percentage points difference is shown between lower versus higher educated fathers. Similar patterns can be seen through the follow-up period except the gap in some cases becomes wider. This is especially seen in the case of number of children in the family.

Table 4.3 is the same type of analysis as given in Table 4.2 except we have three levels of the six socioeconomic variables considered. In this table, the pattern becomes more clear and one can see stronger effects between low level versus high level in terms of the average percent of standard weight for age. The values for percent of standard weight at baseline are typical of what is seen throughout the study. Those children who started at a higher percent of standard weight continue to remain at higher levels, on the average, than those who started at a lower percent of standard weight. This would suggest that birth weight for infants is one of the more important

TABLE 4.1

LEVELS USED FOR UNADJUSTED AVERAGES

Two Levels

Level	PSWTO	EDM[a]	Income	No. Children (exclude subject)	Mage	EDF[a]
1	<100%	0-4	<25(00)	0-2	<28 yrs.	0-4
2	≥100%	≥5	≥25(00)	≥3	≥28 yrs.	≥5

[a]0-4 means primary completed or less, and ≥ means completed some elementary or more.

Three Levels

Level	PSWTO	EDM[b]	Income	No. Children (exclude subject)	MAGE	EDF[b]
1	<90%	0-3	<15(00)	0-1	≤22 yrs.	0-3
2	90%-109%	4-5	15(00)-34(00)	2-4	23-35 yrs.	4-5
3	≥110%	≥6	≥35(00)	≥5	>35 yrs.	≥6

[b]0-3 means completed less than primary, 4-5 means completed primary and some elementary, and ≥6 means completed elementary and some high school or more.

TABLE 4.2

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:
UNADJUSTED MEANS - TWO LEVELS[a]

		Intervention Number (Age in months)				Follow-up Number (Age in months)			
	Level	1 (5)	3 (9)	5 (13)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
PSWTO	1	91.2	82.6	79.2	78.9	79.4	80.1	80.3	82.6
	2	106.2	93.7	87.0	86.4	85.6	86.2	86.9	86.6
EDM	1	98.1	86.8	81.5	81.2	81.5	81.8	82.1	83.9
	2	99.4	89.7	85.0	84.2	83.7	84.6	85.6	85.7
INCOME	1	98.3	87.1	82.0	81.6	81.2	82.0	82.4	83.8
	2	98.9	88.8	83.8	83.3	83.3	83.6	84.3	85.3
MAGE	1	98.7	88.4	84.0	82.8	82.8	83.4	84.0	84.9
	2	98.7	88.0	82.3	82.6	82.3	82.7	83.3	84.5
NO. CHILD	1	99.1	88.7	84.4	83.6	83.5	84.5	84.9	86.3
	2	98.2	87.4	81.4	81.4	81.4	81.2	82.0	82.9
EDF	1	98.9	87.5	82.4	81.9	82.0	81.7	82.3	83.2
	2	98.5	88.8	83.9	83.4	83.2	84.6	85.1	86.4

[a] 1 denotes low level and 2 denotes high level. [b] See Table 4.1 for boundary points of levels.

TABLE 4.3

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

UNADJUSTED MEANS - THREE LEVELS[a]

		Intervention Number (Age in months)				Follow-up Number (Age in months)			
	Level	1 (5)	3 (9)	5 (13)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
PSWTO	1	87.7	80.7	78.1	77.9	77.6	78.4	7 .0	80.0
	2	99.5	88.4	82.9	82.6	82.8	83.0	8 .6	84.7
	3	110.3	96.7	89.6	88.5	87.8	88.6	89.9	89.0
EDM	1	97.2	85.6	80.8	80.7	80.8	80.5	80.6	82.0
	2	99.3	88.7	83.3	82.4	82.3	82.9	83.8	85.2
	3	99.4	90.9	86.3	86.4	86.0	87.5	88.8	88.8
INCOME	1	97.9	86.6	82.1	81.6	81.2	82.2	82.3	84.7
	2	98.7	87.8	81.8	81.4	81.7	81.8	82.8	83.5
	3	99.0	89.1	84.6	84.0	83.7	84.3	84.8	85.6
MAGE	1	99.9	88.5	83.6	82.8	82.8	83.0	83.0	84.3
	2	98.2	88.2	83.3	82.9	82.6	83.4	84.0	84.7
	3	98.8	94.0	82.0	81.7	82.2	82.1	83.0	84.9
NO. CHILD	1	99.6	89.4	85.0	84.2	84.3	85.3	85.5	87.1
	2	98.4	87.8	82.4	82.2	81.5	82.1	82.8	83.1
	3	97.7	86.7	81.3	81.0	81.6	81.1	81.9	84.1
EDF	1	98.3	86.4	81.7	81.4	81.5	81.6	81.9	82.1
	2	98.9	88.6	83.0	82.5	82.4	82.8	83.7	86.2
	3	98.8	89.4	85.0	84.4	84.0	85.1	85.4	85.9

[a] 1 denotes low level, 2 denotes middle level, and 3 denotes high level. [b] See Table 4.1 for boundary points of levels.

characteristics with respect to nutritional status. We note again that at intervention one, when the children are approximately five months old, there are essentially no differences between various levels of mother's education, family income, age of mother, number of children in the family, and father's education. However, differences quickly began to show up at subsequent interventions. Looking at intervention seven, when the subject children are approximately seventeen months old, we see that the range from low level to high level for education of mother is from 80.7 to 86.4. Income does not seem to have as much impact at this age but still children at the higher income level families had an average of 84 percent of standard weight as compared to 81.6 percent for the low income level children. Only small differences are seen throughout with respect to mother's age. With respect to number of children in the family, subject children in families with at most one additional child averaged 84.2 percent of standard weight. For children in families having at least five additional children the average percent of standard weight was 81.0. Similar differences may be seen throughout the follow-up period and in fact these could be used as estimates of the benefit to the child of altering anyone of the socio-economic indicators to a more desirable level. However, we should caution the reader that several of the socioeconomic indicators are correlated, and hence, we could not assume that all of these differences are additive. This, of course, would clearly be true with respect to education of the mother, income, and education of the father. However, looking at follow-up number four, it does seem rather clear that the mother's education has substantially greater impact upon the child at this age than either family income or father's education.

The graphs shown on the following pages (Figures 4.1-4.5) simply show

the average responses according to the three levels given in Table 4.3. These graphs give a pictorial representation of the magnitude of the difrences in the average percent of standard weight for the subject children with respect to the specified socioeconomic indicators from the baseline stage (age 2 months) through the third follow-up period (age 26 months). It easily can be seen that some of the socioeconomic variables have little impact on the child in early ages but the impact may become considerable as the child grows older.

Unadjusted Data - Two way Comparisons at Two Levels

Tables 4.4 through 4.8 show two-way comparisons for the socioeconomic variables each at two levels for interventions one, four, seven and follow-ups one and three, respectively. These tables give the average percent of standard weight at the two levels of the socioeconomic variables defined in Table 4.1. From these tables indications are seen of the effect of categorizing two variables at a time. Looking at Table 4.6, as an example, one can see the following trends. Comparing the four numbers for education of mother and percent of standard weight at baseline, we see that when both are at the low level the average response was 77.6 percent as opposed to 88 percent when both were at the high level. In fact, of all the two-by-two comparisons on Table 4.6, the best combination is for percent of standard weight at baseline to be at the high level and mother's education to be at the high level. Looking at two-way comparisons and ignoring percent of standard weight at baseline, which makes large differences, some observations seen are as follows: Comparing income with mother's education, higher income families with low educated mothers did not seem to make much difference in the child's nutritional status. This was not true for the better educated mothers. Family size seems to have a greater effect on families with lower educated mothers

FIGURE 4.1

UNADJUSTED MEANS - THREE LEVELS OF

BASELINE PERCENT OF STANDARD WEIGHT (PSWTO)

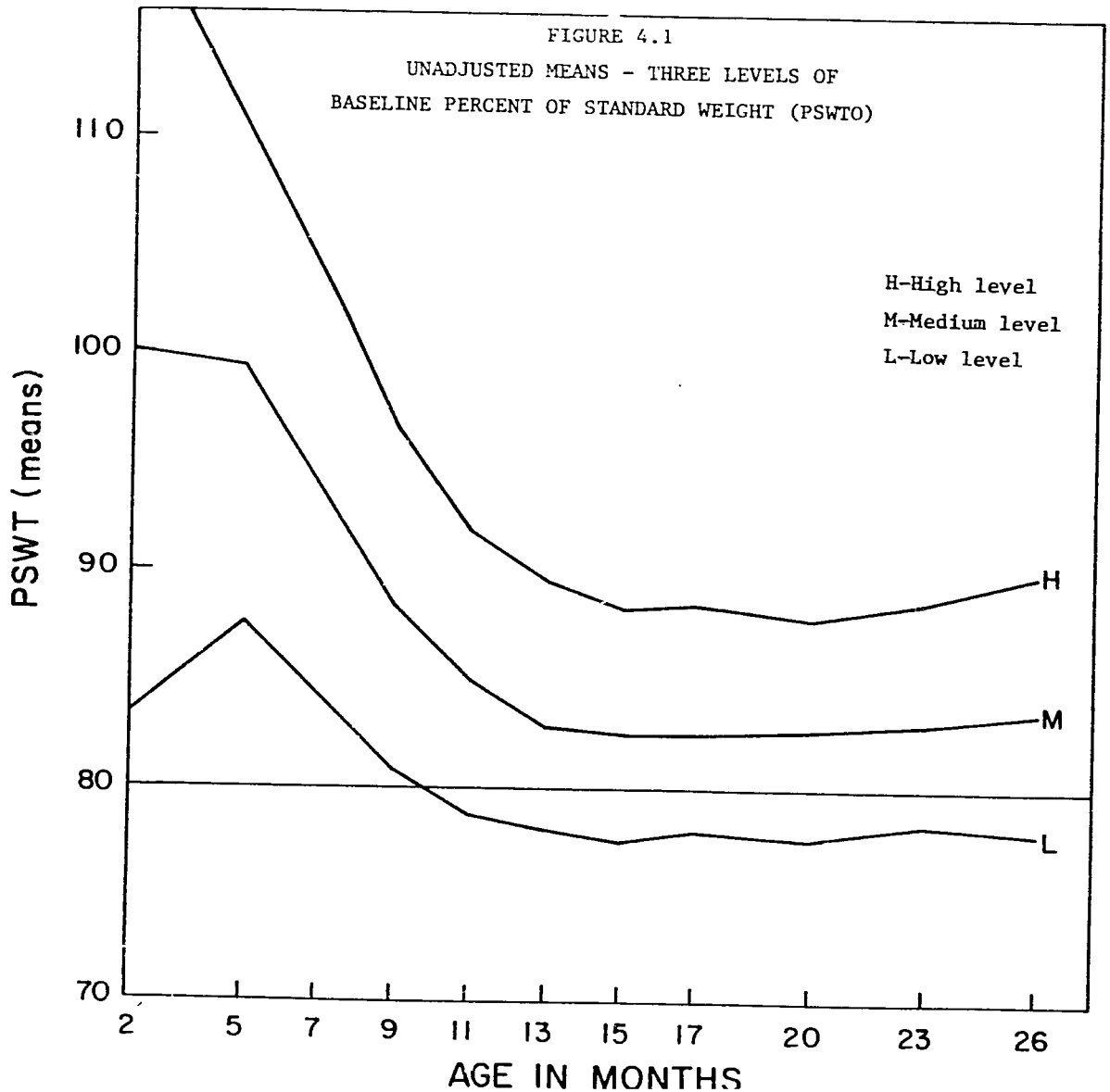


FIGURE 4.2

UNADJUSTED MEANS - THREE LEVELS OF MOTHER EDUCATION (EDM)

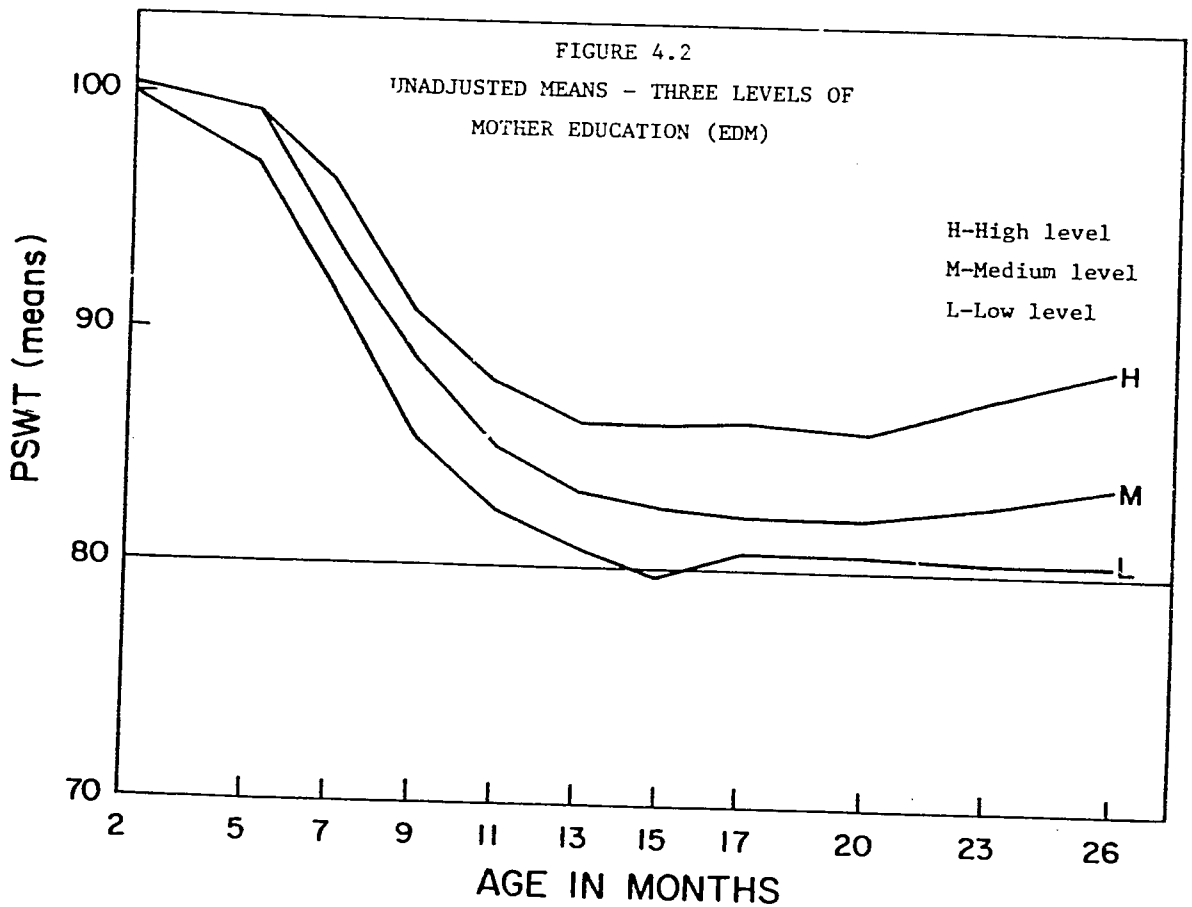


FIGURE 4.3
UNADJUSTED MEANS - THREE LEVELS OF
FATHER EDUCATION (EDF)

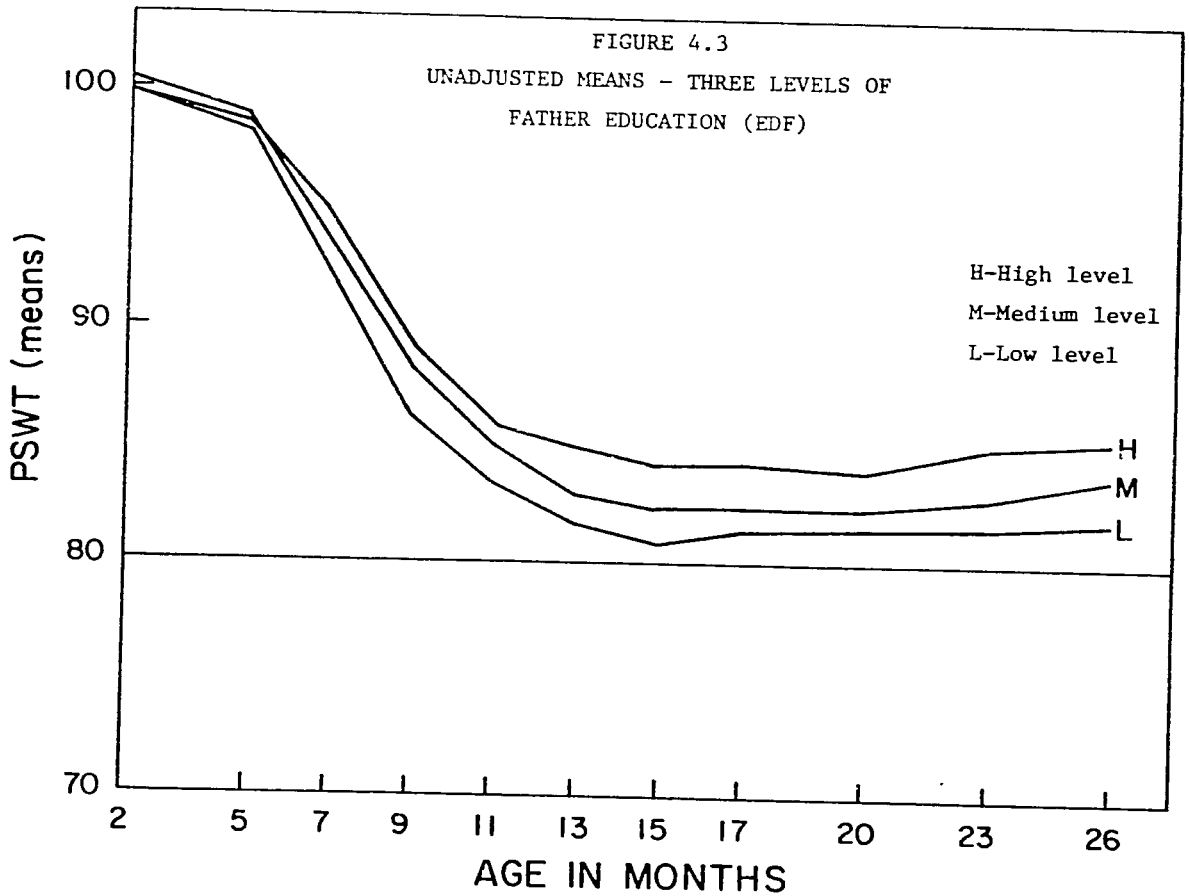


FIGURE 4.4

UNADJUSTED MEANS - THREE LEVELS OF NUMBER OF CHIDLREN IN FAMILY (NO. CHILD)

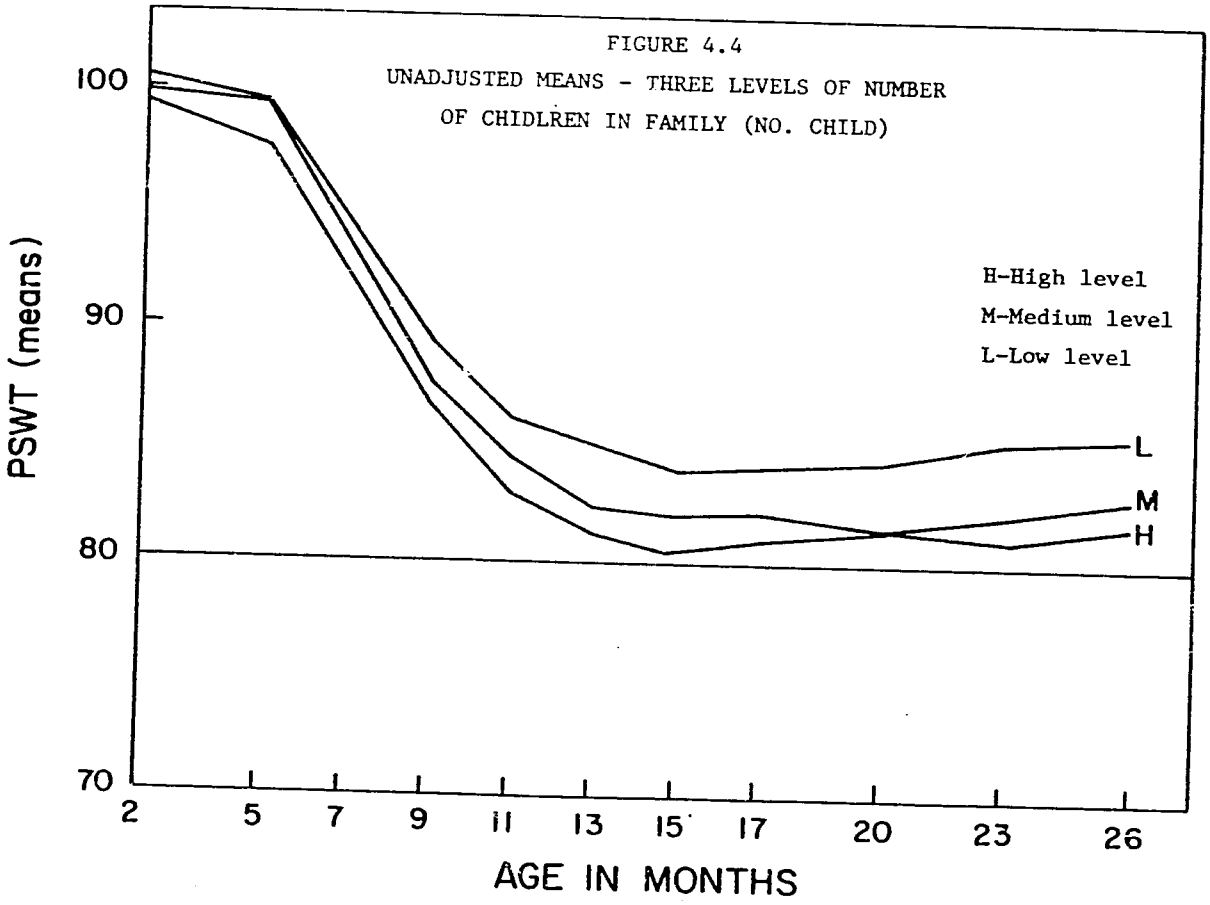


FIGURE 4.5

UNADJUSTED MEANS - THREE LEVELS OF ANNUAL FAMILY INCOME (INC.)

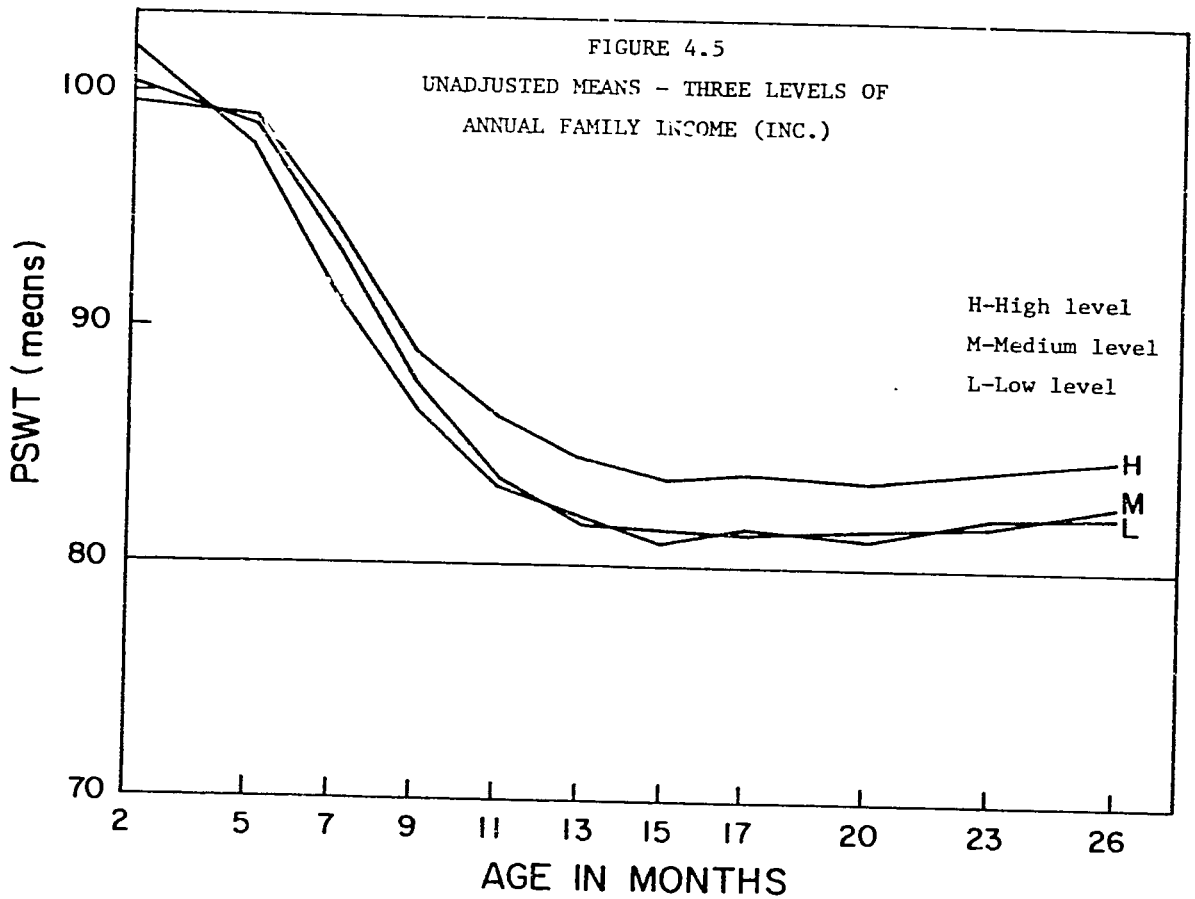


TABLE 4.4

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

UNADJUSTED MEANS - TWO WAY TABLES AT TWO LEVELS

Intervention 1

		EDM		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
PSWTO	1	91.2	91.1	90.2	91.7	91.4	90.8	91.4	90.9	91.1	91.2
	2	105.0	107.5	107.0	105.8	107.0	105.2	106.0	106.3	106.8	105.6
		PSWTO		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
EDM	1	91.2	105.0	98.6	97.6	99.1	97.3	99.0	97.5	98.1	98.0
	2	91.1	107.5	97.6	99.9	99.0	100.3	98.5	100.5	100.7	98.8
		PSWTO		EDM		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
INCOME	1	90.2	107.0	98.6	97.6	97.3	99.5	97.8	98.8	98.9	97.1
	2	91.7	105.8	97.6	99.9	99.9	97.5	99.2	98.6	98.9	99.0
		PSWTO		EDM		INCOME		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
NO.CHILD	1	91.4	107.0	99.1	99.0	97.3	99.9	98.5	100.9	99.7	98.7
	2	90.8	105.2	97.3	100.3	99.5	97.5	100.0	97.9	98.3	98.1
		PSWTO		EDM		INCOME		NO.CHILD		EDF	
		1	2	1	2	1	2	1	2	1	2
MAGE	1	91.4	106.0	99.0	98.5	97.8	99.2	98.5	100.0	100.0	97.8
	2	90.9	106.3	97.5	100.8	98.8	98.6	100.9	97.9	98.1	99.6
		PSWTO		EDM		INCOME		NO.CHILD		MAGE	
		1	2	1	2	1	2	1	2	1	2
EDF	1	91.1	106.8	98.1	100.7	98.9	98.9	99.7	98.3	100.0	98.1
	2	91.2	105.6	98.0	98.8	97.1	99.0	98.7	98.1	97.8	99.6

TABLE 4.5

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

UNADJUSTED MEANS - TWO WAY TABLES AT TWO LEVELS

Intervention 4

		EDM		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
PSWTO	1	79.5	81.4	79.2	81.1	81.2	79.2	81.0	79.8	79.5	81.3
	2	87.5	91.1	88.1	89.9	90.1	88.2	89.3	89.2	89.2	89.2

		PSWTO		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
EDM	1	79.5	87.5	83.0	83.9	84.2	82.9	84.0	83.1	83.6	83.2
	2	81.4	91.1	84.6	86.9	86.4	86.0	85.9	87.0	85.9	86.5

		PSWTO		EDM		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
INCOME	1	79.2	88.1	83.0	84.6	83.6	83.5	84.0	83.0	83.7	83.1
	2	81.1	89.9	83.9	86.9	86.6	84.1	86.0	85.3	84.8	86.1

		PSWTO		EDM		INCOME		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
NO.CHILD	1	81.2	90.1	84.2	86.4	83.6	86.6	85.0	87.6	85.1	85.9
	2	79.2	88.2	82.9	86.0	83.5	84.1	86.3	83.4	83.7	84.2

		PSWTO		EDM		INCOME		NO.CHILD		EDF	
		1	2	1	2	1	2	1	2	1	2
MAGE	1	81.0	89.3	84.0	85.9	84.0	86.0	85.0	86.3	85.2	85.2
	2	79.8	89.2	83.1	87.0	83.0	85.3	87.6	83.4	83.7	85.7

		PSWTO		EDM		INCOME		NO.CHILD		MAGE	
		1	2	1	2	1	2	1	2	1	2
EDF	1	79.5	89.2	83.6	85.9	83.7	84.8	85.1	83.7	85.2	83.7
	2	81.3	89.2	83.2	86.5	83.1	86.1	85.9	84.2	85.2	85.7

