NUTRITIONAL STATUS

IN THE

DOMINICAN REPUBLIC

TUFTS UNIVERSITY SCHOOL OF NUTRITION/USAID NUTRITION SURVEY
A Report to USAID, Santo Domingo
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With Grateful Appreciation to

Dr. Beatrice Rogers, PI, Tufts Consumption Project

and

Anne Swindale, Director, Tufts Consumption Project

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DEFINITIONS

REAL INCOME: The income level of each family calculated by using expenditure data. A figure for average monthly income was derived by dividing estimated yearly income from expenditure databy 12. Included in this calculation was income "in kind" that the household received, which were foods received as gifts, payment, or donation from government or private agencies. The value of foods produced and consumed by the family was also included in the real income figure. Medicine expenditures were not included in the equation, as they were considered to show such high deviation from month to month that an accurate average would not be possible to calculate. The equation used to derive real income was:

$$\text{REAL INCOME} = \left(\text{MONTHLY CASH EXPENDITURES}\right) + \left(\text{VALUE OF DAILY IN-KIND FOOD CONSUMPTION} * 30\right)$$

EARNED INCOME: Estimated monthly income from salaries, daily wages, self-employment, or any activity generating cash income. This figure also included income from crops and animals and family business.

INCOME QUARTILE: Using REAL INCOME for family, the sample was divided into four equal quartiles. Hence, the lowest quartile (quartile number 1) contains families at the lowest 25 percent of real income. Conversely, the highest quartile (quartile number 4) contains families at the highest 25 percent of real income.

INCOME DECILE: As with income quartiles, this variable divided households into equal deciles by real income, with the lowest decile (decile number 1) containing families at the lowest 10 percent of real income, and the highest decile (decile number 10) comprised of families at the highest 10 percent of real income.

ADULT MALE EQUIVALENT:
From the Rogers' research, ratio of caloric requirement by age, sex, and lactation or prenatal status to caloric requirement of an adult male. Complete description of calculation included in Appendix 5.

REGION

According to the division of the country currently used by SESPAS and other health/nutrition organizations, the sample was divided into eight health regions for the sake of uniformity of reporting. These regions and sites of which the sample was comprised are as follows:

0 CAPITAL

All areas comprising the urban sector of Santo Domingo.

I SOUTH-CENTRAL CIBAO

Contains the provinces of Peravia, San Cristobal, and Monte Plata.

II WESTERN CIBAO

Contains the provinces of Santiago, Puerto Plata, Espaillat, La La Vega, and Monseñor Nouel.

III EASTERN CIBAO

Contains the provinces of Salcedo, Duarte, Sanchez Ramirez, Maria Trinidad Sanchez, and Samana.

IV SOUTHWEST

Contains the provinces Bahoruco, Independencia, Pedernales, and Barahona.

V EAST

Contains provinces San Pedro de Marcoris, La Romana, El Seybo, Hato Mayor, and Altagracia.

VI CENTRAL WEST

Contains provinces Elias Pina, San Juan, and Azua.

VII NORTHWEST

Contains provinces Monte Cristi, Dajabon, Santiago Rodriguez, and Valverde.

These regions are mapped in Figure 1.