TABLE 4.6

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

UNADJUSTED MEANS - TWO WAY TABLES AT TWO LEVELS

Intervention 7

		EDM		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
PSWTO	1	77.6	80.3	78.2	79.3	79.9	77.6	79.2	78.6	77.8	80.1
	2	84.8	88.0	85.1	87.0	87.4	85.1	86.2	86.6	86.3	86.4

		PSWTO		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
EDM	1	77.6	84.8	81.1	81.4	82.2	80.6	81.2	81.3	81.6	80.4
	2	80.3	88.0	82.5	84.8	84.5	83.4	83.8	84.9	82.6	84.9

		PSWTO		EDM		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
INCOME	1	78.2	85.1	81.1	82.5	81.2	82.1	81.1	82.1	81.9	80.9
	2	79.3	87.0	81.4	84.8	84.9	81.1	83.7	82.8	81.9	84.2

		PSWTO		EDM		INCOME		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
NO.CHILD	1	79.9	87.4	82.2	84.5	81.2	84.9	83.0	85.6	82.5	84.3
	2	77.6	85.1	80.6	83.4	82.1	81.1	80.9	81.5	81.5	81.3

		PSWTO		EDM		INCOME		NO.CHILD		EDF	
		1	2	1	2	1	2	1	2	1	2
MAGE	1	79.2	86.2	81.2	83.8	81.1	83.7	83.0	80.9	81.8	83.4
	2	78.6	86.6	81.3	84.9	83.1	82.8	85.6	81.5	82.0	83.5

		PSWTO		EDM		INCOME		NO.CHILD		EDF	
		1	2	1	2	1	2	1	2	1	2
EDF	1	77.8	86.3	81.6	82.6	81.9	81.9	82.5	81.5	81.8	82.0
	2	80.1	86.4	80.4	84.9	80.9	84.2	84.3	81.3	83.4	83.5

TABLE 4.7

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

UNADJUSTED MEANS - TWO WAY TABLES AT TWO LEVELS

Follow-Up 1

		EDM		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
PSWTO	1	78.5	80.5	78.2	80.1	80.4	78.3	80.0	78.8	78.3	80.7
	2	84.6	86.7	84.4	86.3	86.5	84.5	85.4	85.9	85.7	85.5

		PSWTO		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
EDM	1	78.5	84.6	80.4	82.5	82.2	81.1	81.4	81.6	81.9	80.9
	2	80.5	86.7	82.9	83.9	84.3	82.1	83.7	83.6	82.2	84.4

		PSWTO		EDM		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
INCOME	1	78.2	84.4	80.4	82.9	81.3	81.2	81.1	81.3	81.4	80.9
	2	80.1	86.3	82.5	83.9	84.6	81.6	83.8	82.8	82.4	84.0

		PSWTO		EDM		INCOME		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
NO.CHILD	1	80.4	86.5	82.2	84.3	81.3	84.6	83.0	85.3	82.7	84.0
	2	78.3	84.5	81.1	82.1	81.2	81.6	81.6	81.4	81.4	81.3

		PSWTO		EDM		INCOME		NO.CHILD		EDF	
		1	2	1	2	1	2	1	2	1	2
MAGE	1	80.0	85.4	81.4	83.7	81.1	83.8	83.0	81.6	82.3	83.1
	2	78.8	85.9	81.6	83.6	81.3	82.8	85.3	81.4	81.8	83.2

		PSWTO		EDM		INCOME		NO.CHILD		MAGE	
		1	2	1	2	1	2	1	2	1	2
EDF	1	78.3	85.7	81.9	82.2	81.4	82.4	81.7	81.4	82.3	83.1
	2	80.7	85.5	80.9	84.4	80.9	84.0	84.0	81.3	81.8	83.2

TABLE 4.8

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

UNADJUSTED MEANS - TWO WAY TABLES AT TWO LEVELS

Follow-Up 3

		EDM		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
PSWTO	1	79.0	82.4	79.4	80.9	81.7	78.8	80.8	80.0	78.2	83.1
	2	85.6	88.4	85.7	87.5	88.1	85.4	86.8	86.9	86.7	87.1

		PSWTO		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
EDM	1	79.0	85.6	81.2	82.8	82.8	81.6	81.0	82.7	82.1	82.1
	2	82.4	88.4	85.3	85.8	86.5	83.3	86.2	84.7	82.9	87.1

		PSWTO		INCOME		NO.CHILD		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
INCOME	1	79.4	85.7	81.2	85.3	83.5	81.0	82.6	82.2	81.9	83.6
	2	80.9	87.5	82.8	85.8	85.8	82.6	84.9	83.8	82.7	85.7

		PSWTO		EDM		INCOME		MAGE		EDF	
		1	2	1	2	1	2	1	2	1	2
NO.CHILD	1	81.7	88.1	82.8	86.5	83.5	85.8	84.5	86.5	82.8	86.6
	2	78.8	85.4	81.6	83.3	81.0	82.6	80.1	82.3	81.9	82.2

		PSWTO		EDM		INCOME		NO.CHILD		EDF	
		1	2	1	2	1	2	1	2	1	2
MAGE	1	80.8	86.8	81.0	86.2	82.6	84.9	84.5	80.1	81.6	85.7
	2	80.0	86.9	82.7	84.7	82.2	83.8	86.5	82.3	82.7	84.3

		PSWTO		EDM		INCOME		NO.CHILD		EDF	
		1	2	1	2	1	2	1	2	1	2
EDF	1	78.2	86.7	82.1	82.9	81.9	82.7	82.8	81.9	81.6	82.7
	2	83.1	87.1	82.1	87.1	83.6	85.7	86.6	82.2	85.7	84.3

than on higher educated mothers. Note that high educated mothers with a large number of children have slightly larger subjects (83.4%) than low educated mothers with small family size (82.2%). Similar comparisons may be made for any of the combinations shown. In considering the two-way comparisons during the follow-up period, as shown in Tables 4.7 and 4.8, it is seen that differences are of the same direction but generally of a greater magnitude. This would suggest that some of these family characteristic variables have a greater impact upon the child as it gets older, at least past the weaning age.

Figures 4.6, 4.7 and 4.8 graphically illustrate some of the two-way comparisons in the previous tables for (a) percent of standard weight versus number of children in the family, (b) percent of standard weight versus education of mother, and (c) percent of standard weight versus family income. Looking at Figure 4.6, it is observed that children who had a high percent of standard weight at baseline and a low number of children in the family were considerably better than those in decending order to low percent of standard weight at baseline and high number of children in the family. It should be noted here, as is also true in Figures 4.7 and 4.8, that the variables showing the greatest impact upon the child's percent of standard weight for age is the percent of standard weight at the baseline as compared to the other variables of family size, mother's education, and family income. However, it is also noted that the width between these curves for the variables other than percent of standard weight at baseline generally becomes wider as the child grows older, particularly during the weaning age (5-13 months).

Statistical Modeling for Prediction Purposes

In this section models are developed for the purpose of predicting

FIGURE 4.6

UNADJUSTED MEANS - TWO LEVELS EACH OF BASELINE PSWTO AND NUMBER OF CHILDREN

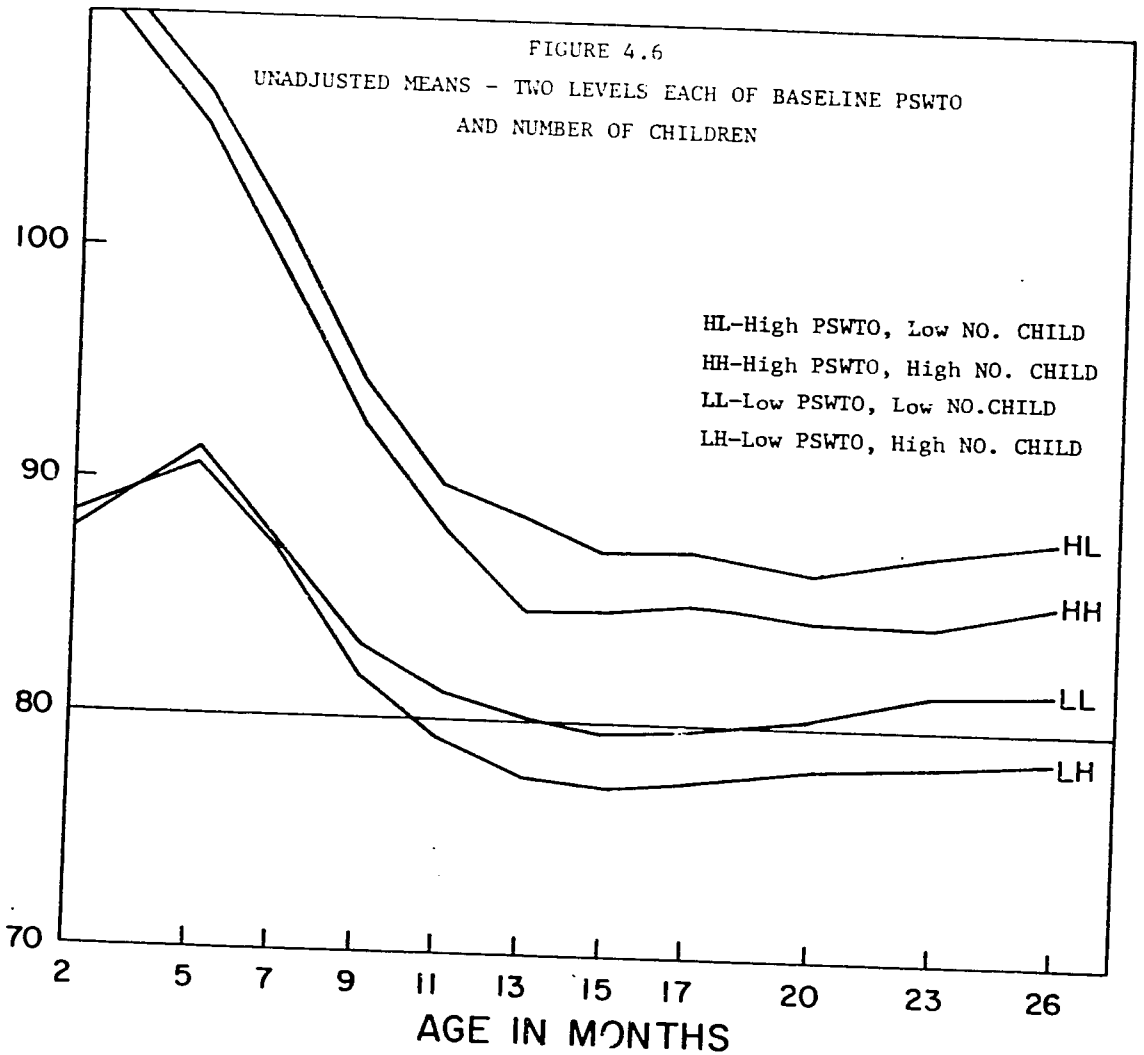


FIGURE 4.7

UNADJUSTED MEANS - TWO LEVELS EACH OF BASELINE PSWTO AND MOTHER EDUCATION

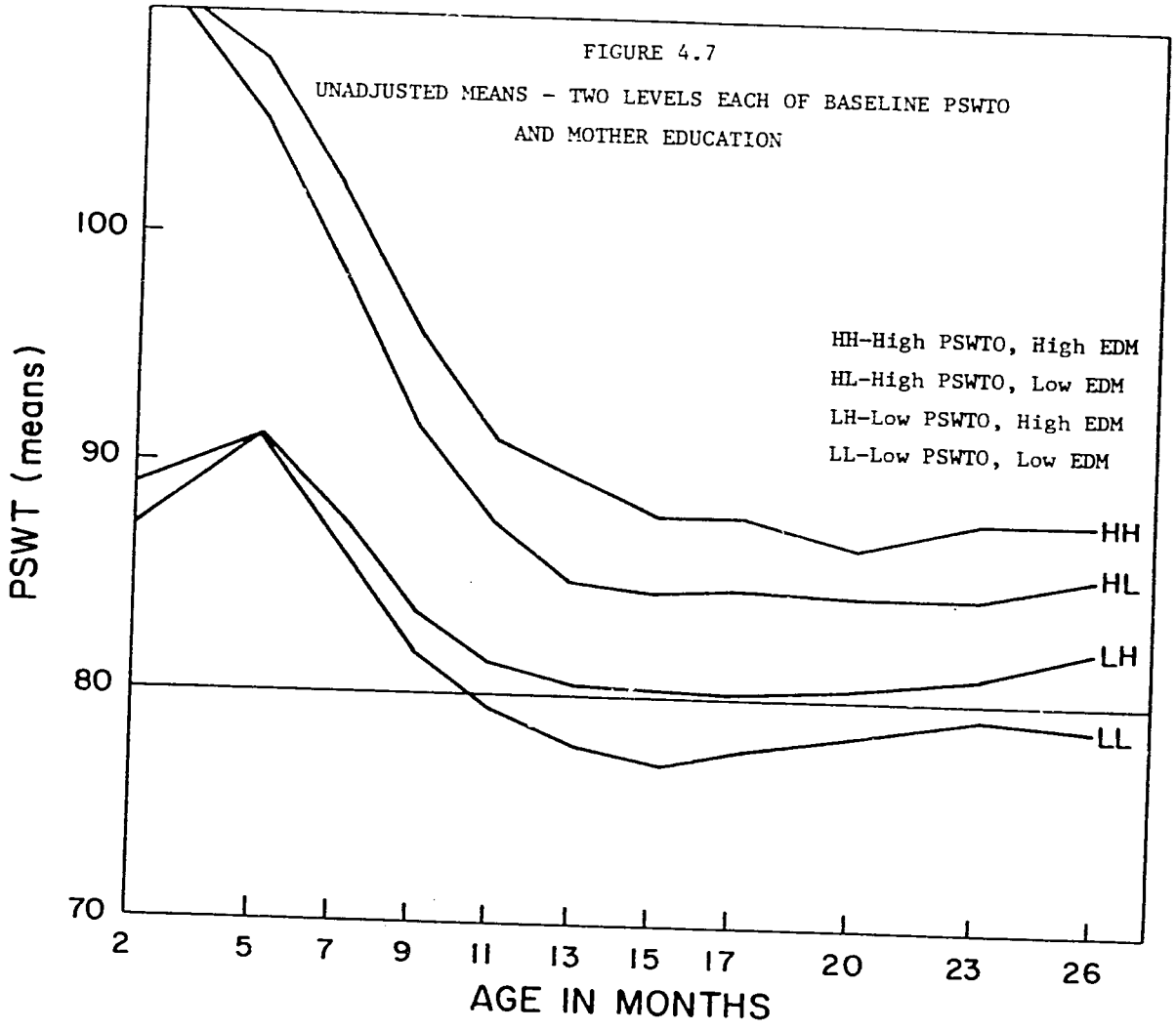
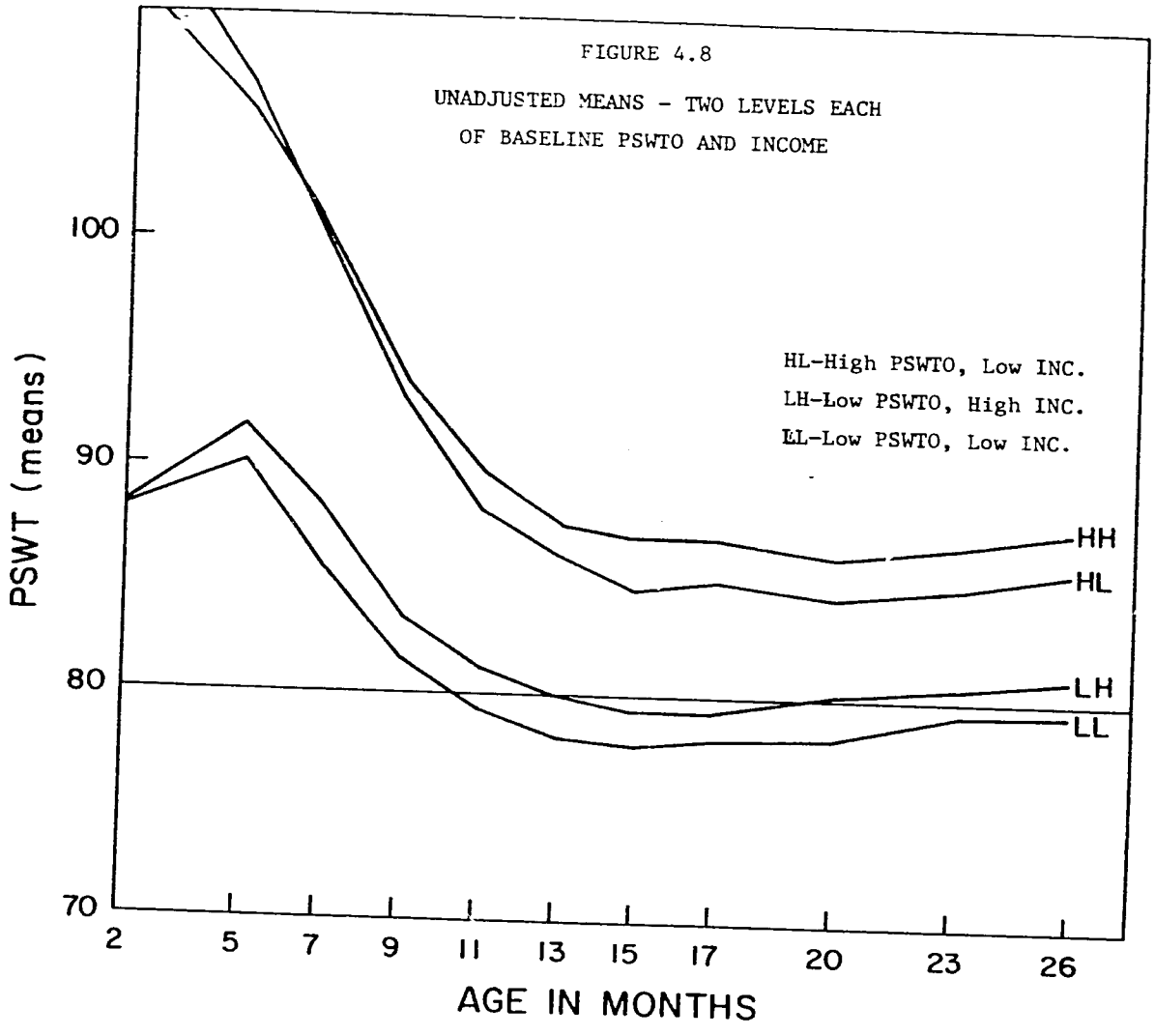


FIGURE 4.8

UNADJUSTED MEANS - TWO LEVELS EACH
OF BASELINE PSWTO AND INCOME



percent of standard weight based upon family characteristics and initial percent of standard weight of the subject child. These models are useful and instructive in several ways. Firstly, they allow us to estimate the value to the child of a socioeconomic variable at various levels in terms of percent of standard body weight for age. The models also allow us to make judgements of which socioeconomic variables have the greatest impact upon the child's growth as well as a look at which variables might be modified in the short term versus variables requiring long term solutions. With these models an investigator can play "what if" games. For example, by asking the question of "For a child having the following specified characteristics, in terms of socioeconomic variables, what would be the predicted percent of standard weight at specified ages"? One can vary one or more variables at a time to get estimates of the average value, or impact, upon the child's growth. We should caution the reader that since the empirical models are built upon the data base at hand, one should use extreme caution in extrapolating beyond the range of any of the variables in the model, including age beyond 30 months.

Several modeling efforts were attempted and we ultimately concluded that the most simple multiple linear regression model worked very well. Models were developed with polynomial and interaction terms, but the improvement in predictive ability did not prove to be sufficient to warrant the more complicated models. Though we recognize that the study is longitudinal in nature, and hence, a time series type model would be appropriate, we concluded that developing separate models at each interview stage would work quite well and would be simpler from the practical point of view. Hence a separate multiple linear regression model was developed for each interview point, including the four follow-up points. Though several variables were

considered for inclusion in the model, the variables ultimately used, because of value for predictive purposes and simplicity, included percent of standard weight at intervention one, mother's education, family income, mother's age, number of children in the family, father's education, age of subject child in months, and height of subject child at intervention one. The only exception to the use of these variables was for the model for intervention number one where percent of standard weight at baseline was substituted for percent of standard weight at intervention one.

For illustration purposes, Tables 4.9 and 4.10 were developed. For the models used for prediction in this chapter, we selected input values for the covariates to be included in the model for comparative analysis. The first column designates the covariates (socioeconomic variables) included in the models. The second column designates low, middle and high values respectively as given in the third column. For example, under mother's education, the middle value of six represents six years of formal schooling. For all of the predictive values in the table except the last two rows, the following "what if" questions were asked. "What if the child's characteristics are all at the middle value for all variables except for the variable indicated"? Then if we allow the variable of interest to vary from low to middle to high, what effect does the value of that variable have upon the predicted percent of standard weight for the child at a given intervention number (or age in months)? For example, looking at intervention number seven for the variable of mother's education, we see predicted values of 82.5 for two years of formal education, 85.7 for six years of formal education and 88.1 for nine years of formal education. These numbers again represent the predicted percent of standard weight for the subject child if all of the other variables were at the middle or average value and the mother's education

variable is allowed to vary from two to six to nine years of formal education. Hence, we see the model predicts an approximate six percentage point value to the child for the mother's education of nine years as opposed to two years. Similar comparisons are shown for each of the other variables. It should be emphasized again that for each row in the table, except the last two, every variable in the model is assumed to be at the middle value as indicated in column three and the only variable allowed to vary is the variable corresponding to the designated row. The last two rows in Table 4.9 are different in the sense that for the row labeled "all best" all of the better values of the seven variables of interest are put into the model for prediction purposes. It is of interest to note that at follow-up four when the child is 29 months old, the model predicts the child to be 100% of normal if the mother's education is nine years, the father's education is nine years, the income is 10,000 pesos, the mother's age is 30 years, the number of children in the family is one, the percent of standard weight at intervention one was 115% and the height at intervention one of the child was 68 centimeters. Similarily, if all of the worst characteristics are put into the model, the child is predicted to be 72.1% of normal at follow-up four. Any values of the covariates used in the models and within the range of the data collected, may be in-putted into the model for the purpose of predicting percent of standard weight of the child at a given age.

Table 4.10 displays the predicted percent of standard weight using the same models, except that in this table two variables are allowed to vary from low to high and each of the other variables in the model are assumed to be at the middle value. For illustration purposes, consider the predicted values in the table listed under intervention number seven. We note that the largest value 93.3% is predicted when both the percent of standard

TABLE 4.9

PREDICTED PERCENT OF STANDARD WEIGHT OF SUBJECT

(All Covariates Fixed at Middle Value Except Specified Single Covariate)

Covariate	Level	Value	Intervention Number				Follow-Up Number			
			1	3	5	7	1	2	3	4
EDM	L	(2)[a]	99.4	89.8	84.1	82.5	82.9	83.0	82.7	84.6
	M	(6)	100.7	91.9	86.1	85.7	85.2	86.1	87.7	87.7
	H	(9)	101.6	93.5	87.6	88.1	87.0	88.4	91.5	90.0
EDF	L	(2)	102.0	91.3	85.8	85.4	84.9	85.9	88.0	87.1
	M	(6)	100.7	91.9	86.1	85.7	85.2	86.1	87.7	87.7
	H	(9)	99.7	92.4	86.3	85.9	85.5	86.3	87.5	88.1
INCOME	L	[20(00)][b]	100.4	91.5	85.0	85.1	84.3	85.2	87.3	87.0
	M	[50(00)]	100.7	91.9	86.1	85.7	85.2	86.1	87.7	87.7
	H	[100(00)]	101.2	92.7	87.9	86.9	86.7	87.6	88.4	88.8
MAGE	L	(18)[c]	100.0	90.7	85.0	82.9	83.3	84.0	85.4	85.3
	M	(30)	100.7	91.9	86.1	85.7	85.2	86.1	87.7	87.7
	H	(45)	100.6	93.4	87.5	89.3	87.6	88.7	90.6	90.6
NO. OF CHILDREN	L	(1)	101.6	92.6	87.1	86.9	86.1	87.1	88.4	88.4
	M	(3)	100.7	91.9	86.1	85.7	85.2	86.1	87.7	87.7
	H	(6)	99.3	90.9	84.6	83.9	84.0	84.5	86.7	86.6
PSWT1	L	(85)	92.8	83.8	79.9	80.5	80.5	81.7	83.5	84.3
	M	(100)	100.7	91.9	86.1	85.7	85.2	86.1	87.7	87.7
	H	(115)	108.6	100.0	92.3	90.9	90.0	90.5	92.0	91.0
HT1	L	(60)[d]	99.2	89.2	83.6	83.1	82.6	82.7	83.7	83.2
	M	(64)	100.7	91.9	86.1	85.7	85.2	86.1	87.7	87.7
	H	(68)	102.2	94.7	88.5	88.3	87.9	89.5	91.7	92.1
ALL BEST			111.5	106.2	99.2	98.3	97.0	98.9	100.9	100.0
ALL WORST			89.9	75.8	71.6	69.2	71.1	70.4	71.0	72.1

NOTE: Mo. (age in months) is fixed at average value for interview. [a]Years of education. [b]Annual family income in units of 100. [c]Age in years. [d]Height in cm.

TABLE 4.10

PREDICTED PERCENT OF STANDARD WEIGHT OF SUBJECTS[a]

Covariate Levels	Intervention Number			Follow-Up Number			
	3	5	7	1	2	3	4
ALL MIDDLE	100.7	91.9	86.1	85.7	85.2	86.1	87.7	87.7
ALL WORST	88.9	75.8	71.6	69.2	71.1	70.4	71.0	72.1
ALL BEST	111.5	106.2	99.2	98.3	97.0	98.9	100.9	100.0
X1X2 LOW	91.5	81.8	77.9	77.3	78.2	78.6	78.5	81.3
HIGH	109.5	101.5	93.8	93.3	91.7	92.8	95.7	93.3
X1X3 LOW	92.4	83.4	78.8	80.0	79.6	80.7	83.1	83.7
HIGH	109.1	100.8	94.1	91.8	91.5	92.1	92.6	92.1
X1X5 LOW	93.7	84.5	80.9	81.8	81.3	82.7	84.2	85.1
HIGH	107.2	99.0	90.8	89.0	88.7	89.0	90.9	89.9
X1X6 LOW	94.1	83.2	79.6	80.3	80.1	81.4	83.8	83.8
HIGH	107.6	100.4	92.5	91.1	90.2	90.7	91.7	91.4
X2X3 LOW	99.1	89.4	83.0	81.9	82.0	82.1	82.3	83.9
HIGH	102.2	94.2	89.4	89.1	88.5	89.9	92.2	91.1
X2X5 LOW	100.4	90.5	85.1	83.7	83.7	84.1	83.4	85.3
HIGH	100.2	92.4	86.1	86.3	85.7	86.8	90.4	88.9
X2X6 LOW	100.8	89.2	83.8	82.2	82.5	82.8	83.0	84.0
HIGH	100.6	93.9	87.8	88.3	87.3	88.5	91.3	90.4
X3X5 LOW	101.3	92.1	86.0	86.3	85.2	86.2	88.0	87.7
HIGH	99.8	91.7	86.4	84.9	85.5	86.1	87.3	87.7
X3X6 LOW	101.7	90.8	84.7	84.8	84.0	84.9	87.6	86.4
HIGH	100.2	93.1	88.1	86.9	87.0	87.8	88.2	89.2
X5X6 LOW	102.9	92.0	86.8	86.6	85.7	86.9	88.7	87.8
HIGH	98.3	91.4	84.9	84.1	84.3	84.7	86.5	87.0

[a]X1 = PSWT1, *2=EDM, X3= INCOME, X4= MAGE, X5= NO. OF CHILDREN, X6= EDF

NOTE: Mo (age in months) and HT1 are fixed at average for interview, MAGE is fixed at 30 years.

weight of the subject child at intervention one and mother's education are high. The second largest value is when percent of standard weight at intervention one is high and income is high. The third largest predicted value is for percent of standard weight at intervention one high and father's education at the high level. Similarily, the fourth largest predicted value is when the mother's education level is high and the income level is high, and the fifth largest value is when the percent of standard weight at intervention one is high and the number of children is low. Hence, one possible use of these models would be to consider the question of program intervention to cause changes in one of the socioeconomic variable. Which variable is suggested to yield the greatest benefit to the child's growth rate? Similarily, examining two variables at a time could indicate which are the two best variables one might select for intervention purposes. Similar tables could be constructed for examining three variables at a time, etc.

Summary

Though it is clear that there are many factors which affect the child's growth and health, it seems to also be clear from the above considerations that certain socioeconomic variables play an extremely important role, at least in the child's growth rate. Though some of these are variables where programs may be implemented to effect change on a relatively short time frame, it is unfortunately clear that some of the most important socioeconomic variables imply long term solutions. We do feel it is important, for purposes of planning, to be able to estimate the value or impact of the important socioeconomic variables to the child's growth so that predictions or prior estimates can be made of program implementation impact. It will be clearly demonstrated in the next chapter that it is extremely risky, if not impossible, to evaluate intervention programs without adequate analysis and appropriate adjustments

for socioeconomic factors which may affect the child's growth and health even more than most reasonable intervention programs.

CHAPTER 5

ANALYSIS OF NUTRITION/HEALTH INTERVENTIONS

Introduction

The true effects of nutrition/health interventions are difficult to analyse and interpret principally because of two reasons. (a) There are many factors which affect an infant's rate of growth, directly or indirectly. In some cases these factors have a greater impact upon the infant's health and growth than most typical interventions. (b) For the purpose of measuring the impact of interventions on a child it is not clear what the best parameters should be. For the analysis in this chapter we have primarily used percent of standard body weight for age.

With little difficulty, one could list many factors which likely affect an infants growth and health. Some of the major factors include mother's health, infant's birth weight, mother's education, father's education, family income, family size, disease experience, environmental living conditions, type of infant feeding, weaning process, medical services, etc. In order to have a reasonable chance of measuring the true impact of an intervention on a child, the statistical analysis must attempt to adjust the child's growth weight for the major socioeconomic factors measurable. In our analysis, we considered many of the socioeconomic factors which were felt to have an impact on the child's growth rate and which were measured in our research. One of the principle functions of the baseline study was to collect these data. After considering several factors, we ultimately selected eight extraneous variables (covariates) to include in our analysis for the purpose of making statistical adjustments in the child's percent of standard body weight for age. These were used in an attempt to adjust

for effects on growth other than intervention effect. Hence, in calculating the adjusted average percent of standard body weight for age, an analysis of covariance procedure was used which included only those of the eight covariates which were significantly related to the child's growth pattern at each intervention stage.

Even using covariance analysis, there were many difficulties remaining in the analysis. Not the least of these include proper practical interpretation of the statistical results after the analysis was completed. Hence, the first part of this chapter will restrict itself to statistical analysis and interpretation of the four basic interventions plus the control group. Again, the four basic interventions were nutrition and health education to the mother, childhood immunizations, supplementary feeding, and sanitation. These were defined in detail in Chapter 2 of this report.

Analysis of Four Basic Interventions Plus Control

Early in the analysis it became very clear that naively looking at unadjusted averages could be misleading. For example, when the infants in the study were approximately one year old, the unadjusted average percent of standard body weight for the control group was higher than the same mean for most of the intervention groups. After further investigation, however, it became clear that this was misleading because several of the covariates influencing child growth were distinctly different between the control and treatment groups.

Several statistical procedures for the analysis were considered before deciding to rely primarily upon a modified analysis of covariance procedure with the measure of intervention impact being the average of the covariate-adjusted percent of standard body weights. At this stage of the analysis, considerable effort was devoted to selecting proper covariate functions.

Even after having selected the eight covariates used in our analysis, it was not clear what function of these covariates should best be utilized in the analysis. After looking at several reasonable covariate functions, including polynomial functions with up to cubic terms and at least third order interaction terms, we concluded that a simple linear function of the covariates worked well statistically and also was more practical because of its simplicity. In the analysis, a covariate function of one or more of the eight covariates was selected at each of the seven intervention stages and for each of the four follow-up stages. At each of these points in time only those covariates which were statistically significant were retained in the covariate function. Some covariates were significant at certain ages of the child's development and not significant at other ages. The unadjusted and covariate adjusted means are given in this chapter for several reasonable analysis constraints.

Table 5.1 and Figure 5.1 show the unadjusted average (raw data) percent of standard body weight of the subjects in each intervention group at each point in time of the study. Note that the control group children, on the average, were higher in body weight for age at the baseline and at the beginning of interventions. We also note the considerable difference in the average percent of standard body weight between the five groups at age five months when interventions began. With these kinds of differences at the beginning of the intervention stage, it is clear that adjustments must be made in order to make any reasonable estimates of the intervention effects. Simply adjusting for differences at the beginning of the intervention stage would not be appropriate because of the behavior of the general growth curve. Differences at earlier ages tend to become smaller,

TABLE 5.1

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

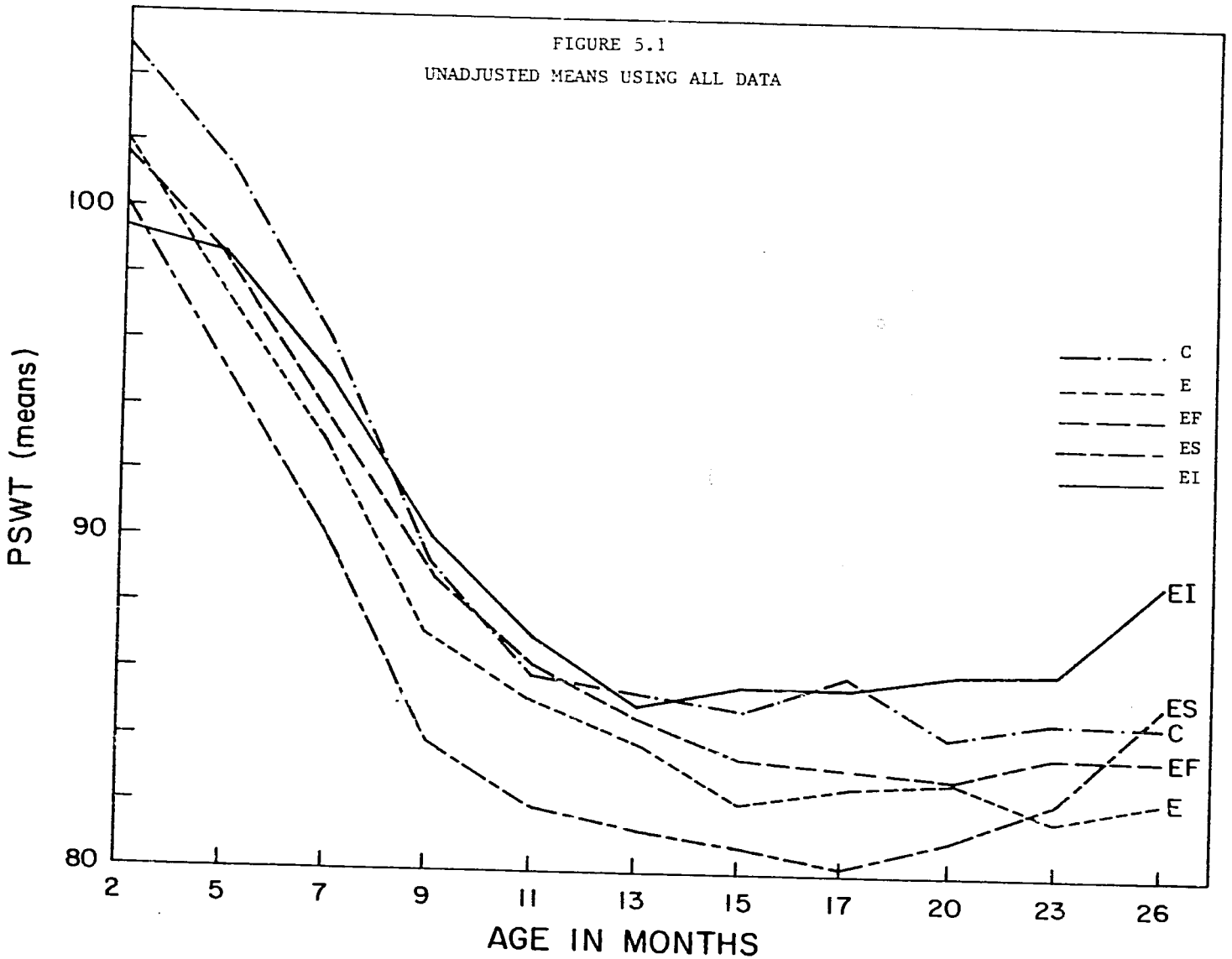
UNADJUSTED MEANS

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	104.43 (61)	102.56 (61)	96.16 (61)	89.40 (61)	86.03 (61)	85.40 (61)	85.05 (61)	86.01 (57)	84.34 (55)	84.86 (37)	84.90 (21)	81.59 (15)
Education	101.42 (55)	97.13 (56)	92.75 (56)	86.77 (56)	85.21 (55)	84.14 (54)	82.44 (54)	82.74 (52)	82.14 (42)	81.02 (32)	82.23 (27)	83.29 (22)
Education/ Immunization	99.66 (62)	98.58 (63)	94.89 (63)	90.17 (63)	87.33 (63)	85.37 (63)	85.68 (62)	85.91 (58)	86.06 (51)	85.99 (41)	88.23 (29)	86.42 (24)
Education/ Suppl. Food	101.38 (66)	98.41 (66)	93.55 (66)	89.05 (66)	86.16 (65)	83.28 (65)	83.55 (65)	83.34 (60)	82.98 (54)	83.66 (41)	83.62 (36)	85.88 (27)
Education/ Sanitation	100.20 (62)	94.91 (62)	90.35 (62)	84.03 (62)	81.92 (62)	81.35 (62)	80.72 (62)	80.10 (55)	81.40 (60)	82.30 (51)	83.87 (45)	85.53 (39)

(.) Sample size.

FIGURE 5.1

UNADJUSTED MEANS USING ALL DATA



on the average, as the child becomes older.

Adjusted Means Based Upon Covariate Analysis

In this section we consider the covariate adjusted average percent of standard weight for the four basic interventions plus the control group. The data are analyzed in four different ways as follows: (a) all of the data in the complete data set are analyzed using the eight covariates; (b) the same analysis as in (1) except the data set is restricted to only those children whose percent of standard body weight at baseline (average age of two months) is at least 80% of normal and no greater than 120% of normal; (c) the intervention analysis is analyzed separately for a lower socio-economic group based upon a devised socioeconomic indicator function similar to the Hollingshead Index; (d) the same analysis as in (c) except that the subject children are again limited to only those between 80% and 120% of standard body weight for age. A table of the adjusted means along with a graph is given for each case. The results are presented in tabular and graphic form. The graphs are shown only through the third follow-up intervention since the sample size during the fourth follow-up period was so small that the possible errors are too large to make reasonable conclusions.

The table given below can be used as a guide in determining when adjusted means are statistically different. A few comments about the table will first be stated. The first column denotes the interview number and age of subjects in months. The second column gives the typical values of the standard error (not standard deviation) for the adjusted means. Though there was some variation between groups at each given intervention number, the standard errors were remarkably stable. Column three gives the standard error for the difference between two means at each intervention number.

We note that these are estimated differently for covariate adjusted means than for a simple test of unadjusted means. Columns four and five give the difference required for two means to differ significantly (one-sided test) at the 10% and 5% levels, respectively. The computations in this table are for the case where all data were used. The other cases restricted in various ways, typically had slightly larger standard errors. However, for practical purposes this table can be used as a guideline for comparing means in the various tables given in this chapter.

Typical Standard Errors for Adjusted Means

Intervention Number (Age in months)	Standard Error of Adjusted Mean	Standard Error of Difference Between Two Adjusted Means	Difference Required for Significance (1-sided) Level	
			10%	5%
1 (5)	1.30	1.84	2.36	3.04
2 (7)	0.85	1.20	1.54	1.98
3 (9)	0.86	1.21	1.55	2.00
4 (11)	0.88	1.24	1.59	2.05
5 (13)	0.94	1.33	1.70	2.19
6 (15)	0.90	1.27	1.63	2.10
7 (17)	0.94	1.33	1.70	2.19
F-1[a] (20)	0.95	1.34	1.72	2.21
F-2 (23)	1.00	1.41	1.80	2.33
F-3 (26)	1.20	1.70	2.18	2.81
F-4 (27)	1.70	2.40	3.07	3.96

[a] F denotes follow-up interviews.

Table 5.2 and Figure 5.2 show the adjusted means for each of the four

TABLE 5.2

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

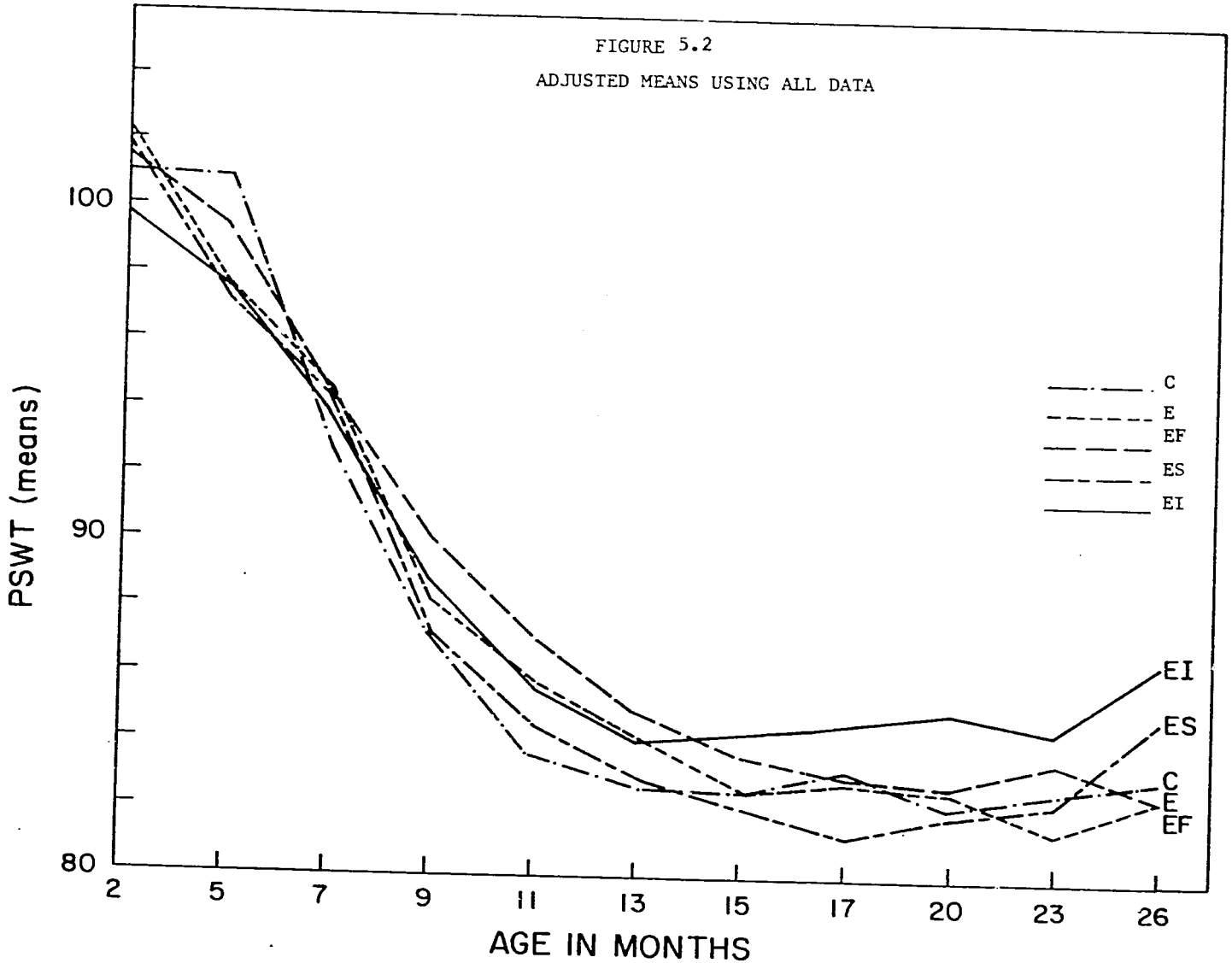
ADJUSTED MEANS USING ALL DATA

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	100.96 (61)	100.77 (61)	93.00 (61)	87.29 (61)	83.68 (61)	82.75 (61)	82.48 (60)	83.34 (56)	82.35 (49)	82.84 (33)	83.08 (17)	80.43 (13)
Education	102.35 (53)	97.72 (53)	94.58 (53)	88.18 (53)	85.69 (53)	84.18 (53)	82.64 (53)	82.90 (51)	82.59 (41)	81.39 (29)	82.53 (23)	84.76 (19)
Education/ Immunization	99.69 (61)	97.55 (61)	93.75 (61)	88.73 (61)	85.65 (61)	84.00 (61)	84.30 (61)	84.55 (56)	85.03 (50)	84.39 (41)	86.46 (29)	84.30 (23)
Education/ Suppl. Food	101.47 (65)	99.32 (65)	94.52 (65)	90.15 (65)	87.08 (65)	84.91 (65)	83.58 (65)	82.99 (60)	82.66 (54)	83.54 (41)	82.53 (36)	84.61 (27)
Education/ Sanitation	101.76 (63)	97.21 (63)	94.28 (63)	87.31 (63)	84.47 (63)	83.04 (63)	82.15 (63)	81.30 (56)	81.94 (57)	82.32 (50)	84.92 (43)	85.55 (37)

(.) Sample size.

FIGURE 5.2

ADJUSTED MEANS USING ALL DATA



interventions and the control for case (a), using all of the data set and the eight covariates. It can be seen from Figure 5.2 that between the first and second intervention (between five and seven months of age) no significant differences are seen between the interventions and the control. However, from age 7 months to age 15 months, all of the intervention groups generally have a higher percent of standard body weight for age than the control group. The supplementary food intervention with nutrition/health education is clearly the highest of the interventions considered during this age span. No real difference can be demonstrated between the control and the education/sanitation intervention. In addition, during the time frame 7 months to 13 months the interventions of education alone and education with immunization yield approximately the same adjusted averages. Supplementary food shows gains significantly greater than any of the other interventions or the control group. However, we note that at approximately age 15 months, the group of subject children receiving the education and immunization intervention dramatically increases relative to the other interventions. The education and supplementary food intervention tends toward the education alone and the control group of children. During the approximate period of age 15 months to 20 months the group receiving education and sanitation has a lower adjusted percent of standard body weight than any of the interventions as well as the control. We will offer some conjectured explanations about this in the section on conclusions.

In the various ways we attempted to analyse the data, the following pattern seemed to emerge. The education with immunization intervention seemed to have little or no affect until approximately age 15 months and then invariably seemed to demonstrate a higher body weight for age than the other interventions. Another common pattern was that little or no effect was seen

from the education with sanitation intervention until approximately age 15 months. However, at this time there is a strong suggestion that this intervention may even cause a slight loss in body weight for age and then show a dramatic recovery during the follow-up period. In the third follow-up period (9 months after interventions ceased) education with immunization was highest and education with sanitation was next highest. Supplementary food with education and education alone and the control group did not seem to be significantly different at the third follow-up period.

Our above statements, along with statements to follow, should include the caution that though we have attempted to make adjustments for covariates measured in a sound statistical manner, we of course cannot guarantee that other unmeasured factors affecting child growth have been adequately adjusted for in the analysis. One such factor which will be discussed in a later section is disease experience.

Table 5.3 and Figure 5.3 show the same kind of analysis except that the subject children are restricted to those in the "normal" range for body weight at baseline (80% to 120% at age two months). Figure 5.3 shows a similar pattern to Figure 5.2 (where all subjects were included in the anslysis) except that the differences between interventions are greater in some cases and less in others. The supplementary food with education intervention shows a significantly greater average percent of standard body weight than the control or the education with sanitation intervention during the intervention period, but is not significantly greater than education with immunization. Once again, after age 13 to 15 months, the intervention of education with immunization clearly demonstrates a higher level than any of the other interventions. Supplementary food with education again follows a similar pattern to education alone after supplementary feeding ceases.

TABLE 5.3

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO 80 ≤ PSWTO* ≤ 120[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	99.68 (45)	99.88 (45)	92.05 (45)	86.45 (45)	82.61 (45)	81.57 (45)	82.22 (45)	82.45 (42)	81.04 (36)	82.64 (24)	81.45 (14)	80.47 (11)
Education	99.51 (45)	97.83 (45)	94.39 (45)	88.04 (45)	85.77 (45)	84.18 (45)	82.99 (45)	82.52 (43)	81.93 (33)	80.97 (26)	82.47 (20)	84.38 (18)
Education/ Immunization	99.27 (53)	97.20 (53)	94.14 (53)	89.35 (53)	86.60 (53)	85.03 (53)	84.78 (53)	84.74 (49)	85.35 (42)	84.63 (34)	87.95 (24)	85.11 (18)
Education/ Suppl. Food	100.25 (54)	99.36 (54)	94.48 (54)	90.22 (54)	87.21 (54)	84.60 (54)	83.24 (54)	82.33 (51)	81.78 (45)	83.17 (34)	82.06 (30)	83.93 (21)
Education/ Sanitation	101.11 (52)	96.26 (52)	93.93 (52)	86.55 (52)	83.76 (52)	82.33 (52)	81.59 (52)	80.50 (45)	81.63 (46)	81.88 (40)	83.90 (35)	84.49 (29)

[a](.) Sample size. PSWTO = percent standard weight at baseline.

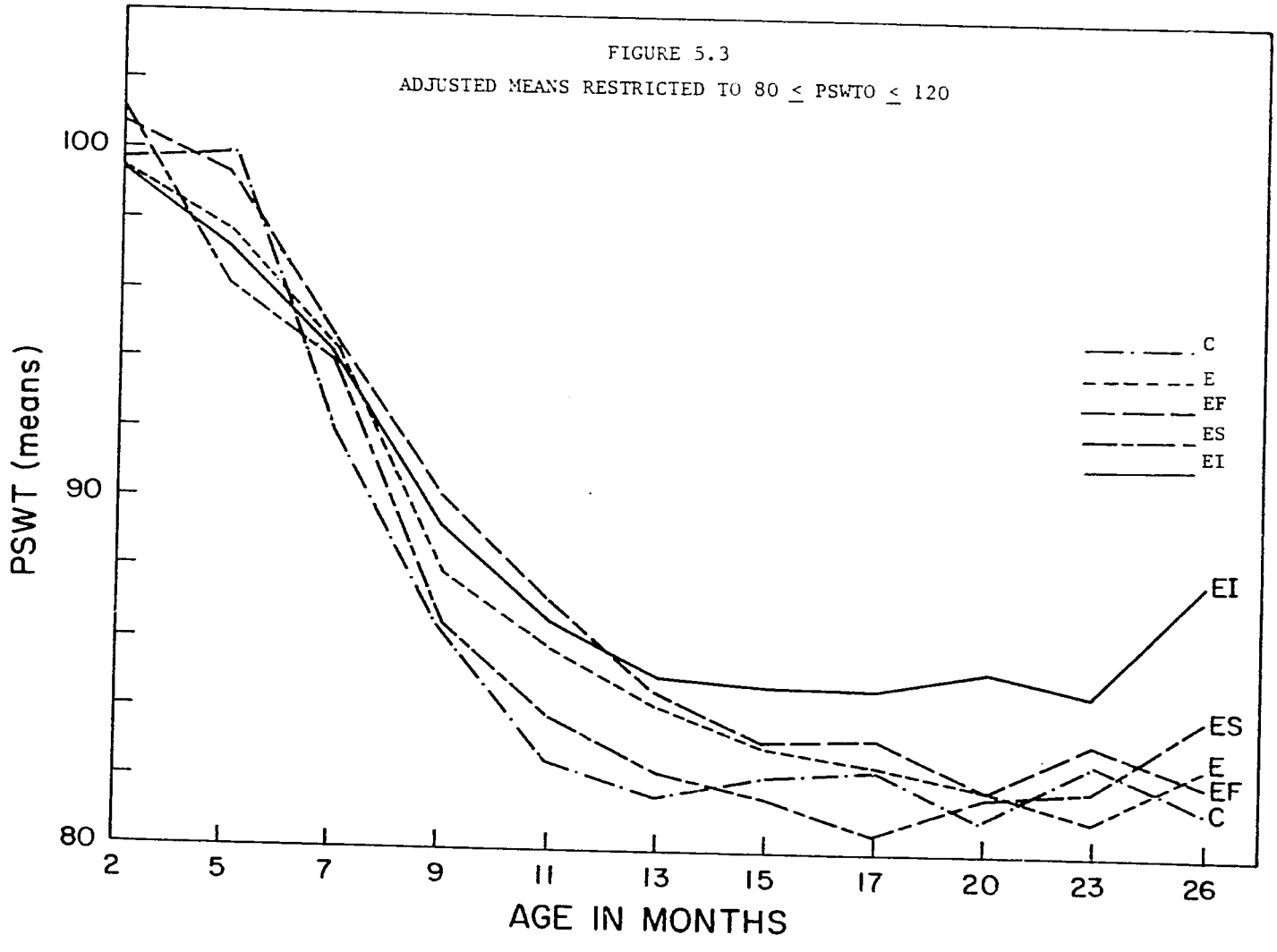


FIGURE 5.3
ADJUSTED MEANS RESTRICTED TO 80 ≤ PSWTO ≤ 120
PSWT (means)
100
90
80
2
5
7
9
11
13
15
17
20
23
26
AGE IN MONTHS
C
E
EF
ES
EI
EI
ES
E
EF
C

TABLE 5.4

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO HIGHER SOCIOECONOMIC FAMILIES[a]

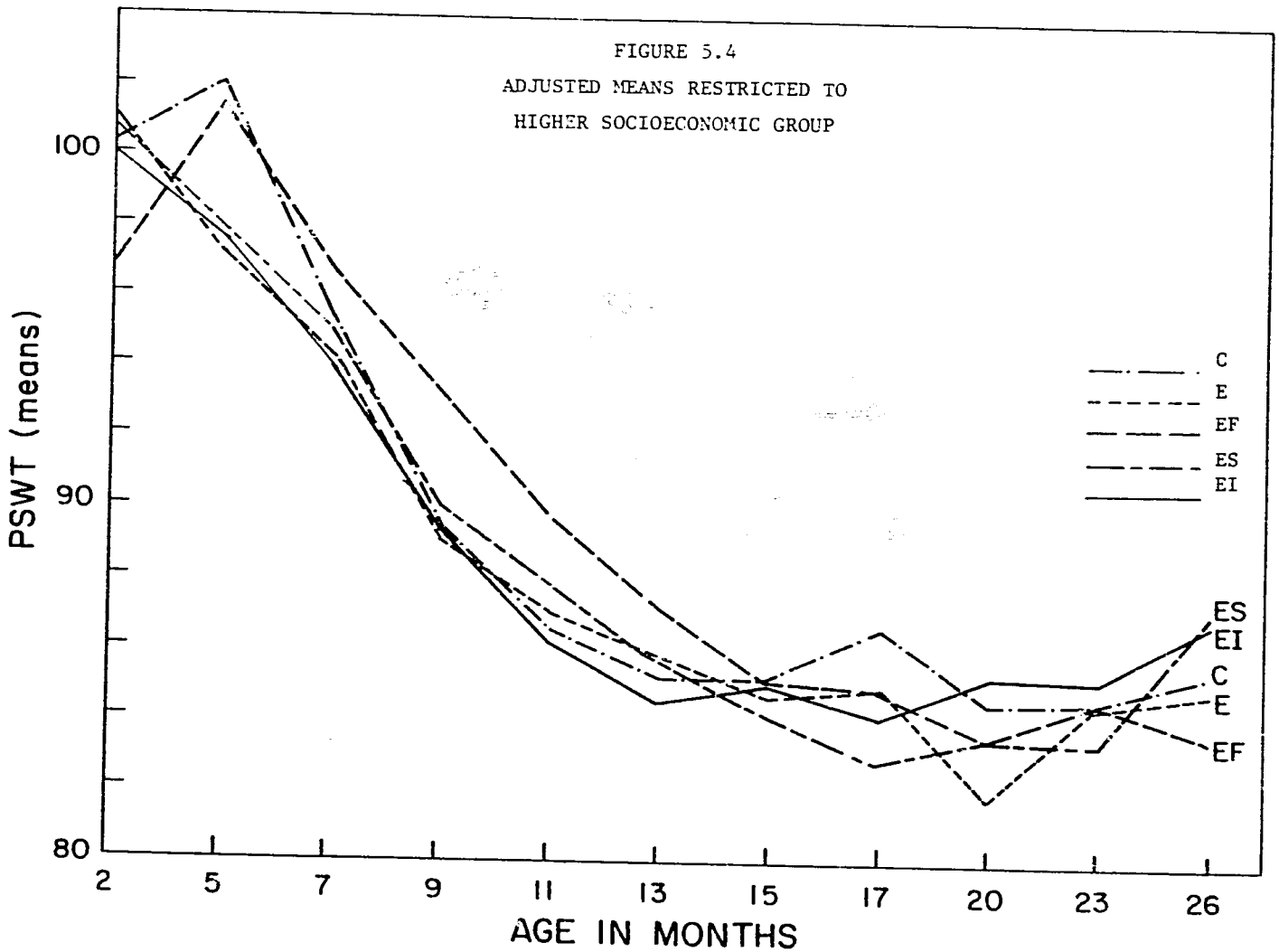
Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	100.32 (35)	102.03 (35)	95.31 (35)	89.43 (35)	86.54 (35)	85.27 (35)	85.05 (35)	86.31 (32)	84.31 (27)	84.55 (17)	85.39 (7)	81.62 (4)
Education	101.34 (26)	97.11 (26)	94.35 (26)	89.16 (26)	87.10 (26)	85.79 (26)	84.67 (26)	84.99 (25)	81.77 (19)	84.51 (13)	84.98 (9)	87.50 (5)
Education/ Immunization	100.01 (40)	97.36 (40)	94.04 (40)	89.27 (40)	86.18 (40)	84.46 (40)	84.96 (40)	84.08 (36)	85.35 (34)	85.07 (29)	86.89 (21)	88.22 (18)
Education/ Suppl. Food	96.68 (28)	101.44 (28)	96.83 (28)	93.12 (28)	89.66 (28)	87.19 (28)	85.08 (28)	84.91 (26)	83.54 (25)	84.61 (20)	83.58 (16)	84.87 (11)
Education/ Sanitation	101.08 (24)	97.83 (24)	94.90 (24)	90.16 (24)	87.95 (24)	85.70 (24)	82.24 (24)	82.94 (22)	83.53 (22)	83.39 (19)	87.02 (16)	88.00 (16)

[a](.) Sample size. 7 (EDM) + 4 (INCOME) > 38.5

FIGURE 5.4

ADJUSTED MEANS RESTRICTED TO

HIGHER SOCIOECONOMIC GROUP



Sanitation with education again shows a good increase during the follow-up period. We note that the control group of children are lowest at the third follow-up period though not significantly lower than education alone or education with supplementary food.