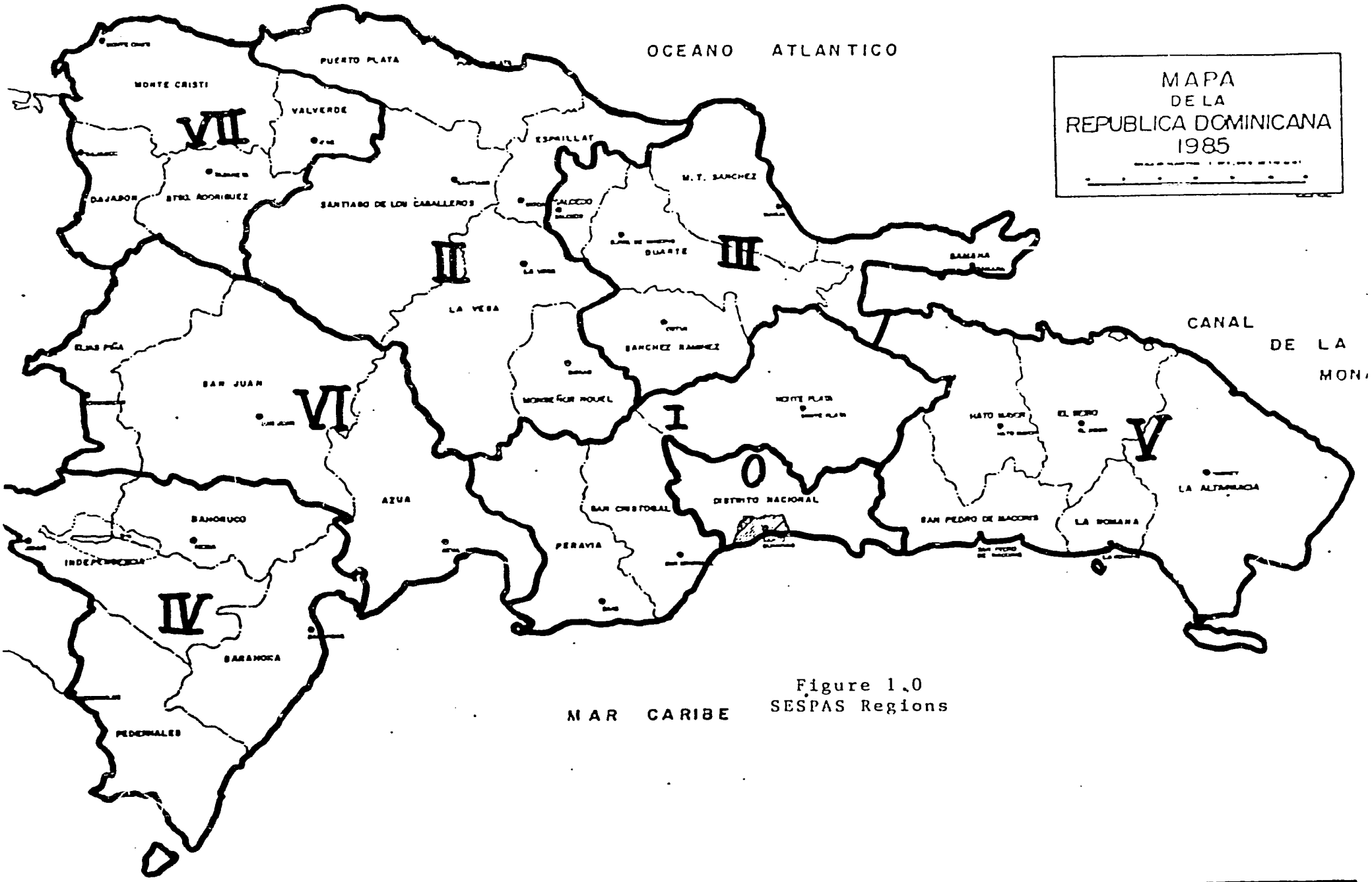


Figure 1.0
SESPAS Regions

STRATA

The Tufts Consumption Project sampled the country according to economic and geographic criteria (Figure 2). Five major strata were thus identified. The sample was randomly selected and grouped by strata for the Tufts Consumption Project analysis:

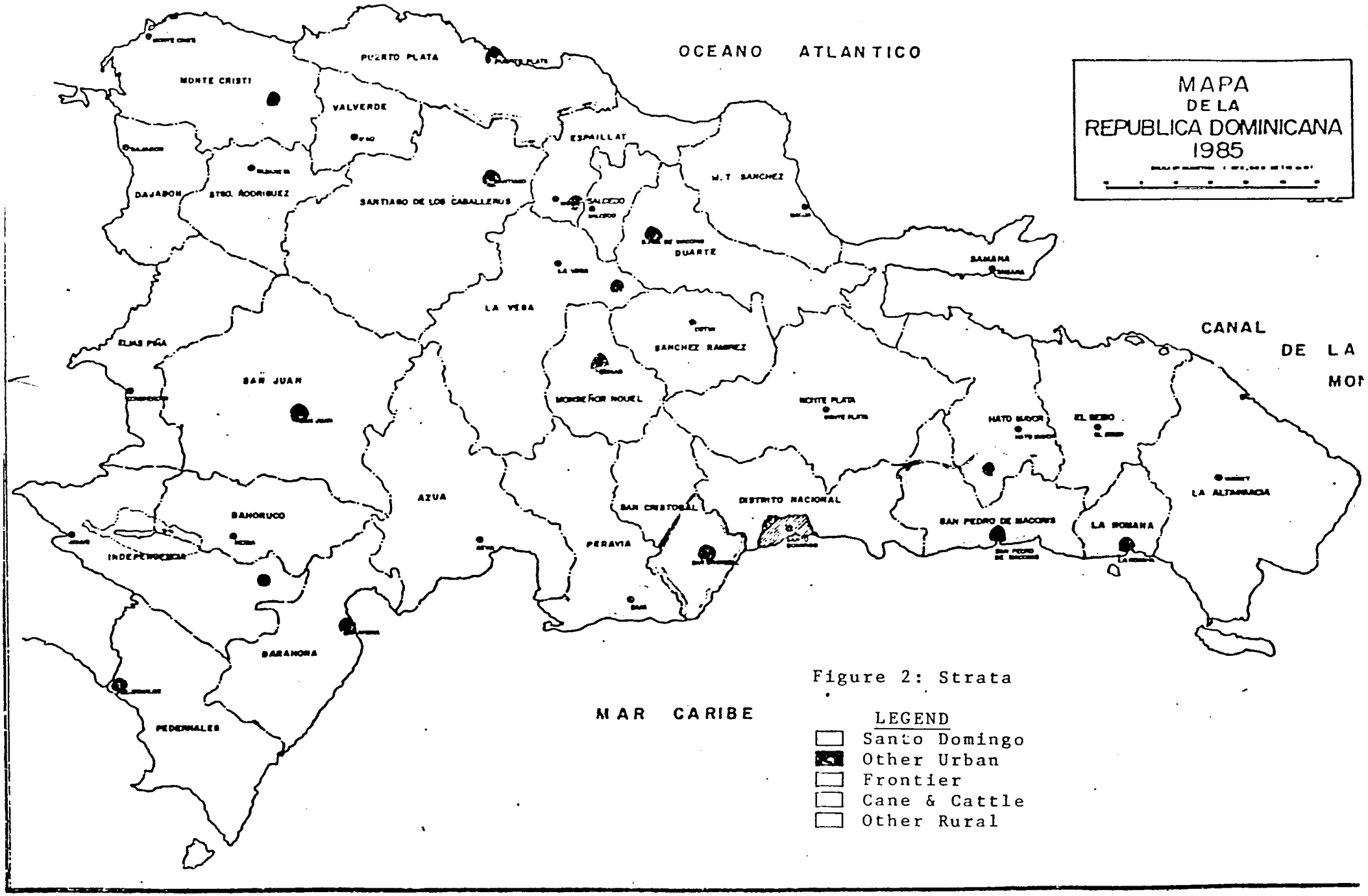
STRATUM 1: Santo Domingo
Includes periurban periphery settlements.

STRATUM 2: Other Urban
Includes all urban areas surveyed other than Santo Domingo, regardless of geographic locale.

STRATUM 3: Frontera
Includes all region running north/south along the Dominican/Haitian border, regardless of SESPAS region.

STRATUM 4: Sugarcane and Livestock Regions
A geographically diverse stratum, this encompasses sugarcane bateys and livestock areas in the east and livestock areas in the north-central part of the country (near Puerto Plata).

STRATUM 5: Other Rural
Includes all other rural areas not accounted for in the above breakdown throughout the country. These are chiefly located in the Cibao region.


MAPA
DE LA
REPUBLICA DOMINICANA
1985
OCEANO ATLANTICO
MAR CARIBE
CANAL DE LA MON
MONTE CRISTI
PUERTO PLATA
VALVERDE
DAJABON
STGO. RODRIGUEZ
SANTIAGO DE LOS CABALLEROS
ESPAILLAT
SALCEDO
M.T. SANCHEZ
DUARTE
SAMANA
LA VEGA
SANCHEZ RAMIREZ
ELIAS PIÑA
SAN JUAN
MONSEÑOR NOUEL
NORTE PLATA
HATO MAYOR
EL SEIBO
LA ALTAGRACIA
AZUA
SAN CRISTOBAL
DISTRITO NACIONAL
SAN PEDRO DE MACORIS
LA ROMANA
BAHORUCO
INDEPENDENCIA
PERAVIA
BARAHONA
PEDERNALES
Figure 2: Strata
LEGEND
Santo Domingo
Other Urban
Frontier
Cane & Cattle
Other Rural