In order to attempt to compare children from different socioeconomic levels, we did the same kind of analysis using the eight covariates mentioned above. This was done by calculating a socioeconomic index (similar to the Hollingshead socioeconomic index) which was equal to seven times the number of years of formal education of the mother plus four times the family income (in thousands of pesos). The average index for all of the children in the data set was 38.5. Our analysis then considered all children with a family index above 38.5 as the higher socioeconomic group and those below the value of 38.5 were considered to be the lower socioeconomic group. Table 5.4 and Figure 5.4 show the adjusted means for the higher socioeconomic group. The adjusted means shown in Figure 5.4 are considerably different from those shown in the previous graphs where all subject children were included. In this graph, supplementary feeding intervention seems to show considerably greater improvement in the children's body weight for age than the other interventions during the intervention period. However, the same pattern emerges as for the previous analysis in that during the third follow-up period (nine months after intervention ceased) the interventions of education with immunization and education with sanitation appeared to have the highest average body weight for the subject children. Figure 5.5 and Table 5.5 show the same analysis for the lower socioeconomic groups. Again a picture is seen quite different than that seen for all subjects combined. Uniformly subject children receiving education with immunization showed a higher average body weight for age than any other intervention. The

TABLE 5.5

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO LOWER SOCIOECONOMIC FAMILIES[a]

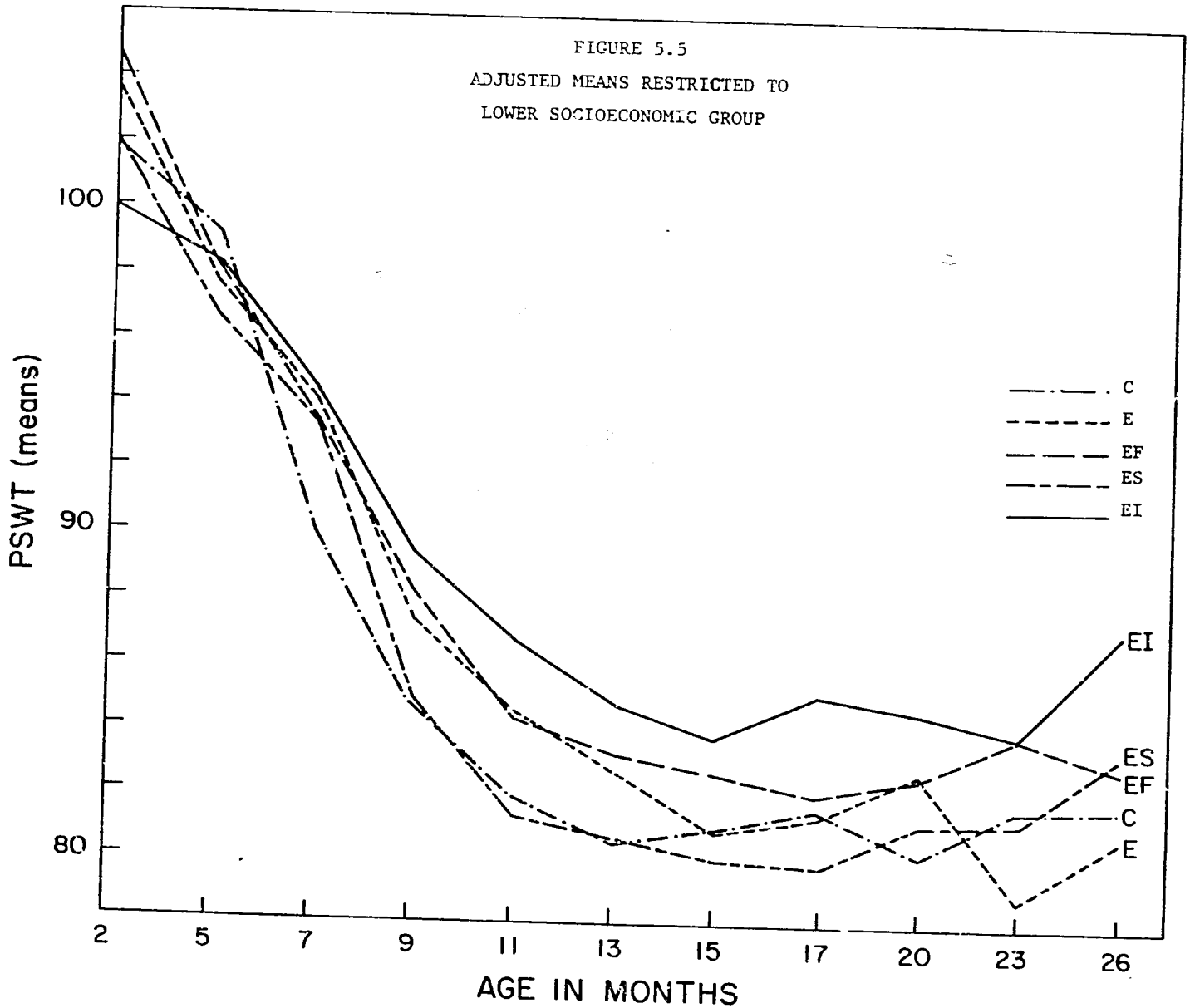
Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	101.90 (26)	99.09 (26)	90.14 (26)	84.84 (26)	81.85 (26)	80.50 (26)	80.86 (25)	81.56 (24)	80.07 (22)	81.55 (16)	81.62 (10)	80.11 (9)
Education	103.61 (27)	97.66 (27)	94.25 (27)	87.48 (27)	84.65 (27)	82.94 (27)	80.80 (27)	81.37 (26)	82.71 (22)	78.90 (16)	80.70 (14)	83.04 (14)
Education/ Immunization	99.91 (21)	98.32 (21)	94.43 (21)	89.38 (21)	86.77 (21)	84.76 (21)	83.71 (21)	85.15 (20)	84.61 (16)	83.95 (12)	86.99 (8)	80.47 (5)
Education/ Suppl. Food	104.75 (37)	98.20 (37)	93.45 (37)	88.16 (37)	84.42 (37)	83.31 (37)	82.71 (37)	81.97 (34)	82.55 (29)	83.85 (21)	82.85 (20)	84.71 (16)
Education/ Sanitation	102.10 (39)	96.69 (39)	93.52 (39)	84.93 (39)	81.35 (39)	80.69 (39)	79.87 (39)	79.84 (34)	81.07 (35)	81.23 (31)	83.33 (27)	83.55 (21)

[a](.) Sample size. 7 (EDM) + 4 (INCOME) $\leq$ 38.5

FIGURE 5.5

ADJUSTED MEANS RESTRICTED TO

LOWER SOCIOECONOMIC GROUP



intervention with education and sanitation seems to clearly be lower than one might expect. This was not the same pattern for the education with sanitation intervention among the higher socioeconomic group subject children. The supplementary food and education group shows little difference from the education alone group for the lower socioeconomic children, except possibly during the follow-up period.

There is another possibly important observation we wish to point out. The control group of subjects generally come from higher socioeconomic families. In spite of this, the average percent of standard weight for the controls dropped at a much more rapid rate than the intervention subjects. This more rapid loss for control children is especially evident between age five months (beginning of interventions) and approximately age 12 months. This pattern is consistent in every analysis we performed.

Figures 5.4 and 5.5 suggest possible different intervention effects for children coming from relatively higher socioeconomic families as opposed to those coming from lower socioeconomic families. For example, the supplementary food intervention seems to be the best intervention for the higher socioeconomic families where possibly the food was not needed as badly or at least was more properly utilized. Supplementary food does not seem to yield results nearly as effective for the lower socioeconomic children possibly due to sharing with other family members. In addition, the education with sanitation intervention seems to show considerably better results for children in higher socioeconomic families than for those in the lower socioeconomic families. In all cases, however, education with immunization seems to yield very favorable results as well as education with sanitation in the latter part of the follow-up period. What also seems to be clear is that <u>each</u> of the interventions are yielding average

percent of standard body weights generally higher than the control group and generally higher than other sets of non-intervention data seen by these writers for Philippine children. It should be noted that in this study the control group was generally of a higher socioeconomic level than the other intervention groups. This is unfortunate for comparative analysis purposes. The covariate analysis does adjust for these differences but whether it adjusts sufficiently well is not completely clear. It is felt by us that the interventions are even more effective than the comparison with our control group indicates.

Tables 5.6 and 5.7 and Figures 5.6 and 5.7 show the average percent of standard body weight when both the subjects are restricted to the 80% to 120% standard body weight for age range and the socioeconomic index is applied to define upper and lower socioeconomic groups. The pattern is similar to the above separate socioeconomic levels in that supplementary food performs very well during the intervention period for the higher socioeconomic group and not as well for the lower socioeconomic group. On the other hand, immunization seems to do very well for the lower socioeconomic groups and still looks good in the follow-up period for the higher socioeconomic groups. There is also evidence that the education intervention has its greatest impact in lower socioeconomic families during the earlier months of the intervention implemention phase.

With caution, there seem to be certain rather strong suggestions that these analysis show for the four basic interventions. Firstly, supplementary food clearly shows improvement as long as food is being given but seems to not perform as well as immunization and possibly sanitation during the follow-up period. There is also a rather strong suggestion that the supplementary food intervention does better for the higher socioeconomic

TABLE 5.6

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO HIGHER SOCIOECONOMIC FAMILIES AND 80 ≤ PSWTO ≤ 120[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	(20)	2 (23)	3 (26)	4 (29)
Control	99.11 (26)	101.72 (26)	95.00 (26)	88.92 (26)	85.58 (26)	84.52 (26)	85.24 (26)	85.50 (24)	83.79 (21)	84.53 (14)	81.69 (6)	80.48 (4)
Education	100.23 (22)	97.81 (22)	94.57 (22)	89.13 (22)	87.26 (22)	85.55 (22)	85.49 (22)	84.80 (21)	80.90 (15)	84.33 (10)	85.52 (6)	87.89 (4)
Education/ Immunization	99.22 (32)	96.95 (32)	94.71 (32)	90.60 (32)	87.62 (32)	85.93 (32)	85.96 (32)	84.13 (29)	85.41 (26)	85.33 (22)	88.01 (16)	87.64 (13)
Education/ Supp. Food	98.49 (23)	101.94 (23)	97.21 (23)	93.25 (23)	89.92 (23)	86.56 (23)	84.52 (23)	84.19 (23)	82.86 (21)	83.71 (17)	83.44 (14)	85.16 (9)
Education/ Sanitation	100.32 (18)	95.69 (18)	94.71 (18)	88.89 (18)	86.65 (18)	84.83 (18)	83.13 (18)	81.51 (16)	81.95 (16)	81.44 (14)	85.35 (11)	87.48 (11)

[a](.) Sample size. 7 (EDM) = 4(INCOME) > 38.5.

FIGURE 5.6

ADJUSTED MEANS RESTRICTED TO 80 ≤ PSWTO ≤ 120

AND HIGHER SOCIOECONOMIC GROUP

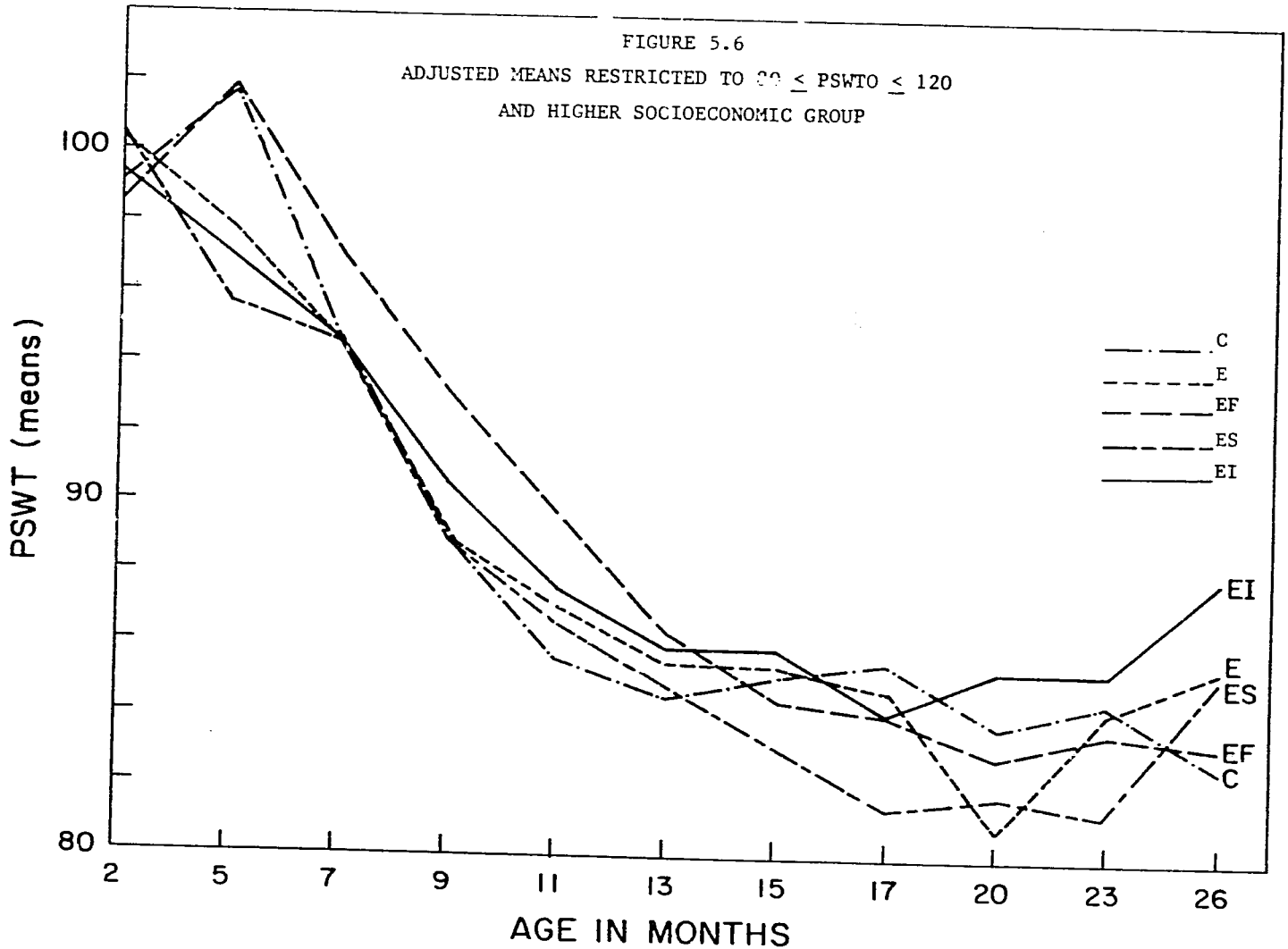


TABLE 5.7

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO LOWER SOCIOECONOMIC FAMILIES AND 80 ≤ PSWTO ≤ 120[a]

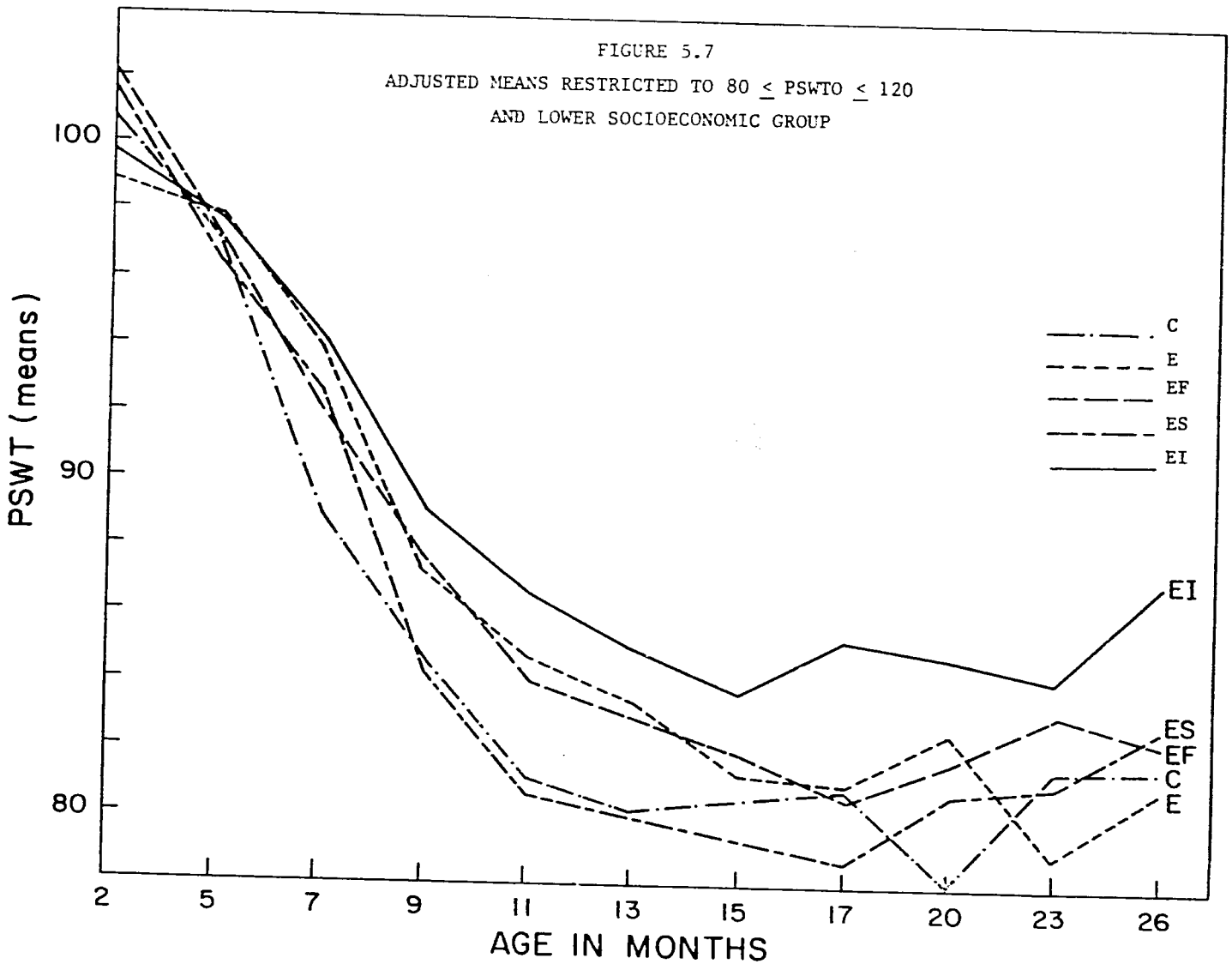
Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	100.64 (19)	97.32 (19)	89.12 (19)	84.68 (19)	81.11 (19)	80.20 (19)	80.65 (19)	80.88 (18)	78.06 (15)	81.53 (10)	81.56 (8)	80.23 (7)
Education	98.83 (23)	97.83 (23)	94.11 (23)	87.26 (23)	84.83 (23)	83.54 (23)	81.30 (23)	80.96 (22)	82.65 (18)	78.92 (16)	80.92 (14)	82.99 (14)
Education/ Immunization	99.59 (21)	97.76 (21)	94.21 (21)	89.23 (21)	86.62 (21)	85.00 (21)	83.69 (21)	85.32 (20)	84.80 (16)	84.10 (12)	87.09 (8)	80.00 (5)
Education/ Supp. Food	102.25 (31)	97.43 (31)	92.45 (31)	87.63 (31)	84.11 (31)	83.00 (31)	82.03 (31)	80.82 (28)	81.66 (24)	83.23 (17)	82.27 (4)	83.82 (12)
Education/ Sanitation	101.50 (34)	96.54 (34)	92.64 (34)	84.35 (34)	80.65 (34)	79.99 (34)	79.38 (34)	79.75 (29)	80.72 (30)	81.03 (26)	82.73 (24)	82.38 (18)

[a](.) Sample size. 7 (EDM) + 4 (INCOME) ≤ 38.5. PSWTO = Percent standard weight at baseline.

FIGURE 5.7

ADJUSTED MEANS RESTRICTED TO 80 ≤ PSWTO ≤ 120

AND LOWER SOCIOECONOMIC GROUP



children than for the lower socioeconomic children. This might be explained by the possibility that utilization is better among the higher socioeconomic groups than for the lower groups. There is also a strong suggestion that education with sanitation shows a good impact during the follow-up period when the child is two years of age or older. We cannot fully explain the low levels that the education with sanitation group seems to show for approximately the five month period between 15 and 20 months of age. However, some possible explanations will be conjectured in our conclusions. In all cases and in all of the analysis we performed, the subject children receiving education with immunization showed considerable gains during the follow-up period. These however were not seen as dramatically during the intervention period itself. It is also very clear and should be emphasized here that none of the interventions show an impact as great as several of the socioeconomic variables considered in the analysis of Chapter 4.

Intervention Combinations

Analysis of intervention combinations has been very difficult. The major reason is that there is interaction between the interventions and these interactions are different at various ages of the subject child. For these reasons the intervention effects are not additive, and hence, simply looking at the usual estimates for intervention effects does not adequately describe the total picture. Rather than simply comparing the adjusted means, it should be more informative to look at interactions and compare intervention effects in the presence or absence of other interventions.

Additional analysis is currently being completed for the intervention

combinations and will be reported in a supplement to this report along with further analysis of the entire data set. Preliminary analysis suggests some possibly interesting results will be seen. However, for the reader's information we are including here the adjusted means for the intervention combinations. We would caution the reader to use care in directly comparing the adjusted means in this section with those in the previous section because of the difficulties stated above. Tables 5.8 - 5.14 are the intervention combination tables corresponding to Tables 5.1 - 5.7 which included only the four basic interventions plus the control group.

Nutrition and Health Education Knowledge

Estimates of the impact upon the subject child for the nutrition/health education intervention can be obtained by comparing the adjusted means for the education and control interventions. As an additional measure of the education intervention effect on nutrition and health knowledge for the mother, a test was designed to measure prior and past knowledge separately for health and nutrition. A pre-test was given initially to measure the mother's current knowledge. Post-test 1 was given after the education training was completed. Lack of knowledge shown from post-test 1 was then reinforced and the gain due to reinforcement was measured with post-test 2.

Table 5.15 gives the average nutrition education test scores and standard errors for each intervention. The gains from the pre-test to post-test 1 were very substantial and highly statistically significant. Interestingly, the gains from post-test 1 to post-test 2 were also considerable (though less than from pre-test to post-test 1) and highly significant. This would strongly suggest that reinforcement is very important and productive in nutrition education for the mother.

Table 5.16 shows the corresponding test scores for health education. The gains shown from the pre-test to post-test 1 were considerable and again highly significant for every intervention group. As opposed to the case for nutrition education, the gains from post-test 1 to post-test 2 were relatively small.

These results very strongly suggests that the mothers gained considerably from nutrition and health education instruction. They also suggests that reinforcement is much more important for nutrition education than for health education.

TABLE 5.8

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

UNADJUSTED MEANS[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	104.43 (61)	102.56 (61)	96.16 (61)	89.40 (61)	86.03 (61)	85.40 (61)	85.05 (61)	86.01 (57)	84.34 (55)	84.86 (37)	84.90 (21)	81.59 (15)
Education/ Immunization/ Food	101.52 (61)	103.03 (61)	97.68 (61)	91.00 (61)	85.50 (61)	83.31 (61)	81.31 (60)	82.02 (59)	82.17 (61)	83.69 (46)	84.50 (37)	85.23 (35)
Education/ Food/ Sanitation	98.51 (61)	96.59 (61)	89.81 (60)	85.78 (61)	83.16 (61)	81.82 (61)	81.23 (60)	81.58 (59)	81.89 (53)	83.60 (46)	83.34 (37)	84.13 (31)
Education/ Immunization/ Sanitation	100.45 (60)	101.15 (60)	97.21 (60)	90.87 (60)	86.39 (60)	83.27 (60)	82.85 (60)	82.21 (58)	81.66 (50)	81.56 (41)	82.03 (29)	83.14 (23)
Education/ Immunization/ Food/ Sanitation	94.46 (60)	96.17 (60)	91.15 (60)	86.58 (60)	82.18 (60)	80.93 (60)	79.64 (59)	80.48 (58)	79.41 (50)	79.80 (42)	80.34 (35)	83.10 (20)

[a](.) denotes sample size.

TABLE 5.9

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS USING ALL DATA[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	100.96 (61)	100.77 (61)	93.00 (61)	87.29 (61)	93.68 (61)	82.75 (61)	82.48 (60)	83.34 (56)	82.35 (49)	82.84 (33)	83.08 (17)	80.43 (13)
Education/ Immunization/ Food	99.57 (61)	99.98 (61)	93.62 (61)	87.81 (61)	83.96 (61)	82.53 (61)	80.84 (60)	81.82 (59)	81.86 (59)	83.55 (45)	83.07 (36)	84.87 (34)
Education/ Food/ Sanitation	98.05 (60)	99.01 (60)	91.53 (59)	87.22 (60)	83.63 (60)	82.25 (60)	81.94 (60)	82.27 (57)	82.22 (51)	82.92 (43)	82.62 (35)	84.11 (29)
Education/ Immunization/ Sanitation	100.12 (60)	98.75 (60)	94.52 (60)	88.60 (60)	84.70 (60)	82.32 (60)	82.36 (60)	81.84 (58)	81.78 (51)	82.01 (42)	81.23 (29)	85.28 (23)
Education/ Immunization/ Food/ Sanitation	97.74 (59)	97.48 (59)	93.22 (59)	88.44 (59)	84.57 (59)	83.42 (59)	81.95 (59)	83.05 (58)	82.42 (51)	83.07 (43)	83.89 (36)	85.25 (20)

[a](.) denotes sample size.

TABLE 5.10

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO 80 <PSWTO <120[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	99.68 (45)	99.88 (45)	92.05 (45)	86.45 (45)	82.61 (45)	81.57 (45)	82.22 (45)	82.45 (42)	81.04 (36)	82.64 (24)	81.45 (14)	80.47 (11)
Education/ Immunization/ Food	99.34 (51)	98.90 (51)	92.86 (51)	86.90 (51)	83.23 (51)	81.67 (51)	80.21 (51)	81.15 (50)	81.83 (49)	82.52 (39)	82.59 (32)	83.79 (30)
Education/ Food/ Sanitation	98.90 (52)	97.88 (52)	91.48 (51)	86.39 (52)	83.02 (52)	81.46 (52)	81.19 (52)	81.88 (49)	81.55 (43)	82.00 (37)	82.30 (30)	83.54 (25)
Education/ Immunization Sanitation	99.80 (55)	99.11 (55)	93.81 (55)	87.83 (55)	83.64 (55)	81.93 (55)	81.61 (55)	80.84 (53)	80.94 (46)	80.92 (38)	82.32 (26)	83.42 (20)
Education/ Immunization/ Food/ Sanitation	97.98 (47)	98.76 (47)	92.93 (47)	88.61 (47)	84.47 (47)	83.46 (47)	81.92 (47)	83.25 (46)	82.54 (39)	83.62 (33)	83.86 (26)	85.49 (15)

[a](.) denotes sample size and PSWTO = Percent standard weight at baseline.

TABLE 5.11

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO HIGHER SOCIOECONOMIC FAMILIES >38.512[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	100.32 (35)	102.03 (35)	95.31 (35)	89.43 (35)	86.54 (35)	85.27 (35)	85.05 (35)	86.31 (32)	84.31 (27)	84.55 (17)	85.39 (7)	81.62 (4)
Education/ Immunization/	97.91 (21)	101.76 (21)	98.46 (21)	90.96 (21)	85.91 (21)	84.83 (21)	82.80 (21)	83.64 (21)	83.83 (21)	87.79 (14)	86.73 (10)	86.98 (10)
Education/ Food/ Sanitation	98.52 (20)	98.03 (20)	92.73 (20)	88.71 (20)	84.30 (20)	83.92 (20)	84.59 (20)	82.70 (19)	82.49 (19)	83.05 (17)	84.24 (12)	83.78 (9)
Education/ Immunization/ Sanitation	100.57 (38)	98.66 (38)	96.25 (38)	90.13 (38)	86.26 (38)	84.40 (38)	85.59 (38)	84.16 (36)	83.14 (30)	86.19 (23)	86.64 (15)	90.21 (10)
Education/ Immunization/ Food/ Sanitation	97.87 (21)	98.71 (21)	95.29 (21)	90.81 (21)	86.22 (21)	84.93 (21)	83.73 (21)	86.10 (21)	86.27 (18)	83.22 (15)	83.42 (11)	84.68 (6)

[a](.) denotes sample size and 7 (EDM) + 4 (INCOME) >38.5.

TABLE 5.12

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO LOWER SOCIOECONOMIC FAMILIES[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	101.90 (26)	99.09 (26)	90.14 (26)	84.84 (26)	81.85 (26)	80.50 (26)	80.86 (25)	81.56 (24)	80.07 (22)	81.55 (16)	81.62 (10)	80.11 (9)
Education/ Immunization/ Food	100.34 (40)	98.75 (40)	90.72 (40)	85.90 (40)	82.36 (40)	80.73 (40)	79.31 (39)	80.07 (38)	81.39 (38)	80.52 (31)	81.08 (26)	83.16 (24)
Education/ Food/ Sanitation	97.96 (40)	99.47 (40)	90.43 (39)	85.70 (40)	83.26 (40)	80.72 (40)	80.14 (40)	81.26 (38)	81.00 (32)	82.50 (26)	81.46 (23)	83.53 (20)
Education/ Immunization/ Sanitation	98.83 (22)	99.91 (22)	91.70 (22)	86.36 (22)	81.86 (22)	78.99 (22)	76.91 (22)	78.69 (22)	79.10 (21)	77.53 (19)	76.28 (14)	81.41 (13)
Education/ Immunization/ Food/ Sanitation	97.57 (38)	96.45 (38)	92.13 (38)	86.98 (38)	83.13 (38)	82.48 (38)	80.90 (38)	80.90 (37)	80.59 (33)	82.77 (28)	83.40 (25)	84.84 (14)

[a](.) denotes sample size and 7 (EDM) + 4 (INCOME) $\leq$ 38.5.

TABLE 5.13

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO HIGHER SOCIOECONOMIC FAMILIES AND 80 ≤ PSWTO ≤ 120[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	99.11 (26)	101.72 (26)	95.00 (26)	88.92 (26)	85.58 (26)	84.52 (26)	85.24 (26)	85.50 (24)	83.79 (21)	84.53 (14)	81.69 (6)	80.48 (4)
Education/ Immunization/ Food	98.45 (17)	102.12 (17)	98.29 (17)	91.01 (17)	86.37 (17)	85.12 (17)	84.32 (17)	84.49 (17)	83.72 (17)	87.88 (12)	87.50 (9)	88.51 (9)
Education/ Food/ Sanitation	99.40 (18)	98.70 (18)	93.11 (18)	88.95 (18)	84.14 (18)	83.44 (18)	83.79 (18)	83.04 (17)	83.18 (17)	82.68 (16)	83.78 (11)	83.94 (8)
Education/ Immunization/ Sanitation	99.65 (35)	99.09 (35)	96.07 (35)	89.92 (35)	85.43 (35)	83.90 (35)	84.70 (35)	83.55 (33)	83.40 (27)	84.37 (20)	84.43 (13)	87.36 (8)
Education/ Immunization/ Food/ Sanitation	100.50 (16)	99.20 (16)	95.20 (16)	91.04 (16)	86.31 (16)	84.54 (16)	84.55 (16)	86.87 (16)	86.16 (13)	84.96 (11)	84.53 (7)	83.96 (3)

[a](.) denotes sample size, 7 (EDM) + 4 (INCOME) > 38.5, and PSWTO = Percent standard weight at baseline.

TABLE 5.14

AVERAGE PERCENT OF STANDARD WEIGHT OF SUBJECTS:

ADJUSTED MEANS RESTRICTED TO LOWER SOCIOECONOMIC FAMILIES AND 80 ≤ PSWTO ≤ 120[a]

Intervention	Baseline	Intervention Number (Age in mos.)							Follow-up Number (Age in mos.)			
	0	1 (5)	2 (7)	3 (9)	4 (11)	5 (13)	6 (14)	7 (17)	1 (20)	2 (23)	3 (26)	4 (29)
Control	100.64 (19)	97.32 (19)	89.12 (19)	84.68 (19)	81.11 (19)	80.20 (19)	80.65 (19)	80.88 (18)	78.06 (15)	81.53 (10)	81.56 (8)	80.23 (7)
Education/ Immunization/ Food	99.82 (34)	97.30 (34)	89.82 (34)	84.10 (34)	81.19 (34)	79.05 (34)	77.76 (34)	79.19 (33)	80.70 (32)	79.81 (27)	80.40 (23)	81.94 (21)
Education/ Food/ Sanitation	98.98 (34)	97.35 (34)	89.91 (33)	84.37 (34)	82.35 (34)	79.87 (34)	79.30 (34)	80.51 (32)	80.28 (26)	81.39 (21)	81.43 (19)	83.19 (17)
Education/ Immunization/ Sanitation	99.52 (20)	99.51 (20)	91.05 (20)	85.39 (20)	81.14 (20)	78.44 (20)	75.97 (20)	77.54 (20)	78.36 (19)	77.45 (18)	81.20 (13)	80.69 (12)
Education/ Immunization/ Food/ Sanitation	96.54 (31)	98.33 (31)	91.81 (31)	87.11 (31)	83.53 (31)	82.73 (31)	80.93 (31)	80.98 (30)	80.40 (26)	82.81 (22)	83.01 (19)	85.50 (12)

[a](.) denotes sample size, 7 (EDM) + (INCOME) ≤ 38.5, and PSWTO = Percent standard weight at baseline.

TABLE 5.15

AVERAGE NUTRITION EDUCATION TEST SCORES

Intervention	Test	No. of Subjects	Average Score	Std. Error of Mean
E	Pre-test	53	70.20	1.7
	Post-test 1	53	82.92	1.86
	Post-test 2	53	89.52	1.49
E/I	Pre-test	60	69.98	1.40
	Post-test 1	60	83.18	1.21
	Post-test 2	60	90.55	1.11
E/F	Pre-test	56	68.67	1.44
	Post-test 1	56	84.92	1.28
	Post-test 2	56	88.66	1.51
E/S	Pre-test	57	64.15	1.70
	Post-test 1	57	78.17	1.69
	Post-test 2	57	85.12	1.59
E/I/F	Pre-test	64	66.39	1.61
	Post-test 1	64	80.96	1.48
	Post-test 2	64	87.01	1.99
E/F/S	Pre-test	56	69.39	1.67
	Post-test 1	56	82.42	1.66
	Post-test 2	56	88.80	1.45
E/I/S	Pre-test	59	68.01	1.83
	Post-test 1	59	80.50	1.54
	Post-test 2	59	86.84	1.48
E/I/F/S	Pre-test	59	66.96	1.88
	Post-test 1	59	81.32	1.71
	Post-test 2	59	86.93	1.98

TABLE 5.16

AVERAGE HEALTH EDUCATION TEST SCORES

Intervention	Test	No. of Subjects	Average Score	Std. Error of Mean
E	Pre-test	53	19.69	0.82
	Post-test 1	53	25.73	0.52
	Post-test 2	53	26.35	0.48
E/I	Pre-test	60	22.00	0.66
	Post-test 1	60	26.93	0.42
	Post-test 2	60	27.53	0.30
E/F	Pre-test	56	20.17	0.64
	Post-test 1	56	25.00	0.56
	Post-test 2	56	26.25	0.41
E/S	Pre-test	57	19.38	0.57
	Post-test 1	57	24.01	0.55
	Post-test 2	57	25.03	0.63
E/I/F	Pre-test	64	19.15	0.72
	Post-test 1	64	23.75	0.68
	Post-test 2	64	24.53	0.75
E/F/S	Pre-test	56	18.48	0.64
	Post-test 1	56	24.44	0.67
	Post-test 2	56	26.01	0.41
E/I/S	Pre-test	59	20.76	0.64
	Post-test 1	59	25.77	0.60
	Post-test 2	59	27.00	0.38
E/I/F/S	Pre-test	59	18.89	0.70
	Post-test 1	59	25.01	0.46
	Post-test 2	59	26.16	0.35

CHAPTER 6

INTERVENTION COST ANALYSIS

In this chapter we will consider intervention gains relative to costs. This will enable us to consider the intervention effects from another perspective. There are of course many cost functions which could be considered and many ways of looking at cost-effectiveness. The basic cost-effectiveness function could be formulated in a form of gain per unit cost or cost per unit gain. We have chosen the former case since the latter has mathematical properties making the function difficult to interpret. For example, the function is infinity when the gain is zero. Hence, if g_{it} represents the gain (in units of percent standard weight for age) due to intervention i at time t, and c_{it} represents total cost (in pesos) of intervention i at time t, then the basic cost-effectiveness function we use is

$$(g_{it}/c_{it}) \times 100, \quad i = 1, 2, - - -, 8; \quad t = 1, 2, - - -.$$

The gains are different at various points in time and the cummulative costs increase over time. Hence, we will compute this ratio for each intervention at each interview time, including the follow-up period. Our interpretation of the above ratio is the relative gain at time t per unit cost accumulated to reach time t. We note that the above ratio will be negative if g_{it} is negative (a loss).

Cost data were throughly kept throughout the study in terms of total cost. The costs used in our analysis here are restricted to implementation cost, excluding research costs. This, we believe, best illustrates cost-effectiveness in terms of program implementation costs. In addition, we have only used cost data in terms of supplies and manpower time after reaching the subject household. Travel costs are not included since for purposes

of extrapolation these will vary between locations, population density, etc. The manpower costs and supplies-materials costs are of course reflective of the Philippines.

Estimates of Gains

In Chapter 5 we indicated that the adjusted means given were a modified form of the usual analysis of covariance adjusted means. As opposed to the usual procedure, our estimates are of the form

$$\bar{y}_{i(adj.)} = \bar{\bar{y}}_i + \bar{r}_i,$$

where $\bar{\bar{y}}_i$ is the overall unadjusted mean and $\bar{r}_i$ is the average of the residuals given by the covariate function. These estimates and standard errors are essentially the same as the usual procedure and has the advantage of enabling us to also consider adjusted medians, or any quantile desired. Further analysis utilizing quantiles will be reported in a supplement to this report. The estimate above enables us to simply consider the average residuals ($\bar{r}_i$) for relative intervention comparisons.

In this chapter some of the estimates will differ very slightly (usually <0.1) from those given in Chapter 5. The reason is that here we retained all covariates in the covariate function whereas in Chapter 5 only statistically significant covariates were retained at each stage.

We will consider both intervention combination estimates and single intervention estimates. For example, referring to the adjusted means in Table 5.2 (Chapter 5) for interview number 4 (age 11 months) an estimate of the intervention combination gain for education and supplementary food is

$$EF - C = 87.08-83.68 = 3.40.$$

To estimate the effect of supplementary food alone we can use

$$EF - E = 37.08-85.69 = 1.39.$$

This implies that supplementary food when given alone (no education) at this point in time yields a gain of 1.39. Hence, the intervention combination EF yields an estimated gain of 3.40 and the single intervention F yields an estimated gain of 1.39.

Estimated intervention combination gains are given in Figures 6.1 and 6.2 for the two cases of (a) using all data and (b) using only subjects restricted to percent standard weight for age at baseline between 80% and 120%, respectively. The corresponding single intervention estimates are given in Figures 6.3 and 6.4.

Intervention Cost

Tables 6.1 - 6.4 give the implementation costs individually for the four basic interventions of (a) Nutrition and Health Education, (b) Sanitation, (c) Immunization, and (d) Supplementary Food. The costs are given in pesos. Time and skill level of personnel required are shown by interview number. We have based our personnel costs on the rough figures of ₱ 5/hour for nutritionists, nurses and medical researchers, and ₱10/hour for physicians. The purposes of costs shown for materials and supplies are denoted on each table. All costs, on a per interview number basis, have been rounded to the nearest whole unit.

Since we are considering the gain per total cost at a given point in time (age), the cost effectiveness ratios will utilize the cummulative cost at a specified intervention number. Table 6.5 gives the cummulative costs by interview number for each single intervention. For example (looking at Table 6.5) 32 pesos were spent for the food intervention up to the beginning of interview 2. An additional 27 pesos (from Table 6.4) was spent before the beginning of interview 3 for a total of 59 pesos.

FIGURE 6.1
INTERVENTION COMBINATION GAINS
USING ALL DATA

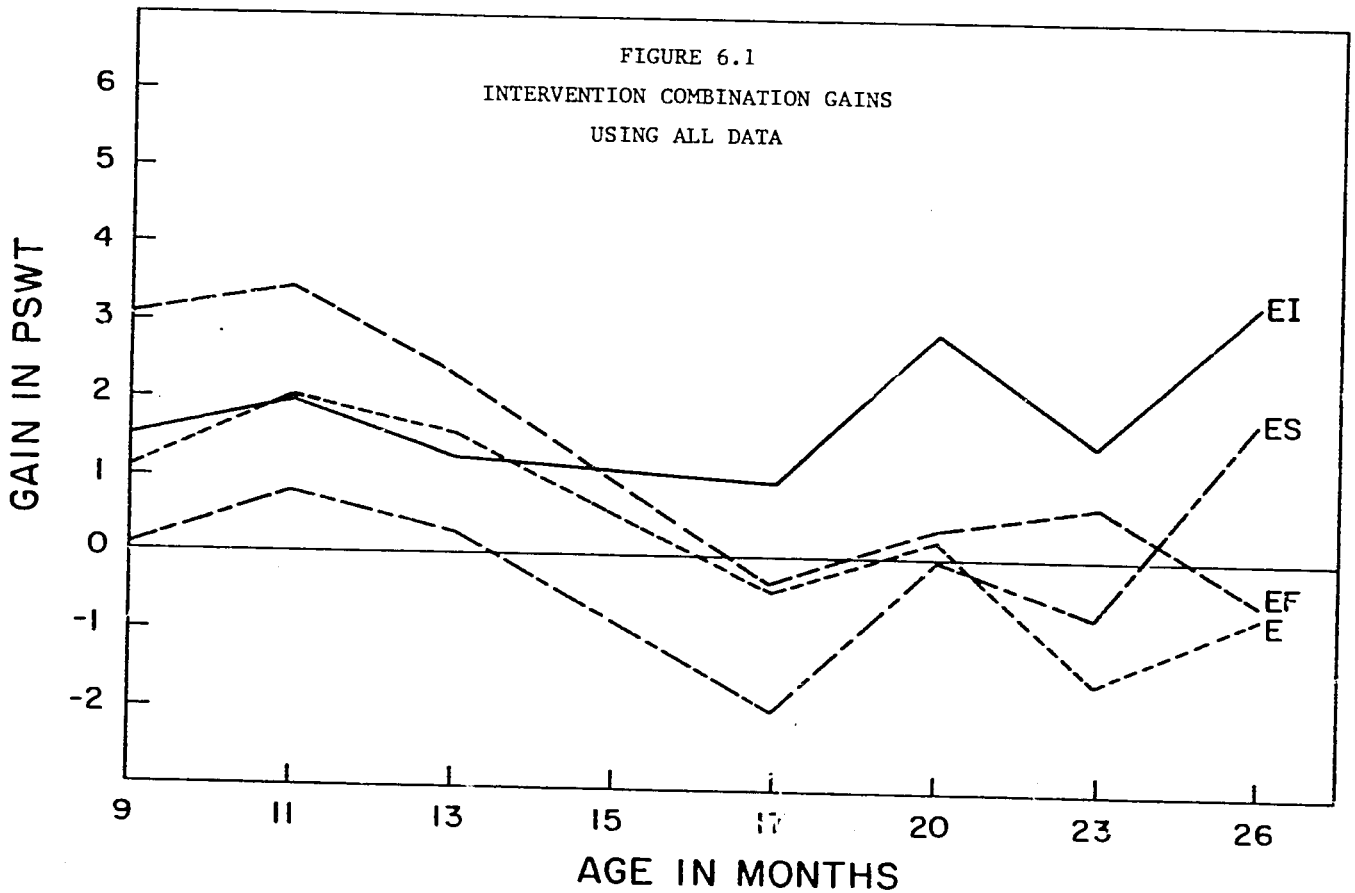


FIGURE 6.2
INTERVENTION COMBINATION GAINS
RESTRICTED TO 80 ≤ PSWTO ≤ 120

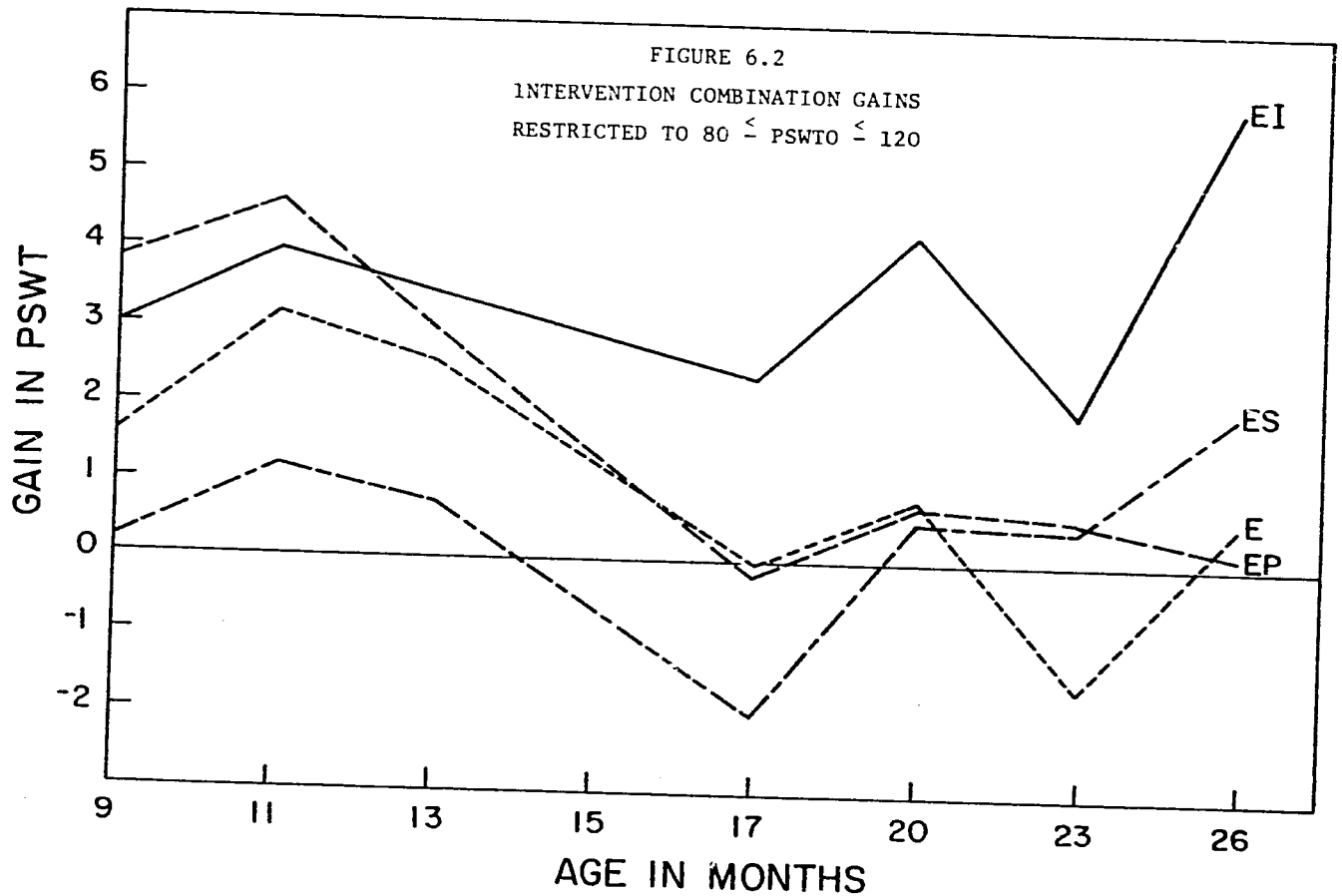


FIGURE 6.3

SINGLE INTERVENTION GAINS USING ALL DATA

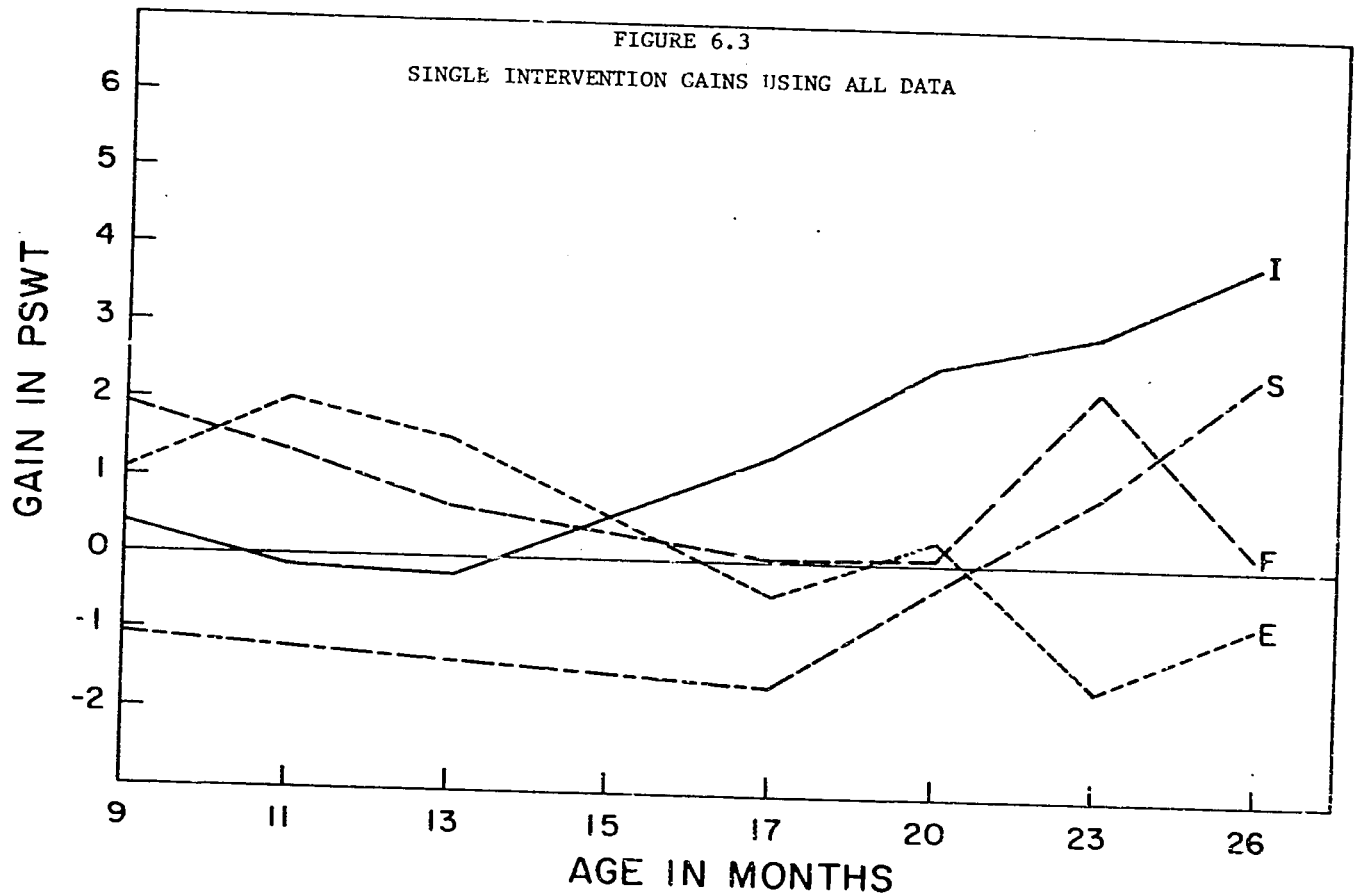


FIGURE 6.4

SINGLE INTERVENTION GAINS

RESTRICTED TO 80 ≤ PSWTO ≤ 120

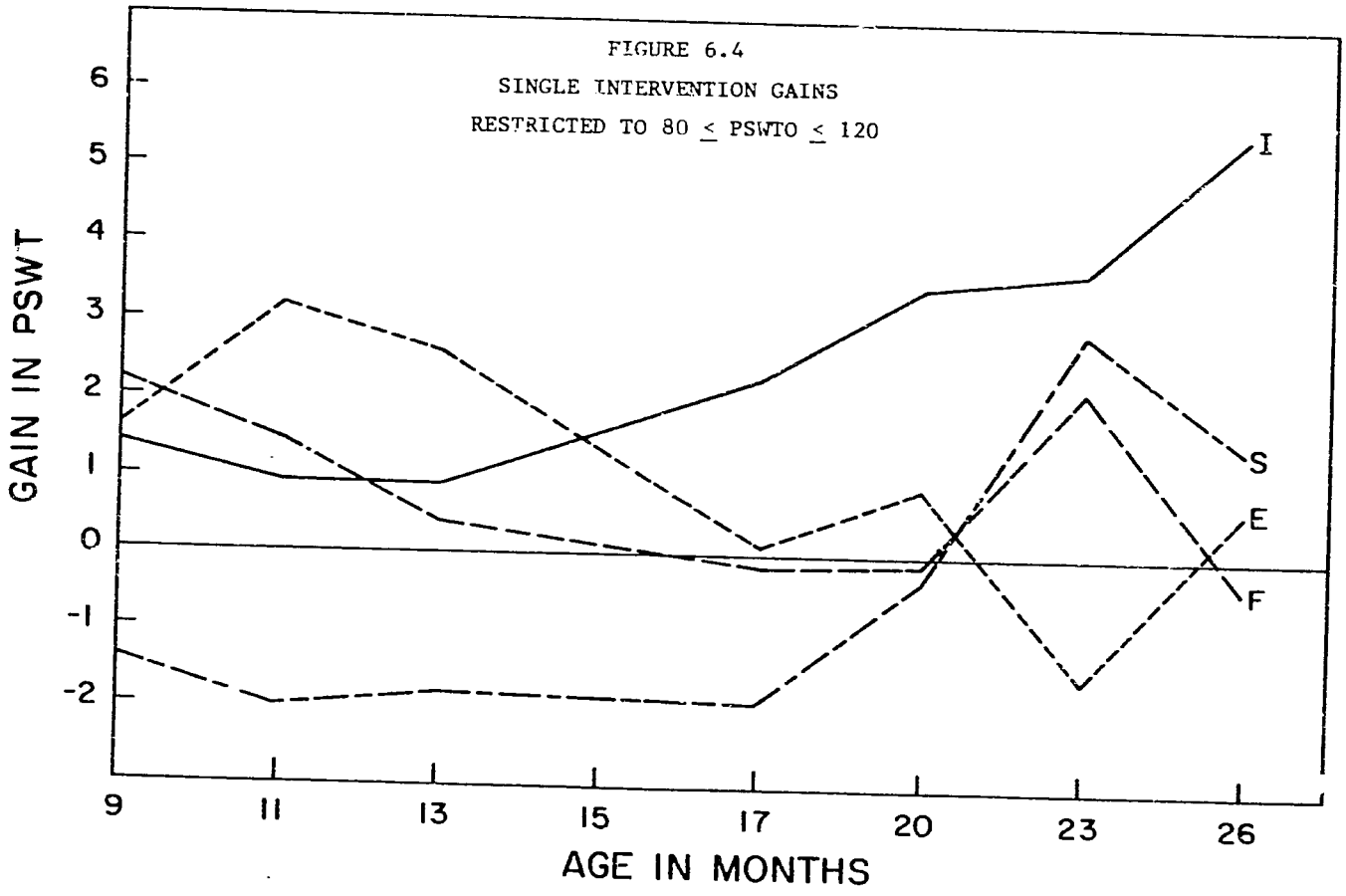


TABLE 6.1

SINGLE PARTICIPANT COSTS FOR TIME AND SUPPLIES

EDUCATION

	Nutrition Education					Health Education				Total Cost (Rounded)
Interv. No.	Age Mos.	Time (Min.)	Skill Level	Supplies Cost		Time	Skill Level	Supplies Costs		
1	5	60[a]	1	0.80[c]	5.80	55[a]	1	0.30[c]	6.25	12.00
	6					15	1			
2	7	40	1		3.35	15	1		2.50	6.00
	8					15	1			
3	9	40[b]	1		3.35	15	1		2.50	6.00
	10					15	1			
4	11	20[b]			1.67	20[b]	1		2.50	4.00
	12					10	1			
5	13					10	1		0.50	1.00
	14									
6	15									
	16									
7	17									
	Follow-up - - - -									

[a]Demonstrations and pre-tests. [b]Post-tests. [c]Handouts.

TABLE 6.2

SINGLE PARTICIPANT COSTS FOR TIME AND SUPPLIES

SANITATION

Interview No.	Age Mos.	Time (Min.)	Skill Level	Supplies	Cost (Rounded)
1	5	25	1	1.65[a]	4.00
	6	3	1	0.30[b]	
2	7	3	1	0.30	1.0
	8	3	1	0.30	
3	9	3	1	0.30	1.0
	10	3	1	0.30	
4	11	3	1	0.30	1.0
	12	3	1	0.30	
5	13	3	1	0.30	1.0
	14	3	1	0.30	
6	15	3	1	0.30	1.0
	16	3	1	0.30	
7	17				
	Follow-up - - - -				

[a] Bottle, dropper, chlorine. [b] Cholorine (1 mo. supply).

TABLE 6.3

SINGLE PARTICIPANT COSTS FOR TIME AND SUPPLIES

IMMUNIZATION

Interview No.	Age Mos.	Time (Min.)	Skill Level	Vaccine (Cost)	Supplies[a]	Cost (Rounded)
1	5	15	2	PPD (.80)	0.55	8.00
	6	15	2	BCG (.80)	0.65	
2	7	15	2	DPT_1 (.80)	0.65	8.00
	8	15	2	DPT_2 (.80)	0.65	
3	9	15	2	DPT_3 (.80)	0.65	32.00
	10	15	2	Measles (25.00)[b]	0.65	
4	11					
	12					
5	13					
	14					
6	15					
	16					
7	17					
	Follow-up - - - -					

[a] Syringe, cotton, alcohol. [b] Measles actually administered at age 10-14 months.