STANDARD DEVIATION SCORES ("Z SCORES")

A data transformation used for height-for-age, weight-for-age, and weight-for-height which compares the actual measurement with a standard reference (in this case, NCHS Standards) and controls for age. The score is the standard deviation value that the measurement in question falls below or above the mean, given the near-normal distribution of height, weight, and weight-for-height. The formula used to calculate these scores was:

$$\text{Z SCORE} = \frac{\text{ACTUAL VALUE-MEDIAN VALUE OF REFERENCE POPULATION}}{\text{STANDARD DEVIATION VALUE OF REFERENCE POPULATION}}$$

In this population, it is useful to bear in mind that a Z Score of -2.00 corresponos approximately to the third percentile, and that a Z-score of -1.00 corresponds approximately to the 16th percentile. A Z Score of zero falls exactly on the 50th percentile, which is 100 percent of the percent median value. For a further discussion of standard deviation scores, percentiles, and percent median, the reader is referred to the monogram "Growth Monitoring", American Public Health Association, 1985.

DEGREE OF MALNUTRITION

In accordance with the breakdown of weight-for-age into categories defined by Gomez (Gomez Classifications), the sample was defined in these categories for some analyses. This was designed for further uniformity of reporting, as health and nutrition workers have used Gomez classifications to identify malnutrition in numerous previous analyses. In accordance with this tradition, the Tufts Nutrition Survey also classified weight-for-age into these groups, using percent median values of NCHS standards as follows:

DEGREE OF MALNUTRITION	PERCENT MEDIAN VALUE WEIGHT-FOR-AGE
Normal	>90%
I	75-89%
II	60-74%
III	<60%

1.0 INTRODUCTION AND PURPOSE

The purpose of this project was to survey and evaluate the nutritional status of Dominican infants and preschoolers in order to better plan and target intervention programs. In addition, the survey collected data on birthweights in ten maternity facilities throughout the country in order to help pinpoint the major contributing factors to malnutrition. Child's recumbent length, weight, age, sex, morbidity status, mother's prenatal history, and medical service availability and use were included in the study design. Community availability of these services, as well as availibility, use, and impact of various food supplement programs, was also examined.

The advantage of this survey was to connect health and nutrition variables with extensive socioeconomic information from the Tufts Consumption Project (1). In this economic project, 1440 families were interviewed intermittantly during a week-long period; food consumption data including accurate dietary recall and detailed income data were collected. The same families interviewed for this first project were located for the Tufts Nutrition Survey; all children in their homes under six years of age were weighed and measured, and basic health information collected. The project thus provided not only accurate health and nutrition information but also reliable economic and food consumption data. Appendix 1 contains the questionnaire used for the Tufts Nutrition Survey; Appendix 2 is the Birthweight Study undertaken by the PI to provide reference information for the Dominican Republic.

2.0 DESIGN OF QUESTIONNAIRE

The PI consulted many different persons working with health and nutrition in the Dominican Republic in designing the questionnarie. Drafts were discussed with Anne Swindale (Tufts Consumption Project), Anne Weeks (USAID); Dr. Didiez, Carmen Gravallese, and staff (SESPAS: Ministerio de Nutricidn); Dra. Cohen (Dominican Pediatric Society); Barbara Reidtke and Juana Mendez (CARITAS); and Joseph Catano (Peace Corps). Drafts were also discussed with the six field workers who had been employed by the Tufts Consumption Project via a "focus group" type of forum. Questions were thus phrased using the colloquial speech patterns that would be easily understood by those surveyed. The knowledge and experience of these workers proved invaluable in questionnaire and logistics design.

3.0 METHODOLOGY

3.1 Sample Size and Selection

The sample of 1440 families was taken from Dr. Beatrice Rogers' Consumption Project. This sample had been randomly selected based on a recent census (1981) by the Central Bank; housing was the criteria for selection. The sample was weighted for population density and included a disproportionate number of families from the Frontier region (the border between Haiti and the Dominican Republic) in order to achieve accurate statistical inferrences in the analysis.