TABLE 6.4

SINGLE PARTICIPANT COSTS FOR TIME AND SUPPLIES

SUPPLEMENTARY FOOD

Interview No.	Age (Mos.)	Time (Mins.)	Skill Level	Nutripak[b] (No. packs/mo.)	Supplies[c]	Cost (Rounded)
1	5	60[a]	1	15	1.20	32.00
	6	20[a]	1	15		
2	7	10	1	15		27.00
	8	10	1	15		
3	9	10	1	15		27.00
	10	10	1	15		
4	11	10	1	15		27.00
	12	10	1	15		
5	13	10	1	15		27.00
	14	10	1	15		
6	15	10	1	15		27.00
	16	10	1	15		
7	17	10	1	15		27.00
		10	1	15		
	Follow-up - - - -					

[a] Demonstrations and distribution. [b] Cost - 0.85/pack. [c] Food information handout.

TABLE 6.5

CUMMULATIVE SINGLE INTERVENTION COSTS (IN PESOS) PER PARTICIPANT

INTERVENTION

Interview No.	Education	Sanitation	Immunization	Food
1	---	---	---	---
2	12	4	8	32
3	18	5	16	59
4	24	6	48	86
5	28	7	48	113
6	29	8	48	140
7	29	9	48	167
11	29	10	48	194
12	29	10	48	194
13	29	10	48	194
14	29	10	48	194

Table 6.6 gives the total cummulative costs, by interview number, for all intervention combinations. These are the cost calculations used in computing the cost effectiveness ratio for intervention combinations. The calculations in Table 6.5 were used for the single intervention cost effectiveness ratio.

Cost Effectiveness

Table 6.7 gives the cost effectiveness ratios for the basic intervention combinations and single interventions, using all data. To illustrate the calculations, consider interview number 4 for food alone and for education and food. Earlier in this chapter we found the education with food (EF) intervention yielded an estimated gain of 3.40 at interview number 4. From Table 6.6 the cummulative cost for EF at interview 4 was 110 pesos. Hence, the cost effectiveness ratio becomes

$$(3.40/110) \times 100 = 3.1.$$

Similiarly, for the single intervention of food alone (F), the respective estimates were 1.39 gain at a cost of 86 pesos yielding a ratio of

$$(1.39/86) \times 100 = 1.6.$$

Hence, in a relative manner one might say that at interview time 4 (age 11 months), education with food is almost twice as cost-effective as food alone.

Figures 6.5 and 6.6 graphically show the cost effectiveness ratios for intervention combinations and single interventions, respectively, for the case where all subject data are utilized. We note that though we could estimate effects of the single interventions of immunization, food, and sanitation, these were not actually administered in the study. Each of these had at least education simultaneously administered. From Table 6.7 for the interventions actually administered, we note that through interview

TABLE 6.6

CUMMULATIVE INTERVENTION COSTS (IN PESOS) PER PARTICIPANT

INTERVENTION COMBINATIONS

Interview No.	E	EI	EF	ES	EIF	EFS	EIS	EIFS
1	---	---	---	---	---	---	---	---
2	12	20	44	16	52	48	24	56
3	18	34	77	23	93	82	39	98
4	24	72	110	30	158	116	78	164
5	28	76	141	35	189	148	83	196
6	29	77	169	37	217	177	85	225
7	29	77	196	38	244	205	86	253
11	29	77	223	39	271	232	87	281
12	29	77	223	39	271	232	87	281
13	29	77	223	39	271	232	87	281
14	29	77	223	39	271	232	87	281

TABLE 6.7

COST FUNCTIONS (X100) USING ALL DATA

Intervention	Intervention Number				Follow-up Number		
	3	4	5	7	1	2	3
Education	6.2	8.4	5.5	-1.4	1.0	-5.3	-2.4
Immunization	2.5	-0.1	-0.5	2.9	5.4	6.3	8.2
Food	3.3	1.6	0.6	0.0	0.0	1.2	0.1
Sanitation	-20.0	-20.5	-17.9	-17.9	-3.1	8.6	25.1
Education/ Immunization	4.4	2.7	1.7	1.3	3.8	1.9	4.2
Education/ Food	4.0	3.1	1.6	-0.2	+0.2	+0.3	-0.2
Education/ Sanitation	0.4	2.6	0.9	-5.3	0.0	-1.8	4.6

FIGURE 6.5

COST-EFFECTIVENESS FOR INTERVENTION COMBINATIONS

USING ALL DATA

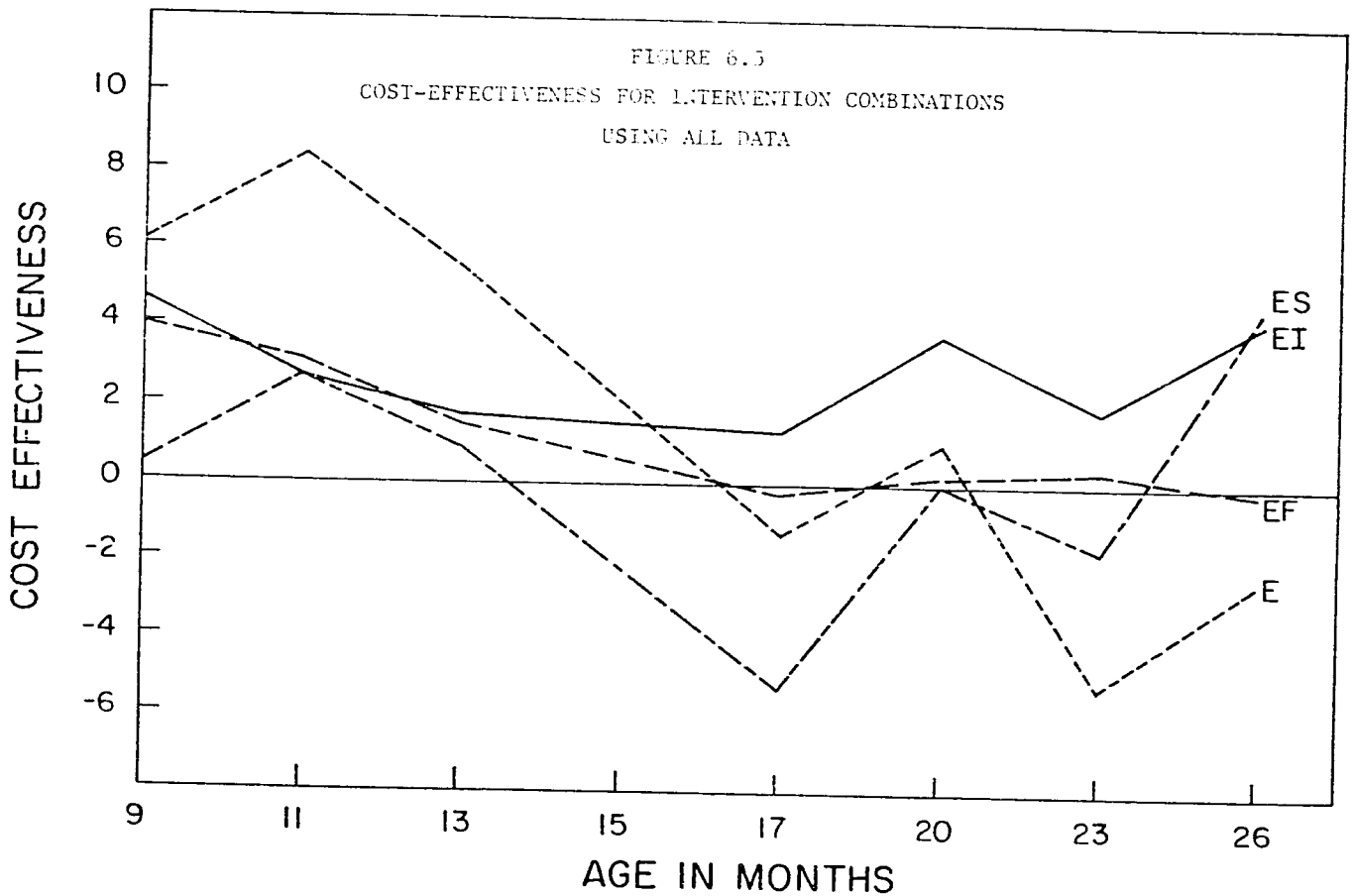
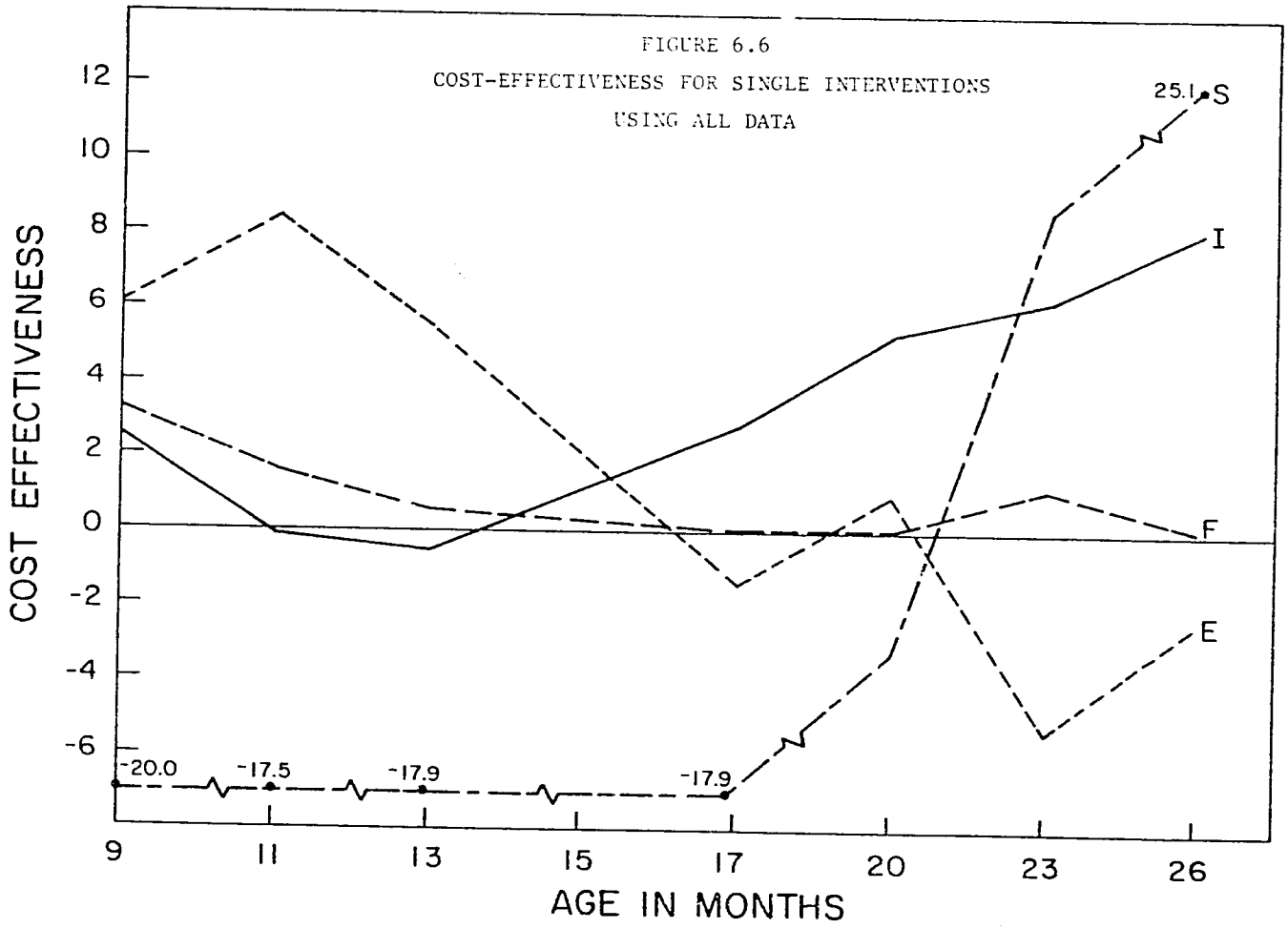


FIGURE 6.6

COST-EFFECTIVENESS FOR SINGLE INTERVENTIONS USING ALL DATA



number 5, the education intervention alone was the most cost-effective. At interview 7 and for follow-ups 1 and 2, education with immunization was the most cost-effective. At follow-up 3 (nine months after interventions ceased), education with sanitation was slightly better than education with immunization. If we also consider single interventions (without education) the picture is somewhat different. Sanitation alone is very poor (due to apparent losses in percent of standard weight) through follow-up 1. It then becomes the most cost-effective for follow-ups 2 and 3. From strictly a cost-effective point of view, the best outcomes using all data were as follows: (a) through interview 5 (age 9 months) education alone is best; (b) interview 7 and follow-up 1 (ages 17 months and 20 months) immunization alone is best; (c) follow-ups 2 and 3 (ages 23 months and 26 months) sanitation alone is best.

For the restricted data case of $80\% \leq$ PSWTO $\leq 120\%$, (Table 6.8), the outcome is slightly different. The best outcomes here were as follows: (a) education alone through interview 5; (b) education with immunization for interview 7 and follow-up 1; (c) education with sanitation for follow-ups 2 and 3. Figures 6.7 and 6.8 graphically illustrate the values given in Table 6.8 for intervention combinations and single interventions.

Though we plan to do further analysis for our supplementary report on the cases of more than two interventions, we have included for information the corresponding cost-effectiveness ratios for all cases in Tables 6.9 and 6.10. However, we are hesitant to attempt further interpretation here until the additional analysis is completed to handle the problem of interactions mentioned earlier in this report.

TABLE 6.8

COST FUNCTIONS (X100) USING DATA RESTRICTED TO 80 ≤ PSWTO ≤ 120

Intervention	Intervention Number				Follow-up Number		
	3	4	5	7	1	2	3
Education	8.8	13.1	9.4	0.2	3.0	-5.6	2.0
Immunization	8.6	1.8	1.8	4.9	7.2	7.7	11.5
Food	3.7	1.7	0.4	-0.1	-0.1	1.1	-0.2
Sanitation	-28.6	-32.7	-25.9	-21.4	-2.5	20.9	14.4
Education/ Immunization	8.7	5.6	4.6	3.1	5.6	2.7	7.9
Education/ Food	4.9	4.2	2.2	0.0	0.3	0.3	0.0
Education/ Sanitation	0.7	4.0	2.3	-4.9	1.6	1.2	5.2

FIGURE 6.7

COST-EFFECTIVENESS FOR INTERVENTION COMBINATIONS

RESTRICTED TO 80 ≤ PSWTO ≤ 120

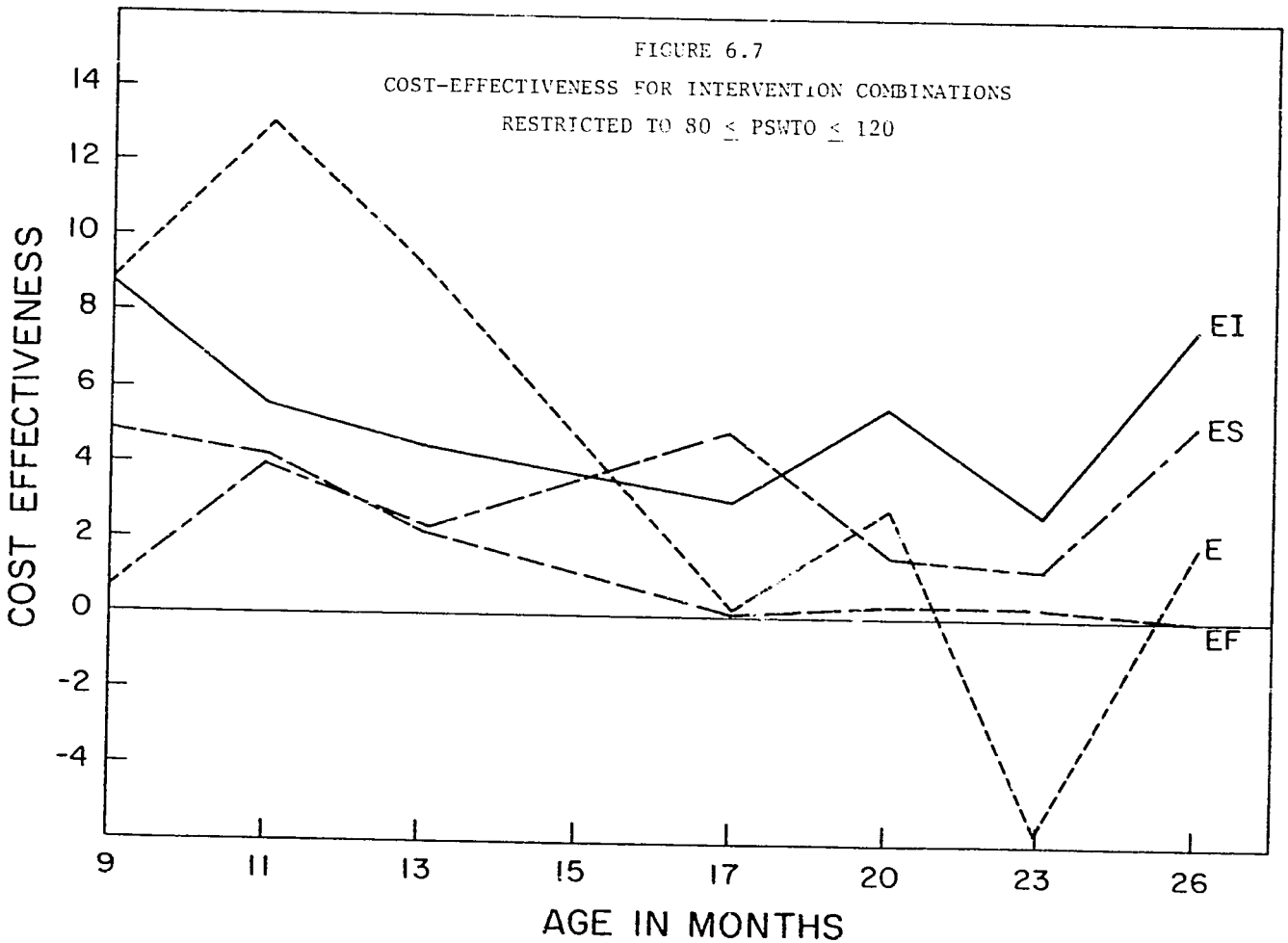


FIGURE 6.8

COST-EFFECTIVENESS FOR SINGLE INTERVENTIONS

RESTRICTED TO 80 $\leq$ PSWTO $\leq$ 120

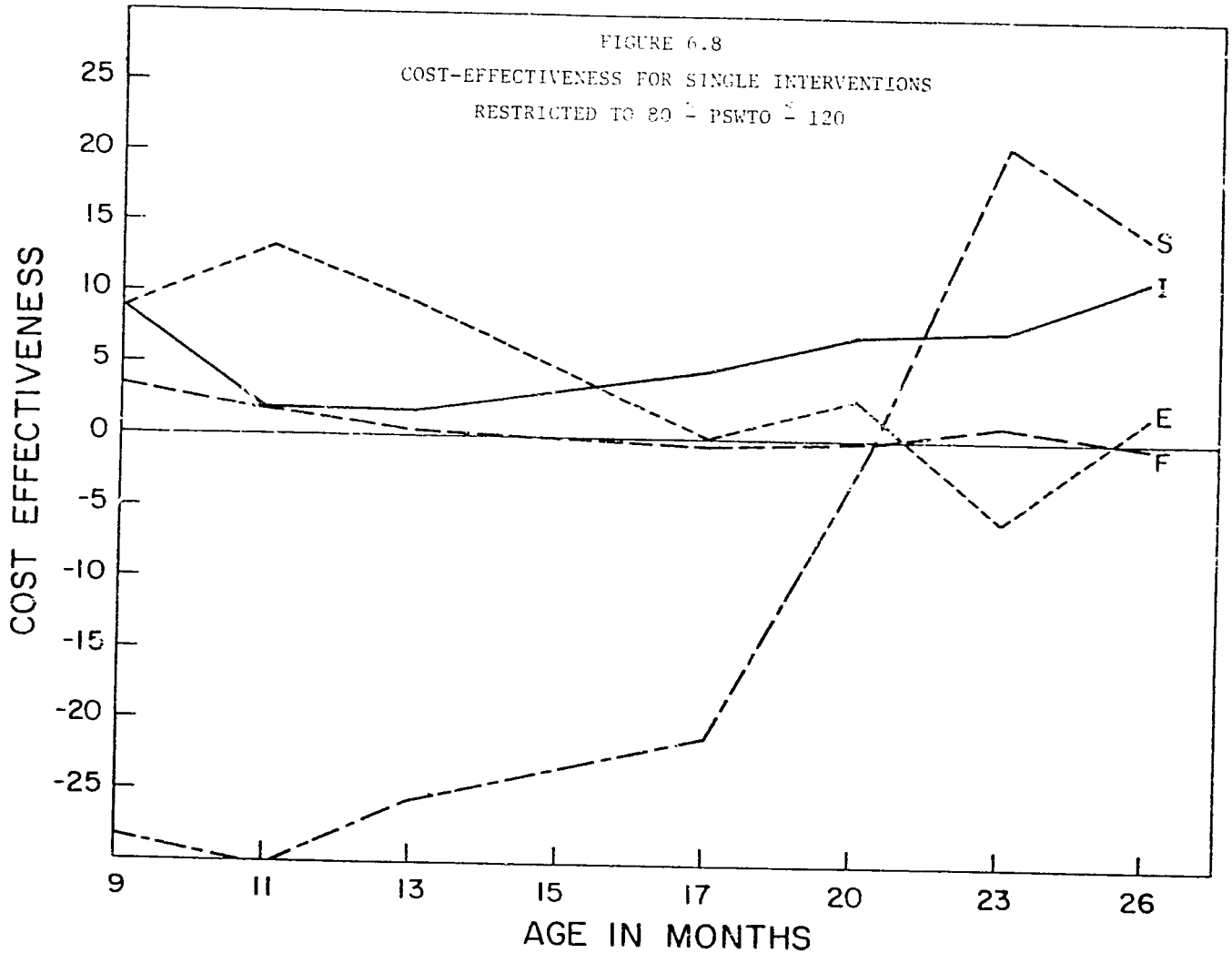


TABLE 6.9

COST FUNCTIONS (X100) USING ALL DATA

Intervention	Intervention Number				Follow-up Number		
	3	4	5	7	1	2	3
Education	6.2	8.4	5.5	-1.4	1.0	-5.3	-2.4
Immunization	2.5	-0.1	-0.5	2.9	5.4	6.3	8.2
Food	3.3	1.6	0.6	0.0	0.0	1.2	0.1
Sanitation	-20.0	-20.5	-17.9	-17.9	-3.1	8.6	25.1
Education/ Immunization	4.4	2.7	1.7	1.3	3.8	1.9	4.2
Education/ Food	4.0	3.1	1.6	-0.2	+0.2	+0.3	-0.2
Education/ Sanitation	0.4	2.6	0.9	-5.3	0.0	-1.8	4.6
Education/ Immunization/ Food	0.8	0.2	0.0	-0.7	0.0	0.1	0.2
Education/Food/ Sanitation	2.6	0.0	-0.3	-0.6	-0.1	0.0	-0.3
Education/ Immunization/ Sanitation	3.5	0.0	-0.4	-1.9	-0.7	-1.1	-1.6
Education/ Immunization/Food/ Sanitation	0.7	0.5	0.4	-0.1	0.1	0.1	0.3

TABLE 6.10

COST FUNCTIONS (X100) USING DATA RESTRICTED TO 80 ≤ PSWTO ≤ 120

Intervention	Intervention Number				Follow-up Number		
	3	4	5	7	1	2	3
Education	8.8	13.1	9.4	0.2	3.0	-5.6	2.0
Immunization	8.6	1.8	1.8	4.9	7.2	7.7	11.5
Food	3.7	1.7	0.4	-0.1	-0.1	1.1	-0.2
Sanitation	-28.6	-32.7	-25.9	-21.4	-2.5	20.9	14.4
Education/ Immunization	8.7	5.6	4.6	3.1	5.6	2.7	7.9
Education/ Food	4.9	4.2	2.2	0.0	0.3	0.3	0.0
Education/ Sanitation	0.7	4.0	2.3	-4.9	1.6	1.2	5.2
Education/ Immunization/ Food	0.5	0.4	0.1	-0.5	0.3	0.0	0.3
Education/Food Sanitation	-0.1	0.4	-0.1	-0.3	0.2	-0.3	0.2
Education/ Immunization/ Sanitation	3.7	1.4	0.1	-0.4	0.0	-1.9	0.1
Education/ Immunization/Food/ Sanitation	2.2	1.1	1.0	0.3	0.1	0.3	1.0

CHAPTER 7

MORBIDITY EXPERIENCE

Disease experience was recorded for the subject children and their families throughout the study. The reader can refer to the intervention study form given in the appendix for detail. We are not satisfied with our analysis of these data to date. If additional information is obtained in our current analysis we will report it in the planned supplement to this report. For example, seasonal adjustments have not been done and clearly should be investigated.

Some of the problems encountered with the accuracy of these data are as follows: (a) the data were collected bi-monthly by mother recall, and hence, accuracy could be questioned; (b) since these data were collected bi-monthly there is the problem of which month the disease occurred; (c) if, for example, two cases of diarrhea were reported, it was not clear whether both cases occurred in one month or one case in each month; (d) the field researchers felt that reporting of PTB was quite unreliable in that they could only observe clinical symptoms of subjects and obvious older family member cases and then make judgments without the aid of laboratory equipment. These methods were clearly not reliable as we often observed contradictory judgments on the same subject at different interview times. For diseases which could be observed during the team visit, the accuracy was felt to be rather good except for PTB.

We will observe from the following tables that cases of measles occurred in the immunization groups. None of these cases were observed among subject children who received the measles vaccine. The majority of the measles cases reported in the immunization groups occurred before the immunization was scheduled at approximately age 12 months. Others occurred in subjects where

the measles vaccine was not given due to contraindications or due to delays in getting the vaccine on schedule.

With the knowledge of the problem indicated above and with some reservations, we have nevertheless compiled some incidence tables for upper respiratory infections, primary tuberculosis, diarrhea/gastroenteritis, measles, and scabies. Compilations were made of all diseases reported for all subjects throughout the span of the study by month and without regard to year. Our best hope is that these tables will reflect any major incidence differences.

Tables 7.1-7.5 give the percentage incidence for the above mentioned diseases by intervention and by month of year. The column totals give the average monthly incidence over the year and the row totals give the average incidence over interventions by month. For clarity in Table 7.1, consider the control group for the month of February. Forty-seven cases of URI were reported in this group during all eighty-nine interviews taken in the month of February for an incidence of 52.8%.

No real differences are seen for URI in Table 7.1 except that E/F/S and E/I/F/S had a higher incidence than the other interventions. Generally, the highest incidence of URI was reported from November through April. With respect to PTB, there is an indication that the control group and the E/I groups had a lower incidence of TB. We note that generally these two groups were the highest, socioeconomically. No apparent seasonal pattern is noted.

Table 7.3 reports diarrhea incidence. Of the six lowest overall incidence reported, four were groups receiving supplementary food. The other two (control and E/I) were the socioeconomically highest groups. Evidence of reduced diarrhea among the supplementary food groups is also seen in

TABLE 7.1

PERCENTAGE INCIDENCE OF UPPER RESPIRATORY INFECTION[a]

Intervention	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
C	39.3 (56)	52.8 (89)	46.6 (73)	47.8 (67)	42.2 (64)	30 (57)	40.6 (32)	35.6 (45)	22 (41)	12.5 (48)	60 (60)	44.7 (47)	41.2 (679)
E	80 (60)	62.9 (62)	53.8 (78)	56.5 (62)	49.1 (53)	26.3 (76)	34 (53)	58.5 (65)	49.2 (61)	44.3 (61)	72.2 (54)	63.5 (63)	40.2 (748)
EI	41.5 (94)	58.8 (80)	60.2 (98)	35.8 (95)	46 (63)	31.33 (83)	36.4 (88)	30.8 (91)	41 (78)	37.8 (90)	62.7 (75)	45 (80)	43.7 (1015)
EF	45.6 (79)	52 (75)	48.2 (83)	57.5 (87)	44.6 (74)	33.3 (87)	37.5 (72)	43.2 (74)	36.4 (77)	52.2 (67)	59.1 (66)	41.3 (75)	45.7 (916)
ES	48.8 (80)	66.1 (56)	52.7 (74)	62.5 (72)	43.4 (76)	48.6 (68)	29.2 (65)	35.9 (78)	34.2 (79)	25 (72)	60.7 (61)	60 (60)	46.5 (841)
EIF	19.4 (89)	60.7 (61)	38.8 (98)	35.8 (81)	41.25 (80)	48.6 (70)	43.4 (76)	43.4 (83)	40.7 (81)	47.2 (72)	35.6 (73)	51.3 (78)	44.3 (942)
EIS	42.5 (73)	55.7 (61)	50.5 (103)	44.8 (67)	44.9 (78)	34.5 (58)	23.8 (84)	57.4 (68)	33.3 (81)	11.9 (59)	44.4 (81)	51.4 (72)	38.5 (955)
EFS	45.8 (72)	70 (70)	52.6 (76)	66.7 (75)	53.3 (60)	32 (75)	34.4 (64)	42.4 (66)	65.8 (76)	38.1 (63)	61 (59)	60.3 (63)	52.0 (819)
EIFS	52.9 (85)	67.2 (61)	50 (84)	39.3 (84)	35.2 (71)	51.5 (68)	47.7 (65)	48.7 (78)	43 (79)	63.2 (68)	52.7 (74)	10.4 (55)	53.1 (872)
TOTAL	49 (688)	60.2 (615)	50.3 (767)	49 (690)	44.1 (619)	37.1 (642)	35.9 (599)	43.7 (648)	41.3 (653)	38 (600)	55.5 (603)	56.7 (593)	

[a](.) Total number interviewed.