The survey team went to each of these 1440 families and weighed/measured each child under six years found in the home. If the child had not been included in the previous Tufts Consumption Study sample, s/he was specially coded for separate analysis; likewise, if the child was not a family member but only visiting in the home, s/he was also coded separately. These distinctions could be made due to a photocopy of the first page of the previous questionnaire with family member name and age breakdown. Each field worker carried this photocopy of previously surveyed homes with her in the field to accurately check family members.

3.2 Anthropometric Measurements

During the initial pretesting of this population in November, 1985, it was found that Dominican children were too lively to stand erect for a sufficient period of time for accurate standing height to be accessed. Adding this experience to the knowledge that recumbent lengths yield more accurate information than standing heights led to the decision to obtain lengths on all subjects. These measurements were taken using portable measuring boards with sliding footpiece. Boards were designed and crafted in Boston by a professional carpenter, and had two standard fiberglass measuring tapes mounted in such a way that the reading could be checked both on top and on the side of the board to ensure against reading error from tilted footpiece. Suspended weights were taken using ITAC scales (Silver Springs, Maryland); scales were hung from a rope in order that they be perfectly suspended. Children that had sufficient physical

development to hold their heads erect were placed in child weighing pants and hung from the bottom part of the scale. Infants who lacked this physical development were placed in a blanket which weighed approximately the same as the weighing pants; a knot was tied in this blanket and the infant was thus suspended from this make-shift "swing". Scales were checked weekly with a standard 10 kg weight (Boston Scales, Inc.) to ensure continued accuracy.

Children were measured in the recumbent positon with the mother/primary caretaker holding the head against the headboard (with topmost portion of head against the board) and the field worker flattening the legs with the palm of the [illegible] hand while sliding the footboard with the right. Subjects were [illegible]ed without shoes/socks or head adornments. If girls were found [illegible] thickly plaited hair on the tops of their heads, braids were unfastened and the child measured with hair flat against her head.

Children were weighed wearing undergarmets only; 100 grams was then subtracted from each weight to account for weighing pants/blankets (30 to 40 grams) and undergarmets. Lengths were taken to the nearest 0.1 cm and weights to the nearest 0.1 kg to conform with NCHS standards.

Each child's length was measured three times and measurements averaged for analysis. If one of the measurements differed from any of the other two by 0.5 cm or more, the field worker re-measured the child. Children's legs were repositioned between each measurement by lifting legs off of the floor/table and gently moving them from the hips to control for postural errors.

3.3 Age

In most cases, child age was calculated by subtracting birthdate from date of measurement. In the few instances that the mother/primary caretaker was unsure of birthdate and had no birth certificate on hand, the field worker prompted her by asking when the child was born according to major events in the country (hurricanes, political elections, national strikes, etc.). Appendix 3 is the field instrument for this purpose. Birthdate could often be more accurately pinpointed in this fashion. If this method was also unsuccessful, approximate age as stated by mother/caretaker was used.

Various "checks" were used extensively in order to ensure accurate age calculation. First, the photocopy of the first page of the original questionnaire (Tufts Consumption Project) stated the date the field worker had been in the home previously and the age (in months) of the child at that time. Second, the field worker asked tha age of the child (in years) during the first part of the Tufts Nutrition Survey questionnaire. If this second age failed to match the first, the field worker probed for further information. Third, the birth date of each child was asked during the mid-point of the Tufts Nutrition Survey; this date was also matched with the first two for conformity. Finally, each child's weight-for-age was plotted on the SESPAS growth grid to evaluate immediate nutritional status. If the child fell into a zone that obviously appeared incorrect (e.g., a seemingly well-nourished child whose data placed her/him in the red zone, or visa-versa) birth date as well as weight were again carefully reviewed and adjustments made.

3.4 Dietary Intake

Dietary intake data was gathered by the Tufts Consumption Project. The author developed methodology and trained field workers in obtaining accurate data. Dr. Rogers' team decided to only accurately measure foods which contributed significantly to protein and caloric intake; thus, fruits and vegetables were noted for food frequency purposes but not measured rigorously. A volumetric system of measurement was used for fats, rice, beans, grains, sugar, prepared foods, and milk. Food models were used for starchy staples and meats. All figures were later converted to gram intake and protein and calories calculated using values from standard Latin American and US food tables (2, 3, 4). In this way, accurate intake was gathered, especially for fats and oils, which contain twice the caloric content of protein and carbohydrates.

It is important to note that all data from the Rogers' study was gathered on the household level. Thus, dietary information was collected for families. During analysis, family values were transposed into the Tufts Nutrition Survey child data. Data sets then went through a transformation from the family to the child level for nutritional analysis. However, because the data was originally collected at the family level, individual intake of children was not possible to abstract.

3.5 Morbidity

Pretesting revealed that the most commonly reported symptoms in this culture were respiratory illness, fever, diarrhea, and skin/eye problems. These were the diseases detailed in the questionnaire for closer scrutiny. Infrequently occurring illnesses were grouped as "other" and specifically noted on the questinnaire by name of illness (e.g. leukemia, rheumatic fever).

Morbidity values were collected by recall from the main child caretaker. During the interview, the caretaker was asked to describe any illness symptoms observed in the study child during the 15 days prior to interview. The caretaker was requested to recollect any illness episode during this recall period, no matter how trivial it may have seemed. In this case, "episode" was defined as the beginning of symptom onset, regardless of time frame between symptoms. Thus, two days of a runny nose (coded as respiratory illness), followed by one day of runny nose and fever (coded as respiratory and fever) followed by three days of runny nose (coded as respiratory illness) were counted as three "episodes", even though there were no days free of illness between symptom onset. In this way, a more in-depth understanding of illness pattern was established. Field workers were trained to ascertain the order and duration of each of these episodes, what sort of consultation was sought for treating each one, whether the child was still ill at time of interview, and total money spent for treatment. Total cost of treatment was calculated by summing cost of transportation to and from the treatment (e.g. round trip to clinic, pharmacy, hospital), plus cost of consultation, plus cost of medicines.

3.6 Community Survey

In addition to the study on the child level, the Tufts Nutrition Survey collected data on individual communities where the study sites were located. In the case of rural regions, these were easily defined; in the case of urban sectors, a community was defined as vecinity immediately accessible to the respondent, either by a short walk or very brief auto or scooter ride. Data regarding community availability of health services and food supplement programs was gathered in this manner. Field workers were trained to collect this information from at least three respondents in the community who were independent of both the Tufts Consumption Study and the Nutrition Survey. Frequently, they went to a neighborhood store for one respondent, a knowledgeable elder who had lived in the community for a long period of time for another, and a health promotor for the third.

3.7. Nutrition Intervention

At the end of each interview, each child's data for weight-for-age (WA) was placed on the SESPAS grid to evaluate immediate nutritional status. Mothers were informed of weight in pounds as kilograms are seldom used in the Dominican Republic. Age and pound weight were quickly approximated via field instrument (Appendix 4). Mothers were advised of the "nutrition region" into which their child's data fell. If this were a color zone other than green or white, they were given brief but appropriate advice about ways to improve their child's nutritional status. Simple, easily remembered counsel (e.g., adding oil to solid foods, improved nourishment for breastfeeding mothers, decreased/discontinued use of bottle, ORT in cases of diarrhea, improved hygiene) were reviewed at this time. Mothers were often counseled to enroll their children in CARE or CARITAS programs which may have been in place in the community. In this way, a service was provided in each home where information was gathered, rather than collecting information without offering anything in return for the invaluable assistance provided.

3.8 Administration of Questionnaire

Field workers were professional, trained, and experienced in the art of obtaining information from human subjects. Nontheless, open-ended questions were emphasized; little prompting was used in questionnaire administration. The PI had helped train these women in November, 1985, and had emphasized at that time the importance of asking questions with no value judgement implied. Each field worker had participated in role-play sessions at that time to reinforce this behavior. Throughout the study, continued use of these principles, which actively protected the dignity of respondents, was utilized.

4.0 TRAINING AND PRETESTING

The six field workers who had been employed by the Tufts Consumption Project were subsequently hired for the present study. This was advantageous for several reasons: first, these women were familiar with both the study sites and families and had build excellent rapport with respondents; second, they had proven themselves superior in interviewing skills and had consistently provided reliable information during their ten months of previous employment.

The six women were taken into the field to pretest the questionnaire with the PI in both rural and urban regions throughout the country (Santo Domingo, an eastern batey, and a rural area in San Juan). Methodology of weighing and measuring children in the field was introduced at that time with "hands-on" experience in order to confront workers with situations they would be likely to encounter in the field. Weights and measurements were recorded and error ranges noted for future corrections.