TABLE 7.2

PERCENTAGE INCIDENCE OF CLINICAL SYMPTOMS OF PTB[a]

Intervention	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
C	5.4 (56)	2.2 (89)	12.3 (73)	6 (67)	1.6 (64)	8.8 (57)	3.1 (32)	2.2 (45)	7.3 (41)	10.4 (48)	8.3 (60)	8.5 (47)	6.3 (679)
E	5 (60)	11.3 (62)	3.8 (78)	4.8 (62)	20.8 (53)	18.4 (76)	18.9 (53)	10.8 (65)	6.6 (61)	11.5 (61)	13.0 (54)	7.9 (63)	10.8 (748)
EI	8.5 (94)	2.5 (80)	11.2 (98)	5.3 (95)	17.5 (63)	7.2 (83)	3.4 (88)	5.5 (91)	11.5 (78)	7.8 (90)	13.3 (75)	5 (80)	8.0 (1015)
EF	20.3 (79)	9.3 (75)	13.3 (33)	3.5 (87)	9.5 (74)	8.0 (87)	9.7 (72)	16.2 (74)	15.6 (77)	3 (67)	6.1 (66)	13.3 (75)	10.7 (916)
ES	12.5 (80)	10.7 (56)	10.8 (74)	9.7 (72)	26.3 (76)	17.6 (68)	23.1 (65)	14.1 (78)	12.7 (79)	9.7 (72)	9.8 (61)	3.3 (60)	12.6 (841)
EIF	20.2 (89)	24.6 (61)	20.4 (98)	8.6 (81)	13.75 (80)	12.9 (70)	23.7 (76)	9.6 (83)	11.1 (81)	13.9 (72)	2.5 (73)	17.9 (78)	16.7 (942)
EIS	17.8 (73)	14.8 (61)	8.7 (103)	7.5 (67)	16.7 (78)	19 (58)	10.7 (84)	17.6 (68)	16.0 (81)	10.2 (59)	14.8 (81)	13.9 (72)	12.8 (955)
EFS	12.5 (72)	12.9 (70)	19.7 (76)	8 (75)	25 (60)	24 (75)	14.1 (64)	21.2 (66)	14.5 (76)	12.7 (63)	15.2 (59)	9.5 (63)	15.8 (819)
EIFS	3.6 (85)	11.5 (61)	15.5 (84)	13.1 (84)	7.0 (71)	11.8 (68)	15.4 (65)	20.5 (78)	21.5 (79)	13.2 (68)	16.2 (74)	10.9 (55)	15.7 (872)
TOTAL	13.5 (688)	10.4 (615)	12.9 (767)	7.4 (690)	15.5 (619)	14.0 (642)	13.7 (599)	13.3 (648)	13.5 (653)	10.2 (600)	13.8 (603)	10.3 (593)	

[a](.) Total interviewed.

TABLE 7.3

PERCENTAGE INCIDENCE OF DIARRHEA[a]

Intervention	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
C	16.1 (56)	9.0 (89)	5.5 (73)	1.5 (67)	9.4 (64)	22.8 (57)	12.5 (32)	15.6 (45)	0 (41)	2.1 (48)	3.3 (60)	6.4 (47)	8.5 (679)
E	11.7 (60)	4.8 (62)	10.3 (78)	3.2 (62)	22.6 (53)	10.5 (76)	22.6 (53)	13.8 (65)	6.6 (61)	8.2 (61)	9.3 (54)	19.0 (63)	11.6 (748)
EI	18.1 (94)	11.3 (80)	6.1 (98)	8.4 (95)	19.0 (63)	10.8 (83)	15.9 (88)	12.1 (91)	2.6 (78)	4.4 (90)	10.7 (75)	10 (80)	10.6 (1015)
EF	16.5 (79)	9.3 (75)	8.4 (83)	4.6 (87)	5.4 (74)	13.8 (87)	12.5 (72)	4 (74)	2.6 (77)	1.5 (67)	7.6 (66)	14.7 (75)	8.5 (916)
ES	10 (80)	7.1 (56)	1.4 (74)	9.7 (72)	10.5 (76)	22.1 (68)	24.6 (65)	15.4 (78)	10.1 (79)	12.5 (72)	13.1 (61)	11.7 (60)	12.2 (841)
EIF	6.7 (89)	9.8 (61)	2.0 (98)	6.2 (81)	11.25 (80)	18.6 (70)	5.3 (76)	2.4 (83)	2.5 (81)	5.6 (72)	9.6 (73)	16.7 (78)	7.7 (942)
EIS	6.8 (73)	16.4 (61)	9.7 (103)	14.9 (67)	5.1 (78)	27.6 (58)	15.5 (84)	10.3 (68)	6.2 (81)	13.6 (59)	9.9 (81)	9.7 (72)	10.8 (955)
EFS	16.7 (72)	4.3 (70)	5.3 (76)	9.3 (75)	1.7 (60)	12 (75)	12.5 (64)	10.6 (66)	6.6 (76)	7.9 (63)	10.2 (59)	7.9 (63)	8.8 (819)
EIFS	9.4 (85)	3.3 (61)	4.8 (84)	7.1 (84)	9.9 (71)	11.8 (68)	15.4 (65)	9 (78)	6.3 (79)	11.8 (68)	18.9 (74)	23.6 (55)	10.6 (872)
TOTAL	12.4 (688)	8.5 (615)	6.0 (767)	6.7 (690)	10.2 (619)	16.0 (642)	15.0 (599)	10.0 (648)	5.1 (653)	7.5 (600)	10.4 (603)	13.3 (593)	

[a](.) Total interviewed.

TABLE 7.4

PERCENTAGE INCIDENCE OF MEASLES[a]

Intervention	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
C	1.8 (56)	0 (89)	0 (73)	1.5 (67)	3.1 (64)	3.5 (57)	9.4 (32)	2.2 (45)	0 (41)	4.2 (48)	1.7 (60)	2.1 (47)	2.1 (679)
E	0 (60)	0 (62)	1.3 (78)	6.5 (62)	3.8 (53)	0 (76)	5.7 (53)	3.1 (65)	0 (61)	3.3 (61)	0 (54)	1.6 (63)	2.0 (748)
EI	7.4 (94)	7.5 (80)	7.1 (98)	3.2 (95)	4.8 (63)	3.6 (83)	4.5 (88)	3.3 (91)	7.7 (78)	4.4 (90)	4 (75)	6.3 (80)	5.3 (1015)
EF	0 (79)	2.7 (75)	3.6 (83)	1.2 (87)	4.0 (74)	0 (87)	0 (72)	4 (74)	2.6 (77)	1.5 (67)	3.0 (66)	4 (75)	2.2 (916)
ES	1.3 (80)	3.6 (56)	2.8 (74)	1.4 (72)	1.3 (76)	2.9 (68)	3.1 (65)	2.6 (78)	0 (79)	0 (72)	1.6 (61)	3.3 (60)	1.9 (841)
EIF	2.2 (89)	3.2 (61)	1 (98)	2.5 (81)	1.3 (80)	5.7 (70)	2.6 (76)	2.4 (83)	0 (81)	2.8 (72)	1.4 (73)	1.3 (78)	2.1 (942)
EIS	0 (73)	1.6 (61)	1.9 (103)	1.1 (67)	1.3 (78)	0 (58)	1.2 (84)	1.5 (68)	0 (81)	1.7 (59)	1.2 (81)	2.8 (72)	1.3 (955)
EFS	0 (72)	4.3 (70)	1.3 (76)	5.3 (75)	1.7 (60)	6.7 (75)	1.6 (64)	0 (66)	0 (76)	0 (63)	3.4 (59)	9.5 (63)	2.8 (819)
EIFS	4.7 (85)	1.6 (61)	1.2 (84)	1.2 (84)	1.4 (71)	4.4 (68)	1.5 (65)	1.3 (78)	1.3 (79)	0 (68)	0 (74)	0 (55)	1.6 (872)
TOTAL	2.2 (688)	2.9 (615)	2.3 (767)	2.8 (690)	2.4 (619)	3.0 (642)	2.8 (599)	2.3 (648)	1.4 (653)	2.0 (600)	1.8 (603)	3.5 (593)	

[a](.) Total interviewed.

TABLE 7.5

PERCENTAGE INCIDENCE OF SCABIES[a]

Intervention	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
C	8.9 (56)	4.5 (89)	11 (73)	4.5 (67)	4.7 (64)	3.5 (57)	6.3 (32)	2.2 (45)	4.9 (41)	2.1 (48)	10 (60)	10.6 (47)	6.2 (679)
E	8.3 (60)	9.7 (62)	7.7 (78)	8.1 (62)	5.7 (53)	6.6 (76)	5.7 (53)	15.4 (65)	4.9 (61)	9.8 (61)	16.7 (54)	7.9 (63)	8.8 (748)
EI	10.6 (94)	10 (80)	9.2 (98)	7.4 (95)	6.3 (63)	6 (83)	5.7 (88)	5.5 (91)	9 (78)	5.6 (90)	6.7 (75)	12.5 (80)	7.9 (1015)
EF	10.1 (79)	4 (75)	7.2 (83)	2.3 (87)	5.4 (74)	5.7 (87)	9.7 (72)	9.5 (74)	3.9 (77)	10.5 (67)	7.6 (66)	9.3 (75)	7.0 (916)
ES	20 (80)	16.1 (56)	9.5 (74)	8.3 (72)	5.3 (76)	10.3 (68)	6.2 (65)	5.1 (78)	7.6 (79)	5.6 (72)	11.5 (61)	11.7 (60)	10.1 (841)
EIF	10.1 (89)	9.8 (61)	12.2 (98)	11.1 (81)	11.3 (80)	2.9 (70)	11.8 (76)	9.6 (83)	7.4 (81)	9.7 (72)	9.6 (73)	9 (78)	9.7 (942)
EIS	15.1 (73)	13.1 (61)	18.4 (103)	10.5 (67)	14.1 (78)	10.3 (58)	4.8 (84)	10.3 (68)	12.3 (81)	11.9 (59)	12.3 (81)	15.3 (72)	11.6 (955)
EFS	9.7 (72)	5.7 (70)	5.3 (76)	6.7 (75)	5 (60)	5.3 (75)	4.7 (64)	4.5 (66)	2.6 (76)	15.9 (63)	20.3 (59)	14.3 (63)	8.1 (819)
EIFS	5.9 (85)	11.5 (61)	9.5 (84)	11.9 (84)	9.9 (71)	11.8 (68)	6.2 (65)	6.4 (78)	6.3 (79)	8.8 (68)	8.1 (74)	7.3 (55)	8.6 (872)
TOTAL	11.0 (688)	8.9 (615)	10.3 (767)	7.8 (690)	7.8 (619)	6.9 (642)	9.0 (599)	7.7 (648)	6.8 (653)	8.8 (600)	11.1 (603)	11.0 (593)	

[a](.) Total interviewed.

Tables 7.6 and 7.7. To our surprise we did not find evidence of reduced incidence of diarrhea among the sanitation intervention groups. In the following chapter on conclusions we will offer some conjectures related to this and the apparent fact that sanitation caused a loss in percent of standard weight during a certain interval of time.

Scabies incidence is shown in Table 6.5. Generally, scabies was lower in the higher socioeconomic groups and the incidence was highest during the winter months.

Tables 7.6 and 7.7 give a comparison of disease incidence for all groups receiving food versus those not receiving supplementary food. No major differences were noted between groups for URI, measles, or scabies. PTB was generally higher for the food recipients which probably only reflects lower socioeconomic differences. The difference that is interesting is that there is rather strong evidence that diarrhea/gastro incidence is lower in the food recipient group than in the non-food recipient group.

Tables 7.8-7.11 give the same comparisons for immunization and sanitation. No real differences were apparent. However, we should restate here our reservations about the reliability and analysis on morbidity. Possibly, further planned analysis will render more information on this problem.

TABLE 7.6

PERCENTAGE MORBIBITY INCIDENCE FOR ALL FOOD RECIPIENTS[a]

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
URI	48.6 (158)	62.2 (166)	46.9 (160)	49.5 (162)	43.2 (123)	40.7 (122)	40.8 (113)	44.5 (134)	46.3 (145)	50.4 (136)	51.5 (140)	61.3 (166)	48.6 (1725)
PTB	17.2 (56)	14.2 (38)	17.3 (59)	8.3 (27)	16.8 (48)	14 (42)	15.9 (44)	16.6 (50)	15.7 (49)	10.7 (29)	15.8 (43)	13.3 (36)	14.7 (521)
Diarrhea Gastro	12 (39)	6.7 (18)	5.0 (17)	6.7 (22)	7.4 (21)	14 (42)	11.2 (31)	6.3 (19)	4.5 (14)	6.7 (18)	11.8 (32)	15.5 (42)	8.9 (315)
Measles	1.8 (6)	3.0 (8)	1.8 (6)	2.4 (8)	2.1 (6)	4 (12)	1.4 (4)	2.0 (6)	1.0 (3)	1.1 (3)	1.8 (5)	3.7 (10)	2.2 (77)
Scabies	8.9 (29)	7.5 (20)	8.8 (30)	8.0 (26)	8.1 (23)	6.3 (19)	8.3 (23)	7.6 (23)	5.1 (16)	11.1 (30)	11.0 (30)	10.0 (27)	8.3 (296)
TOTAL Interviewed	325	267	341	327	285	300	277	301	313	270	272	271	

[a](.) denotes number interviewed.

TABLE 7.7

PERCENTAGE MORBIBITY INCIDENCE FOR NON-FOOD RECIPIENTS[a]

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
URI	51.1 (157)	60.6 (157)	54.4 (192)	48.6 (144)	45.6 (123)	34.7 (99)	30.7 (89)	44.0 (133)	38.8 (116)	30.5 (86)	58.7 (159)	54.2 (149)	45.1 (1604)
PTB	11.1 (34)	9.3 (24)	8.8 (31)	6.8 (20)	17.4 (47)	15.1 (43)	12.8 (37)	11.6 (35)	12.0 (36)	9.6 (27)	12.9 (35)	7.6 (21)	11.0 (390)
Diarrhea/ Gastro	12.1 (37)	10.0 (26)	7.1 (25)	9.1 (27)	13.3 (36)	16.8 (48)	19.0 (55)	12.9 (39)	6.4 (19)	9.2 (26)	10.7 (29)	12.4 (34)	11.3 (401)
Measles	2.6 (8)	3.5 (9)	3.4 (12)	3.4 (10)	2.6 (7)	1.8 (5)	3.4 (10)	2.6 (8)	2.0 (6)	2.5 (7)	1.8 (5)	3.6 (10)	2.7 (97)
Scabies	13.7 (42)	12.0 (31)	11.6 (41)	8.4 (25)	8.1 (22)	8.1 (23)	5.5 (16)	8.6 (26)	8.7 (26)	7.8 (22)	11.4 (31)	12 (33)	9.6 (342)
TOTAL Interviewed	307	259	353	296	270	285	290	302	299	282	271	275	3559

[a](.) denotes number interviewed.

TABLE 7.8

PERCENTAGE MORBIBITY INCIDENCE FOR ALL IMMUNIZATION RECIPIENTS[a]

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
URI	46.6 (159)	60.5 (159)	50.0 (191)	38.5 (126)	41.8 (122)	41.2 (115)	37.1 (116)	44.1 (141)	39.5 (126)	40.8 (118)	48.9 (148)	59.6 (170)	44.7 (1691)
PTB	15.2 (52)	12.5 (33)	13.8 (53)	8.6 (28)	17.1 (50)	12.2 (34)	12.8 (40)	12.8 (41)	15.0 (48)	11.1 (32)	17.2 (52)	11.9 (34)	13.1 (497)
Diarrhea Gastro	7.6 (26)	10.3 (27)	5.7 (22)	8.9 (29)	11.0 (32)	16.5 (46)	13.1 (41)	8.4 (27)	4.4 (14)	8.3 (24)	12.2 (37)	14.4 (41)	9.9 (376)
Measles	3.8 (13)	3.8 (10)	2.9 (11)	2.4 (8)	2.1 (6)	3.6 (10)	2.6 (8)	2.2 (7)	2.2 (7)	2.4 (7)	1.7 (5)	2.8 (8)	2.6 (100)
Scabies	10.3 (35)	11.0 (29)	12.5 (48)	10.1 (33)	10.6 (31)	7.5 (21)	7.0 (22)	7.8 (25)	8.8 (28)	8.7 (25)	9.2 (28)	11.2 (32)	9.4 (357)
TOTAL Interviewed	341	263	383	327	292	279	313	320	319	289	303	285	3784

[a](.) denotes number interviewed.

TABLE 7.9

PERCENTAGE MORBIDITY INCIDENCE FOR ALL NON-IMMUNIZATION RECIPIENTS[a]

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
URI	53.6 (156)	62.4 (164)	51.8 (161)	60.8 (180)	47.1 (124)	34.6 (106)	33.9 (86)	44.5 (126)	46.1 (135)	39.5 (104)	62.9 (151)	55.6 (145)	49.3 (1638)
PTB	13.1 (38)	11.0 (29)	11.9 (37)	6.4 (19)	17.1 (45)	16.7 (51)	16.1 (41)	15.5 (44)	12.6 (37)	9.1 (24)	10.8 (26)	8.8 (23)	12.5 (414)
Diarrhea Gastro	13.7 (40)	6.5 (17)	6.4 (20)	6.8 (20)	9.5 (25)	14.4 (44)	17.7 (45)	11.0 (31)	6.5 (19)	7.6 (20)	10 (24)	13.4 (35)	10.2 (340)
Measles	0.3 (1)	2.7 (7)	2.3 (7)	3.4 (10)	2.7 (7)	2.3 (7)	2.4 (6)	2.5 (7)	0.7 (2)	1.1 (3)	2.1 (5)	4.6 (12)	2.2 (74)
Scabies	12.4 (36)	8.4 (22)	7.4 (23)	6.1 (18)	5.3 (14)	6.9 (21)	6.7 (17)	8.5 (24)	4.8 (14)	10.3 (27)	13.8 (33)	10.7 (28)	8.5 (231)
TOTAL Interviewed	291	263	311	296	263	306	254	283	293	263	240	261	3324

[a](.) denotes number interviewed.

TABLE 7.10

PERCENTAGE MORBIBITY INCIDENCE FOR ALL SANITATION RECIPIENTS[a]

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
URI	47.7 (148)	64.9 (161)	51.3 (173)	53.0 (158)	43.9 (125)	41.6 (112)	33.1 (92)	45.9 (133)	43.8 (138)	35.1 (92)	53.8 (148)	67.2 (168)	47.3 (1648)
PTB	14.5 (45)	12.5 (31)	13.4 (45)	9.7 (29)	19.3 (55)	18.2 (49)	15.5 (43)	18.3 (53)	16.2 (51)	11.5 (30)	14.2 (39)	9.6 (24)	14.2 (494)
Diarrhea Gastro	10.6 (33)	7.7 (19)	5.6 (19)	10.1 (30)	7.0 (20)	17.8 (48)	16.9 (47)	11.4 (33)	7.3 (23)	11.5 (30)	13.1 (36)	12.8 (32)	10.6 (370)
Measles	1.6 (39)	2.8 (28)	1.8 (38)	2.7 (28)	1.4 (25)	3.7 (25)	1.8 (15)	1.4 (19)	0.3 (23)	0.4 (27)	1.5 (35)	4 (31)	1.9 (337)
Scabies	12.6 (39)	11.3 (28)	11.3 (38)	9.4 (28)	8.8 (25)	9.3 (25)	5.4 (15)	6.6 (19)	7.3 (23)	10.3 (27)	12.7 (35)	12.4 (31)	9.7 (337)
TOTAL Interviewed	310	248	337	298	285	269	278	290	315	262	275	250	3487

[a](.) denotes number interviewed.

TABLE 7.11

PERCENTAGE MORBIBITY INCIDENCE FOR ALL NON-SANITATION RECIPIENTS[a]

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
URI	51.9 (167)	58.3 (162)	50.1 (179)	45.5 (148)	44.8 (121)	34.5 (109)	38.1 (110)	42.8 (134)	41.4 (123)	44.8 (130)	56.3 (151)	49.7 (147)	46.4 (1681)
PTB	14.0 (45)	11.2 (31)	12.6 (45)	5.5 (18)	14.8 (40)	11.4 (36)	13.1 (38)	10.2 (32)	11.4 (34)	9 (26)	14.6 (39)	11.1 (33)	11.5 (417)
Diarrhea/ Gastro	13.4 (43)	9.0 (25)	6.4 (23)	5.8 (19)	13.7 (37)	13.3 (42)	13.5 (39)	8 (25)	3.4 (10)	4.8 (14)	9.3 (25)	14.9 (44)	9.6 (346)
Measles	2.8 (9)	3.6 (10)	3.4 (12)	3.1 (10)	3.3 (9)	2.2 (7)	3.1 (9)	3.2 (10)	2.7 (8)	3.1 (9)	2.2 (6)	3.38 (10)	3 (109)
Scabies	9.9 (32)	8.3 (23)	9.2 (33)	7.1 (23)	7.4 (20)	5.4 (17)	8.3 (24)	3.6 (30)	6.4 (19)	8.6 (25)	9.7 (26)	9.8 (29)	8.3 (301)
TOTAL Interviewed	322	278	357	325	270	316	289	313	297	290	268	296	3621

[a](.) denotes number interviewed.

CHAPTER 8

SUMMARY AND CONCLUSIONS

This study was a rather major effort spanning a continuous period from 1975-1979. Prior to the beginning of interventions, discussions and planning was done for about one year. Initial study forms were designed, tested and finalized from field experience. The project was designed to lend itself to proper statistical analysis to the extent possible in a field research study in a developing country. Field research teams were recruited and trained to keep the interventions as consistent as possible throughout the project. Training sessions were held emphasizing the importance of accurate data collection and recording on the survey forms. Regular meetings were scheduled throughout to enable administrative and field staff to review progress and to discuss unexpected problems encountered.

We believe it is important to emphasize the importance of one aspect of this study. For the most part, the research staff were full-time employees who devoted total effort to the project. This was invaluable, we believe, to it's success in terms of continuity, consistency, and interest in the study. Enthusiasm for the project and interest in being involved in a research oriented study was obvious. The entire staff felt they learned a great deal about research and the difficulties in conducting a study of this size. Finally, the dedication and commitments to the project were unexcelled.

Before discussing the quantitative results, we will mention some observations offered at various points by the team members in the field. Initially, establishing a good rapport with the families was difficult

but almost always improved with time. There were several problems with families whose children were in the immunization groups. In fact several refusals occurred after children became slightly ill from the immunizations or at least an illness was associated by the mothers with an immunization. A better preparatory education program should precede immunizations so that mild fevers, etc. can be expected by the mothers.

Logistics often presented problems. These usually centered around timely availability of supplementary food supplies, availability and proper handling of vaccines, and travel to remote locations. Also, holidays, etc. must be anticipated and planned for in administering the interventions. There are also logistic problems associated with recording the data in the field and timely transporting to a central data handling facility. Since the raw data were on rather bulky survey forms, it was not practical to mail the survey forms for computerization. Hence, the original data were all coded and marked on opscan forms to mail for editing and computerization. We cannot overstress the importance and difficulty of this process. About one million opscan marks were done with each case being verified by a separate researcher. Even with this careful process, a considerable effort was needed in final editing of the data. The editing phase is crucial, however, to hope for meaningful analysis.

With regard to family receptiveness to the various interventions, clearly supplementary food was most receptive. In fact many were disappointed when interventions ended and food was no longer distributed. The majority of the complaints came from immunizations and some even blamed the researchers for illnesses not associated with the intervention. Complaints were also frequent from the clorinated water in the sanitation intervention. The complaints were usually centered around the taste

and smell of the drinking water.

In terms of the researcher's subjective opinions of the interventions, they had concerns about proper utilization of all except immunization. Immunization is a mechanical intervention with known utilization. None of the others have this attribute. Though the field researchers continually tried to reinforce the importance of proper utilization of education, food, and sanitation, they knew that utilization was often not adequate.

Since there are many variables which influence a child's growth, it is very difficult to accurately compare interventions in a quantitative way. We believe it is near impossible to do well without taking into account the most important quantifiable socioeconomic variables. For this reason we devoted a great deal of our analysis efforts to looking at relationships of some of these variables with growth. Chapter 4 is primarily concerned with this problem and illustrates some relationships of various socioeconomic factors with percent of standard body weight. Clearly some of these have greater impact upon growth than most standard interventions. Though it is well known that these relationships exist, we believe it is useful to quantify them as much as possible. The models developed in this chapter enable us to investigate these relationships and to estimate the expected impact upon an infant when one or more of these variables are altered. This kind of information should be useful to national planners of programs in the sense that expected benefits can be estimated in advance and programs can be evaluated against expectations. Again, most professionals would have a feel for these effects but would likely be hard pressed in actually quantifying them.

The analysis discussed in Chapter 4 enabled us to select reasonable covariate functions for the primary concern of this study of intervention

analysis. The intervention groups differed significantly in several aspects of socioeconomic status. The best example was the socioeconomically higher control group. Without statistical adjustments, the control subjects often had higher average percent of body weights for age than the intervention subjects. After covariate adjustments this generally did not occur. However, we are still not convinced that the adjustments were sufficient. If this is indeed the case, the intervention estimates given are conservative and thus probably are slightly better than given. However, we do feel that the basic pattern of intervention effects is sound and that the relative comparisons between interventions are statistically valid. As indicated in Chapter 5, there is clearly interaction between interventions. This makes estimates of intervention combination effects more difficult. A detailed analysis of the interaction effects is currently being completed and will be reported in a supplement to this report. Hence, our discussion here will essentially be restricted to the interventions of education (E), education with food (EF), education with immunization (EI) and education with sanitation (ES).

The education intervention clearly had a significant effect, particularly during the intervention period where reinforcement was given. The effect tended to diminish during the follow-up period. The effect seemed to be much more significant in lower socioeconomic families as defined by a socioeconomic index based on mother's education and family income.

Supplementary food clearly had a significant effect during the intervention period but tailed off rather sharply during the follow-up after food was no longer being given. It is interesting and possibly important to note that supplementary food had the greatest effect among the higher

socioeconomic families where it is likely not needed as badly. We suggest that in these families the supplementary food was truly used as a supplement which may not have been the case in the lower socioeconomic families. However, food did seem to have a continued impact during the follow-up period for the lower socioeconomic families. In retrospect it would have been very informative to have had an additional food intervention with say twice the amount (50% RDA) to compare with the one used here of approximately 25% of the recommended requirement.

The sanitation intervention has been difficult for us to interprete. First of all it did not seem to significantly reduce diarrhea. We conjecture that this is because diarrhea more often comes from person-to-person contact than from the water supply. However, the statistical analysis strongly suggests that the sanitation intervention actually caused weight loss from about 14-20 months of age and then rather dramatically caused a gain during the follow-up period. The research teams reported that many mothers claimed the chlorinated water caused diarrhea for a few months and then no longer. The physicians discussed this phenomenon with various medical faculty at Santo Tomas University. They reported that there is some evidence of this happening, probably due to an allergic reaction in young infants. The subjects seemed to develop a tolerance to the chlorine and then for reasons we cannot fully explain, the weight gain for these children was significant. We have not been able to document this conjecture in the literature.

The immunization intervention showed excellent results from about 14 months of age through the follow-up period. This was even more dramatic in the lower socioeconomic families. Many different analysis were tried and immunization always surfaced as one of the best interventions.

We should note that families in these groups were required to sign a release form and were given additional education on health care. This likely enhanced the mother's interest and attention given to the child. It should also be noted that this intervention is known to be utilized as opposed to education, food, and sanitation.

In evaluating all of the interventions we should not ignore possible sociological effects the interventions may have to enhance the mother's care for the child. We could not measure these but surely there are some effects. We would suggest, however, that these would also be a part of a large implementation program. Therefore, in terms of effect of interventions on the subject children, the analysis given should reflect alternative large program effects.

Cost effectiveness was considered in Chapter 6. We fully realize that interventions have effects not measured simply in weight gain of the subject child. However, it is informative to look at intervention effectiveness in this respect. Simply looking at Table 6.5 one immediately realizes that supplementary food must yield very high weight gains to be cost effective relative to the other interventions. During the intervention periods, the education intervention was quite cost effective, leading all other interventions until about age 13 months. From this time until about age 20 months education with immunization was most cost effective. We note from Table 6.8 that for this time span education with immunization was more cost effective than immunization alone. From age 20 months, education with sanitation was most cost effective (better than sanitation alone). Education with food was low during follow-up due to relatively low gains and high costs.