The next stage of training centered around a Nutrition Workshop given by the PI and Joseph Catano, a qualified nutritionist and Peace Corps Volunteer for health and nutrition students and workers in the country. During this one-and-one-half day workshop, each of the 20 participants weighed and measured ten preschool children (recumbent lengths and suspended weights), thereby standardizing them in accordance with the WHO methodology (5). The six encuestadoras were among the 20 participants and thus were also standardized as well.

The workshop focused on the use and interpretation of anthropometric measurements, understanding use of standard deviation scores in analysis, defining malnutrition, and practical advice to give in the field. In this way, the field workers became more cognizant of what data they were collecting and why, how it would be used, the use of the SESPAS chart defining the three grades of malnutrition, and what advice they could offer to mothers/PC when confronted with a malnourished child.

The third stage of training again used practical methods to gain further experience in accurately weighing and measuring children in the survey. Four children, including one infant, were used in this session. Children were measured twice by each field worker. The final draft of the questionnaire had been completed by this training session; field workers were carefully trained and instructed in its use. Role play in pairs, then in small groups of three (with the third member contributing constructive feedback) was employed to provide field workers with a stylized realistic experience.

4.1 Piloting

After these three stages of training (pretesting, nutrition workshop, and formal session), a two day pilot was conducted. The first pilot site selected was Cristo Rey, a low-income section of Santo Domingo. The second day was in the rural community in Bani where the Tufts Consumption study had also piloted: this provided the field workers with the experience of returning to the same homes they had previously surveyed and admininstering their new questionnaire.

4.2 Data Collection

After these two weeks of training, pretesting, and piloting, data collection began on December 1, 1986. Each field worker had a total of ten study sites ("conglomerados") to survey in the 40-day period; this allowed three days to survey and one day to travel between sites. Many sites were believed to have few infants/preschool children to sample; thus, it was hoped that in some cases field workers would be able to complete one site in one to two days and thus have the remaining time to trace children who had migrated out of original study sites. This in fact proved to be the case: field workers were able to locate over 98 percent of the children who had been included in the Tufts Consumption Project without extending the 40-day time limit.

The first five sites in each field worker's sample were surveyed from December 1-20, 1986. A break was taken during the Christmas/New Year holiday; retraining and restandardization in anthropometrics was conducted on January 5, 1987, and the second half of data collection commenced on January and was completed on January 28, 1987.

Because of the time elapsed between Dr. Rogers' data collection and interviews from the Tufts Nutrition Survey, several of the families and/or children had changed residence. This was to be expected in a mobile society. An effort was made to locate families and especially the mothers and children: approximately 98% were found.

The PI, as Field Director, supervised data collection as much as possible. She visited 34 of the 60 study sites during the 40 days of data collection period; these included a representative sample of the country, as she sought to divide her time evenly between each field worker in each region. Thus, the PI was an active participant in between 33 and 40 percent of all interviews.

Many of these interviews were in the most isolated regions of the study. This was not only because the PI was searching for the most representative cases and not those biased by easy access to roads and services, but also because she sought to alleviate possible "burn-out" of field workers that might have normally occurred during a concentrated three-week intensive work session. This broad experience was a valuable contribution in fostering the PI's understanding of the complex situations resulting in malnutrition. In the end, the researcher calculated that she had traveled approximately 11,000 kilometers during the 40-day data collection period.

4.3 Standing Height vs. Recumbent Length

Because recumbent lengths were more accurate values to assess, they were taken for all study children. However, the NCHS standards were collected using standing height for children over 36 months of age. To avoid error by over or underestimating length, it was decided to measure a small subsample of children in both the recumbent and standing position, then predict standing height using this data. Appendix 6 contains a detailed description of this methodology and analysis.

4.4 Birthweight Study

During initial analysis, birthweights were noted to be higher than many persons working in the country believed accurate for the total population. This, coupled with concern from the medical community that birthweights were falling on a national level, prompted the PI to undertake a survey of ten hospitals from around the country and collect values for 600 birthweights per facility from all births occurring during the past five years (1982 through 1986). Sex ratio (also found to be higher than normal in preliminary findings and warranting further investigation) and seasonal trends were also investigated. The complete report of this work is found in Appendix 2.