In interpreting both the estimates of gains (Chapter 5) and cost

effectiveness (Chapter 6) one must consider the fact that their effects are different at different ages. Hence, to say one single intervention is best would require an assumption of what time (in subject age) is most important. For example, supplementary food looked good during the early months (while being given) but did not demonstrate the more lasting effect of immunization or sanitation.

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APPENDIX

Intervention Study Form

Baseline Study Form

UNIVERSITY OF SANTO TOMAS

CHILD INTERVENTION STUDY

Col. No.

Card No. (01) 1 - 2

Identification Codes:

Town No. _____ 3

Barrio No. _____ 4 - 5

Family No. _____ 6 - 7

Child Identification No. ____ 8

Interview No. _____ 9 - 10

1. Respondent _____
(surname) (first name) (middle name)

2. Child Participant _____
(surname) (first name) (middle name)

3. Birth Date: Month _____ Day _____ Year _____ 11 - 16

4. Birth Place: Town _____ 17

Barrio _____ 18 - 19

5. Sex: Male _____(1) Female _____(2) 20

6. Family Size _____ 21 - 22

7. Name of Father _____

8. Name of Mother _____

9. Physical Data of Child Participant:

Weight (nearest tenth kg.) _____ 23 - 26

Weight (nearest tenth cm.) _____ 27 - 30

Head Circ. (nearest tenth cm.) _____ 31 - 34

Chest Circ. (nearest tenth cm.) _____ 35 - 36

10. Did the subject child have any of the following diseases since the last interview?

Measles: Yes _____(1) No _____ (2) 39

A. Medical consultation Yes _____ (1) No _____ (2) 40

Specific diagnosis _____ 41 - 42

Severity:

Mild _____ (1) Moderate _____ (2) Severe _____ (3) 43

Comments _____

B. If no medical consultant, make judgment of

Mild _____ (1) Moderate _____ (2) Severe _____ (3) 44

Probable specific diagnosis 45 - 46

Comments _____

TB: Yes _____ (1) No _____ (2) 47

A. Medical consultation Yes _____ (1) No _____ (2) - 48
Specific diagnosis _____ 49 - 50
Severity:
Mild _____ (1) Moderate _____ (2) Severe _____(3) 51
Comments _____

B. If no medical consultant, make judgment of
Mild _____ (1) Moderate _____ (2) Severe _____(3) 52
Probable specific diagnosis _____ 53 - 54
Comments _____

Diphtheria: Yes _____ (1) No _____ (2) 55
A. Medical consultation Yes _____ (1) No _____ (2) 56
Specific diagnosis _____ 57 - 58
Severity:
Mild _____ (1) Moderate _____ (2) Severe _____(3) 59
Comments _____

B. If no medical consultant, make judgment of
Mild _____ (1) Moderate _____ (2) Severe _____(3) 60
Probable specific diagnosis _____ 61 - 62
Comments _____

Whooping Cough: Yes _____ (1) No _____ (1) 63
A. Medical consultation Yes _____ (1) No _____ (2) 64
Specific diagnosis _____ 65 - 66
Severity:
Mild _____ (1) Moderate _____ (2) Severe _____(3) 67
Comments _____

B. If no medical consultant, make judgment of
Mild _____ (1) Moderate _____ (2) Severe _____ (3) 68
Probable specific diagnosis _____ 69 - 70
Comments _____

Tetanus: Yes _____ (1) No _____ (2) 71
A. Medical consultation Yes _____ (1) No _____ (2) 72
Specific diagnosis _____ 73 - 74
Severity:
Mild _____ (1) Moderate _____ (2) Severe _____ (3) 75
Comments _____

B. If no medical consultant, make judgment of
Mild _____ (1) Moderate _____ (2) Severe _____ (3) 76
Probable specific diagnosis _____ 77 - 78
Comments _____

Card No. (02) 1 - 2
Identification Codes 3 - 10

Polio: Yes _____ (1) No _____ (2) 11
A. Medical consultation Yes _____ (1) No _____ (2) 12
Specific diagnosis _____ 13 - 14
Severity:
Mild _____ (1) Moderate _____ (2) Severe _____ (3) 15
Comments _____

B. If no medical consultant, make judgment of
Mild _____ (1) Moderate _____ (2) Severe _____ (3) 16
Probable specific diagnosis _____ 17 - 18
Comments _____

Cholera: Yes _____ (1) No _____ (2) 19

A. Medical consultation Yes _____ (1) No _____ (2) 20

Specific diagnosis _____ 21 - 22

Severity:

Mild _____ (1) Moderate _____ (2) Severe ____(3) 23

Comments _____

B. If no medical consultant, make judgment of

Mild _____ (1) Moderate _____ (2) Severe ____(3) 24

Probable specific diagnosis _____ 25 - 26

Comments _____

Typhoid: Yes _____ (1) No _____ (2) 27

A. Medical consultation Yes _____ (1) No _____ (2) 28

Specific diagnosis _____ 29 - 30

Severity:

Mild _____ (1) Moderate _____ (2) Severe ____(3) 31

Comments _____

B. If no medical consultant, make judgment of

Mild _____ (1) Moderate _____ (2) Severe ____(3) 32

Probable specific diagnosis _____ 33 - 34

Comments _____

Malaria: Yes _____ (1) No _____ (2) 35

A. Medical consultation Yes _____ (1) No _____ (2) 36

Specific diagnosis _____ 37 - 38

Severity:

Mild _____ (1) Moderate _____ (2) Severe ____(3) 39

Comments _____

B. If no medical consultant, make judgment of

Mild _____ (1) Moderate _____ (2) Severe ____(3) 40

Probable specific diagnosis _____ 41 - 42

Comments _____

Castroenteritis: Yes _____ (1) No _____ (2) 43

A. Medical consultation Yes _____ (1) No _____ (2) 44

Specific diagnosis _____ 45 - 46

Severity:

Mild _____ (1) Moderate _____ (2) Severe ____(3) 47

Comments _____

B. If no medical consultant, make judgment of

Mild _____ (1) Moderate _____ (2) Severe ____(3) 48

Probable specific diagnosis _____ 49 - 50

Comments _____

URI: Yes _____ (1) No _____ (2) 51

A. Medical consultation Yes _____ (1) No _____ (2) 52

Specific diagnosis _____ 53 - 54

Severity:

Mild _____ (1) Moderate _____ (2) Severe ____(3) 55

Comments _____

B. If no medical consultant, make judgment of

Mild _____ (1) Moderate _____ (2) Severe ____(3) 56

Probable specific diagnosis _____ 57 - 58

Comments _____

Other Disease: Yes _____ (1) No _____ (2) 59

A. Medical consultation Yes _____ (1) No _____ (2) 60

Specific diagnosis _____ 61 - 62

Severity:

Mild _____ (1) Moderate _____ (2) Severe _____ (3) 63

Comments _____

B. If no medical consultant, make judgment of

Mild _____ (1) Moderate _____ (2) Severe _____ (3) 64

Probable specific diagnosis _____ 65 - 66

Comments _____

11. Did any member of the household, other than subject child, have any diseases since the last interview? Yes _____ (1) No _____ (2) 67

If yes, give the following data for each:

Name _____

Age _____

Sex: Male _____ (1) Female _____ (2) 68 - 69

Disease _____ 70

71 - 72

Name _____

Age _____

Sex: Male _____ (1) Female _____ (2) 73 - 74

Disease _____ 75

76 - 77

Card No. (03) 1 - 2

Identification Codes 3 - 10

Name _____

Age _____

Sex: Male _____ (1) Female _____ (2) 11 - 12

Disease _____ 13

14 - 15

Name _____

Age _____

Sex: Male _____ (1) Female _____ (2) 16 - 17

Disease _____ 18

19 - 20

12. Have there been any death in the household since the last interview?

Yes _____ (1) No _____ (2) 21

If yes, give the following data for each:

Name _____

Age _____

Sex: Male _____ (1) Female _____ (2) 22 - 23

Probable cause _____ 24

25 - 26

Name _____

Age _____

Sex: Male _____ (1) Female _____ (2) 27 - 28

Probable cause _____ 29

30 - 31

Name _____

Age _____

Sex: Male _____ (1) Female _____ (2) 32 - 33

Probable cause _____ 34

35 - 36

13. Has subject child dropped out of the study?
Yes _____ (1) No _____ (2) 37

If yes, give reason _____

_____

_____

14. Food Supplement:

A. Supply

Regular _____ (1) Irregular _____ (2) 38

Adequate _____ (1) Inadequate _____ (2) 39

If irregular/inadequate, why? _____

_____

_____

B. Received by: _____

Date: Month _____ Day _____ Year _____ 40 - 45

C. Utilization

Proper _____ (1) Improper _____ (2) 46

If improper, why? _____

_____

_____

D. Supervised by: _____
(name)

Title:

Staff _____ (01) Barangay Capt. _____ (02)

M.D. _____ (03) Teacher _____ (04) 47 - 48

Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)

RHU _____ (07) Para Prof. _____ (08)

Other _____

15. Immunization

Did the subject child receive any of the following vaccines since the last interview?

DPT: Yes _____ (1) No _____ (2) 49

A. Date given: Month _____ Day _____ Year _____ 50 - 55

Given by: _____
(name)

Title:

Staff _____ (01) Barangay Capt. _____ (02)

M.D. _____ (03) Teacher _____ (04) 56 - 57

Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)

RHU _____ (07) Para Prof. _____ (08)

Other _____

Place:

Hospital _____ (1) Church _____ (2)

Center _____ (3) Bar. Hall _____ (4) 58

School _____ (5) House _____ (6)

Other _____

B. Is it on schedule?
Yes _____ (1) No _____ (2) 59
If no, why? _____

C. Side reactions?
Yes _____ (1) No _____ (2) 60
If yes, what are the reactions? _____

Cholear-Typhoid: Yes _____ (1) No _____ (2) 61

A. Date given: Month _____ Day _____ Year _____ 62 - 67
Given by: _____
(name)

Title:
Staff _____ (01) Barangay Capt. _____ (02) 68 - 69
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (08)
Other _____

Place:
Hospital _____ (1) Church _____ (2) 70
Center _____ (3) Bar. Hall _____ (4)
School _____ (5) House _____ (6)
Other _____

B. Is it on schedule?
Yes _____ (1) No _____ (2) 71
If no, why? _____

C. Side reactions?
Yes _____ (1) No _____ (2) 72
If yes, what are the reactions? _____

Card No. (04)
Identification Codes 1 - 2
3 - 10

Polio: Yes _____ (1) No _____ (2) 11

A. Date given: Month _____ Day _____ Year _____ 12 - 17
Given by: _____
(name)

Title:
Staff _____ (01) Barangay Capt. _____ (02) 18 - 19
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (08)
Other _____

Place:
Hospital _____ (1) Church _____ (2) 20
Center _____ (3) Bar. Hall _____ (4)
School _____ (5) House _____ (6)
Other _____

B. Is it on schedule?
Yes _____ (1) No _____ (2) 21
If no, why? _____

C. Side reactions?
Yes _____ (1) No _____ (2) 22
If yes, what are the reactions? _____

BCG: Yes _____ (1) No _____ (2) 23

A. Date given: Month _____ Day _____ Year _____ 24 - 29
Given by: _____
(name)

Title:
Staff _____ (01) Barangay Capt. _____ (02) 30 - 31
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (08)
Other _____

Place:
Hospital (1) Church _____ (2) 32
Center _____ (3) Bar. Hall _____ (40
School _____ (5) House _____ (6)
Other _____

B. Is it on schedule?
Yes _____(1) No _____ (2) 33
If no, why? _____

C. Side reactions?
Yes _____ (1) No _____ (2) 34
If yes, what are the reactions? _____

Measles: Yes _____ (1) No _____ (2) 35

A. Date given: Month _____ Day _____ Year _____ 36 - 41
Given by: _____
(name)

Title:
Staff _____ (01) Barangay Capt. _____ (02) 42 - 43
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (08)
Other _____

Place:
Hospital _____ (1) Church _____ (2) 44
Center _____ (3) Bar Hall _____ (4)
School _____ (5) House _____ (6)
Other _____

B. Is it on schedule?
Yes _____ (1) No _____ (2) 45
If no, why? _____

C. Side reactions? 46

Yes _____ (1) No _____ (2)

If yes, what are the reactions? _____

_____

_____

Other Vaccines: Yes _____ (1) No _____ (2) 47

A. Date given: Month _____ Day _____ Year _____ 48 - 53

Given by: _____
(name)

Title:

Staff _____ (01) Barangay Capt. _____ (02) 54 - 55
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (08)
Other _____

Place:

Hospital _____ (1) Church _____ (2) 56
Center _____ (3) Bar Hall _____ (4)
School _____ (5) House _____ (6)
Other _____

B. Is it on schedule? 57

Yes _____ (1) No _____ (2)

If no, why ? _____

C. Side reactions?

Yes _____ (1) No _____ (2)

If yes, what are the reactions? _____

_____

_____

16. Sanitation

Water Purifier Tablets

A. Supply

Regular _____ (1) Irregular _____ (2) 59
Adequate (1) Inadequate _____ (2) 60
If irregular/inadequate, why? _____

_____

_____

B. Received by: _____

Date: Month _____ Day _____ Year _____ 61 - 66

C. Utilization

Proper _____ (1) Improper _____ (2) 67
If improper, why? _____

_____

D. Supervised by _____
(name)

Title:

Staff _____ (01) Barangay Capt. _____ (02) 68 - 69
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (08)
Other _____

17. Toilet Bowls

A. Yes _____ (1) No _____ (2) 70

If no, why? _____

B. If yes, received by: _____

Date: Month _____ Day _____ Year _____ 71 - 76

C. Utilization

Proper _____ (1) Improper _____ (2) 77

If improper, why? _____

D. Supervised by: _____
(name)

Title:

Staff _____ (01) Barangay Capt. _____ (02) 78 - 79
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (03)
Other _____

Card No. (05) 1 - 2
Identification Codes 3 - 10

TO BE FILLED OUT IN OFFICE

1. Interviewer _____
2. Designation/Title of Interviewer:

Staff _____ (01) Barangay Capt. _____ (02) 11 - 12
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (08)
Other _____

3. Date of Interview: Month _____ Day _____ Year _____ 13 - 18
4. Checked by: _____

Designation/Title

Staff _____ (01) Barangay Capt. _____ (02) 19 - 20
M.D. _____ (03) Teacher _____ (04)
Medical Intern/Clerk _____ (05) Pur. Lead. _____ (06)
RHU _____ (07) Para Prof. _____ (08)
Other _____

5. Barrio Intervention:

Immunization _____ (01) 21 - 22
Supplementary Feeding _____ (02)
Sanitation _____ (03)
Education _____ (04)

FAMILY DATA

BASELINE STUDY

	Col. No.
Card No. (01)	
Identification Codes:	1-2
Town No. _____	3
Barrio No. _____	4-5
Family No. _____	6-7
Child Identification No. _____	8
1. Child Participant _____ (surname) (first name) (middle name)	
2. Respondent _____ (surname) (first name) (middle name)	
3. Relation to Child Participant:	
Mother _____(1)	9
Grandmother _____(2)	
Other (specify)	
4. Is the father living at home?	
Yes _____(1) No_____(2)	10
Name _____	
Age _____	11-12
Frequent Illness:	
Upper Respiratory Tract Inf. _____(1)	13
Pneumonia _____(2)	
Gastroenteritis _____(3)	
Tuberculosis _____(4)	
Cardiovascular _____(5)	
Other (specify _____	
5. Is the mother living at home?	
Yes _____(1) No_____(2)	14
Name _____	
Age _____	15-16
Frequent Illness:	
Upper Respiratory Tract Inf._____(1)	17
Pneumonia _____(2)	
Gastroenteritis _____(3)	
Tuberculosis _____(4)	
Cardiovascular _____(4)	
Other (specify) _____	
6. How many children live in the household? _____	18-19
Give data for each child:	
Name _____	
Age _____	20-21
Sex: Male _____(1) Female _____(2)	22
Frequent Illness _____	23
Name _____	
Age _____	24-25
Sex: Male _____(1) Female _____(2)	26
Frequent Illness _____	27

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 32-33
Frequent Illness _____ 34
35

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 36-37
Frequent Illness _____ 38
39

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 40-41
Frequent Illness _____ 42
43

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 44-45
Frequent Illness _____ 46
47

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 48-49
Frequent Illness _____ 50
51

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 52-53
Frequent Illness _____ 54
55

7. How many others live in the household? _____ 56
Give data for each:

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 57-58
Relation: 59
Grandparents _____(1) Aunt/Uncle _____(2) 60
Other (specify) _____
Frequent Illness _____ 61

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 62-63
Relation: 64
Grandparents _____(1) Aunt/Uncle _____(2) 65
Other (specify) _____
Frequent Illness _____ 66

Name _____
Age _____
Sex: Male _____(1) Female _____(2) 67-68
Relation: 69
Grandparents _____(1) Aunt/Uncle _____(2) 70
Other (specify) _____
Frequent Illness _____ 71

Card No. (02)
Identification Codes

Name _____
Age _____
Sex: Male _____(1) Female _____(2)
Relation:
Grandparents _____(1) Aunt/Uncle _____(2)
Other (specify) _____
Frequent Illness _____

Name _____
Age _____
Sex: Male _____(1) Female _____(2)
Relation:
Grandparents _____(1) Aunt/Uncle _____(2)
Other (specify) _____
Frequent Illness _____

Name _____
Age _____
Sex: Male _____(1) Female _____(2)
Relation:
Grandparents _____(1) Aunt/Uncle _____(2)
Other (specify) _____
Frequent Illness _____

8. How many deaths of people living in the household have occurred in the last two years? _____
Give data for each:
Name _____
Age _____
Relation _____
Cause of Death _____
Medical Attendance? Yes _____(1) No _____(2)

Name _____
Age _____
Relation _____
Cause of Death _____
Medical Attendance? Yes _____(1) No _____(2)

Name _____
Age _____
Relation _____
Cause of Death _____
Medical Attendance ? Yes _____(1) No _____(2)

Name _____
Age _____
Relation _____
Cause of Death _____
Medical Attendance? Yes _____(1) No_____(2)

Name _____
Age _____
Relation _____
Cause of Death _____
Medical Attendance? Yes _____(1) No_____(2)

9. Comments: _____

INFANT'S DATA

10. Date of birth: Month _____ Day _____ Year _____
11. Birth weight (nearest tenth kg.) _____
12. Present weight (nearest tenth kg.) _____
13. Birth length (nearest tenth cm.) _____
14. Present length (nearest cm.) _____
15. Head circumference at birth (nearest tenth cm.) _____
16. Head circumference at present (nearest tenth cm.) _____
17. Chest circumference at birth (nearest tenth cm.) _____
18. Chest circumference at present (nearest tenth cm.)
19. Age of gestation:
    Premature _____(1) Full term _____(2) Post Mature _____(3)
20. Duration of Labor:
    Less than one hour _____(1)
    1-3 hours _____(2) 4-6 hours _____(3)
    7-9 hours _____(4) More than 9 hours _____(5)
21. Membrane rupture:
    Spontaneous _____(1) Induced _____(2)
22. Place of delivery:
    Home _____(1) Hospital _____(2)
    Other (specify) _____
23. Attendant at delivery:
    M.D. _____(1) Pilot _____(3)
    Midwife _____(2) Nurse _____(4)
    Other (specify) _____
24. Manner of delivery:
    Spontaneous _____(1) Ceasarian _____(2)

Card No. (03)
Identification Codes

25. Give data for all immunizations the child has received:

DPT Vaccine (01)
Date received: Month _____ Day _____ Year _____
Place received:
Hospital _____(1) School _____(3)
Center _____(2) Other _____
Attendant:
M.D. _____(1) Midwife _____(3)
Nurse _____(2) Other _____

Polio Vaccine (02)
Date received: Month _____ Day _____ Year _____
Place received:
Hospital _____(1) School _____(3)
Center _____(2) Other _____
Attendant:
M.D. _____(1) Midwife _____(3)
Nurse _____(2) Other _____

Measles Vaccine (03)
Date received: Month _____ Day _____ Year _____
Place received:
Hospital _____(1) School _____(3)
Center _____(2) Other _____
Attendant:
M.D. _____(1) Midwife _____(3)
Nurse _____(2) Other _____

Cholera-Typhoid Vaccine (04)
Date received: Month _____ Day _____ Year _____
Place received:
Hospital _____(1) School _____(3)
Center _____(2) Other _____
Attendant:
M.D. _____(1) Midwife _____(3)
Nurse _____(2) Other _____

BCG Vaccine (05
Date received: Month _____ Day _____ Year _____
Place received:
Hospital _____(1) School _____(3)
Center _____(2) Other _____
Attendant:
M.D. _____(1) Midwife _____(3)
Nurse _____(2) Other _____

Other Vaccine (specify) _____
Date received: Month _____ Day _____ Year _____
Place received:
Hospital _____(1) School _____(3)
Center _____(2) Other _____
Attendant:
M.D. _____(1) Midwife _____(3)
Nurse _____(2) Other _____

Other Vaccine (specify) _____
Date received: Month _____ Day _____ Year _____
Place received:
Hospital _____(1) School _____(3)
Center _____(2) Other _____
Attendant:
M.D. _____(1) Midwife _____(3)
Nurse _____(2) Other _____

Card No. (04)
Identification Codes

INFANT'S NUTRITIONAL DATA

26. Infant's food on first 3 days:
H2O _____(1) Breast Milk _____(2) Sugar sol. _____(3)
Milk formula _____(4) Others _____

27. Has the baby been breastfed?
Yes _____(1) No _____(2)
If yes, SKIP TO QUESTION #29.

28. If no, what was the food intake?
Milk formula _____(01) Cereals _____(02) Fruits _____(03)
Vegetables _____(04) Fish _____(05) Others _____
SKIP TO QUESTION #39.

29. If yes, breastfed by whom?
Mother _____(1) Wet Nurse _____(2) Both _____(3)
Others _____

30. Is the baby breastfed now?
Yes _____(1) No _____(2)

31. How many days was the baby breastfed? _____

32. Has the baby been weaned?
Yes _____(1) No _____(2)
If no, SKIP TO QUESTION #37.

33. When? Month _____ Day _____ Year _____
How old was the baby? _____ Months

34. How was the baby weaned?
Abruptly _____(1) Gradually _____(2)

35. What method was used?
Alternating with milk formula _____(1)
Alternating with non-milk formual _____(2)
Hiding from the baby _____(3)
Painting the nipples with special ingredient _____(4)
Others _____

36. Why was the baby weaned?
Old enough ____(1) Medical advice ____(2) Another pregnancy ___(3)
Others _____

37. Infant's present feeding:
Breastfed _____(1) Bottlefed _____(2) Mixed _____(3)

38. If breastfed, breastfed by:
Mother _____(1) Wet Nurse _____(2) Both _____(3)
Others _____

39. Feeding schedule:
Regular _____(1) Irregular _____(2)
If the baby is not bottlefed at all, SKIP TO QUESTION #48.

40. Reasons for bottlefeeding:
Mother:
Absence of milk ___(01) Illness ___(02) Inadequate milk _____(03)
Working mother ___(04) Another pregnancy _____(05
Others _____
Baby:
Harelip _____(01) Allergy to mother's milk _____(02)
Prematurity _____(03) Illness ___(04) Others _____

41. Milk used:
Evaporated _____(1) Powdered___(2) Condensed _____(3)
Others _____

42. Reasons for choice:
Medical advice _____(2) Suits baby _____(2)
Budget limitation _____(3) Others _____

43. Is there a formula?
Yes_____(1) No _____(2)

44. Who gave the formula?
Medical advice _____(1) Relatives _____(2)
Directions with formula_____(3) Self_____(4)
Others _____

45. How many parts of milk are used for one part water? Give to the nearest half. _____

46. Number of bottles per day _____

47. Is the formula sterilized?
Yes _____(1) No _____(2)
If so, how?
Water and bottle separately _____(1)
Milk and bottle together _____(2) Milk alone _____(3)
Bottle alone _____(4) Water alone _____(5) Others _____
Duration:
Warm enough _____(1) Up to boiling _____(2) Boiling for a few minutes _____(3) Boiling for 30 minutes_____(4) Others _____

48. Is there supplementary feeding?
Yes _____(1) No _____(2)
IF NO, SKIP TO QUESTION #51.

49. When was supplementary feeding started? Month _____Day ____Year_____
How old was the baby? _____Months

50. What food supplements are used?
Cereals _____(01) Fish _____(02) Fruits _____(03)
Egg _____(04) Vegetables____(05) Meats_____(06)
Root Crops _____(07) Others _____

51. Comments: _____

Card No. (12)
Identification Codes

SOCIO-ECONOMIC DATA

63. Principal bread earner:
Father _____(1) Mother _____(2) Grandparents _____(3)
Children _____(4) Aunts/Uncles _____(5) Others _____

64. Secondary bread earner:
Father _____(1) Mother _____(2) Grandparents _____(3)
Children _____(4) Aunts/Uncles _____(5) Others _____

65. Source of livelihood:
Professional _____(01) Government employee _____(02)
Agricultural _____(03) Casual _____(04)
Commercial _____(05) Jobless _____(06)
Industrial _____(07)
Others _____

Employment Time
Fulltime _____(1) Part-time _____(2)

Participation
Owner _____(1) Employee _____(2)

66. Average yearly income of principal bread earner (pesos) _____

67. What is the educational attainment of the father?

No schooling _____(01) Some high school _____(06)
Some primary _____(02) Completed high school _____(07)
Completed primary _____(03) Some college _____(08)
Some elementary _____(04) Completed college _____(09)
Completed elementary _____(05) Higher postgraduate studies _____(10)

68. What is the educational attainment of the mother?

No schooling _____(01)
Some primary _____(02)
Completed primary _____(03)
Some elementary _____(04)
Completed elementary _____(05)
Some high school _____(06)
Completed high school _____(07)
Some college _____(08)
Completed college _____(09)
Higher postgraduate studies _____(10)

69. What is the marital status of the parent

Single _____(1)
Married _____(2)
Separated _____(3)
Widow/er _____(4)
Common law _____(5)
Others _____

70. What is the religion of the parents
Roman Catholic _____(1)
Iglesia ni Cristo _____(2)
Protestant _____(3)
Moslem _____(4)
Others _____

71. Dwelling unit

Material:
Nipa _____(1) Bamboo _____(2) Wood _____(3)
Other _____
Construction:
Strong _____(1) Weak _____(2)

Number of rooms _____

Ventilation:
Adequate _____(1) Inadequate _____(2)

72. Comments: _____

SANITATION DATA

73. What is the source of drinking water?

H20 pipe system _____(01)
Artesian well _____(02)
Deep well _____(03)
Private pump _____(04)
Surface/Ground H20 _____(05)
Rain H20 _____(06)
Others _____

74. What is the source of water for other uses?

H20 pipe system _____(01)
Artesian well _____(02)
Deep well _____(03)
Private Pump _____(04)
Surface/Ground H20 _____(05)

75. How is drinking water transported?

Pail _____(01)
Gas can _____(02)
Metal pipe _____(03)
Bamboo pipe _____(04)
Others _____

76. How is water for other uses transported?

Pail _____(01)
Gas can _____(02)
Metal pipe _____(03)
Bamboo pipe _____(04)
Others _____

77. How is drinking water stored?

Open Drum _____(01) Covered Drum _____(02)
Open Jar _____(03) Covered Jar _____(04)
Open Can _____(05) Covered Can _____(06)
Others _____

78. How is water for other uses stored?

Open Drum _____(01) Covered Drum _____(02)
Open Jar _____(03) Covered Jar _____(04)
Open Can _____(05) Covered Can _____(06)
Others _____

79. Is the drinking water supply

Adequate _____(1) Inadequate _____(2)

80. Is the supply of water for other uses

Adequate _____(1) Inadequate _____(2)

81. Drainage

Open _____(1) Closed _____(2)

82. Excreta disposal:

Pit type _____(1) Water sealed type _____(2)
Antipolo type _____(3) Others _____
None _____(4)

83. Garbage disposal:

Feeding to animals _____(1)
Burning _____(2)
Burying _____(3)
Letting it scatter _____(4)
Other _____

84. Comments: _____

TO BE FILLED OUT IN OFFICE

1. Interviewer _____

2. Designation/Title of Interviewer:

Staff	(01)	Barangay Capt.	(02)
M.D.	(03)	Teacher	(04)
Medical Intern/Clerk	(05)	Pur. Lead.	(06)
RHU	(07)	Para Prof.	(08)
Other			

3. Date: Month _____ Day _____ Year _____

4. Time Duration (minutes) _____

5. Sufficiency:

Sufficient	(1)	Insufficient	(2)

6. Location:

House	(1)	School	(2)
Barangay Hall	(3)	Church	(4)
Other			

7. Respondent's Attitude:

Excellent	(1)	Fair	(2)
Good	(3)	Poor	(4)

8. Interviewer's Impression:

Excellent	(1)	Fair	(2)
Good	(3)	Poor	(4)

9. Subject child - percent of standard weight _____

10. Assessment of infant's health:

Excellent	(1)	Fair	(2)
Good	(3)	Poor	(4)

11. Assessment of mother's health:

Excellent	(1)	Fair	(2)
Good	(3)	Poor	(4)

12. Comments: _____