5.0 DATA ENTRY AND ANALYSIS

Because data were precoded, they were entered directly from the questionnaire into ASKII files. Most data were entered by the PI in the DR; all files were entered twice and compared. Entry errors were then corrected. Length measurements were averaged by the PI then checked by two statistics students before data entry. Frequencies and internal logic checks were then used extensively for further data cleaning.

In the Dominican Republic, exploratory analyses were conducted using an IBMPC XTIII and SPSSPC+ statistical package. Age was calculated via the SPSSPC+ YRMODA function. NCHS standards (5) were used to compute standard deviation scores for height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ); this conversion to standard deviation scores controlled for age variations.

After returning to Boston, the data were transferred to a Digital VAXII system. Analysis of the Recumbent Length vs. Standing Height Study was completed with guidance from Dr. Stephen Bailey (Appendix 6). Predicted values for standing height were used for children aged three to five years in accordance with results from this analysis. The Center for Disease Control software was used to calculate standard deviation scores and percent median values for anthropometry. These values were then grouped according to the Gomez classification for malnutrition for some analyses runs. Using this classification with the addition of standard deviation values provided a consistent measure as well as introducing more accurate means of viewing the data.

Connecting the two data sets had been carefully planned at the outset of study design. Identical family codes were used for both studies; in this way, information from one data set could be easily joined with data from the other. Computer-readable files were thus exchanged during the analysis phase.

Variables from Dr. Rogers' study used in the Nutrition Survey analysis were:

1. Stratum breakdown;

2. Income, including real, earned and in-kind;

3. Per capita income; income quartile and decile breakdown;

4. Per capita caloric and protein consumption;

5. Breakdown of caloric and protein consumption by food sources;

6. Public health variables (garbage collection, type sanitary facilities, availablity of potable water, electricity, number rooms in house, separate kitchen for cooking, primary and secondary fuel source);

7. Community availability and individual use of selected food supplement programs.

Families who had changed residence between the times of data collection had been specially coded to account for their mobility and were excluded from analysis when the two data sets were joined. In this way, change of setting (which would most likely affect income and food consumption) was controlled. Less than ten percent of all cases were treated in this manner.

In order to provide the Dominican Republic with uniform data both from the Consumption Study and for use in current health planning, most analyses were conducted examining regional breakdown using the eight SESPAS health regions, stratum breakdown using the five strata from the Tufts Consumption Study, and income breakdown using income deciles and quartiles from the Tufts Consumption Study, and the population as a whole.

Statistical analyses were conducted using Statistical Package for the Social Sciences (SPSSX), version 2.1, on the Digital VAX2 system at Tufts University. Values were weighted using probability of selection figures calculated for the Tufts Consumption Study. The PI cross-checked these figures with regional population tables from the Dominican Republic and noted virtually no difference in outcome variable values. Because the design of the sample had originally been based on strata, it was thus decided to continue using these weighted values.

6.0 RELIABILITY OF DATA

Because of the stringent methodology applied in anthropometric measurements, these values were found to be highly reliable. Other data collected were also considered sound given the high degree of skill employed by field workers and the excellent rapport they had established during repeated visits to families' homes. Yet caution still must be exercised in the interpretation of results. Many of the variables involved self-reported data (e.g. morbidity, number of abortions, amount spent on food and clothing). Over- and under-

reporting are problems generally found in any major survey; they are undoubtedly present in this data as well. Similarly, families usually reported data with several interested neighbors present. Information for general community knowledge often differs greatly from actuality: specifically, the author recalls one incident where a young mother admitted in private to using oral contraceptives, but asked that no neighbors or family members be told as her husband would be angry with her if he learned of her practice.

Regional breakdown in a sample based on geographic and economic strata must also be addressed. Table 6.0 compares the difference between percent total population living in SESPAS regions at the time of the 1981 census and the percent of the child population surveyed by these regions. Differences of greater than -1.5 are noted, and occur in the South-Central Cibao, the Western Cibao, and the Eastern Cibao (Regions I, II, and III, respectively). Those with a positive difference (the Southwest and Northwest) were intentionally over-sampled to obtain statistical power. These positive differences are therefore not of concern, as they may actually reflect a more accurate picture of reality than had they been sampled according to percent population only. The remaining regions show fairly similar percentage breakdowns. Thus, interpreting results in an absolute sense may not be appropriate for Regions I, II, and III, but trends can be noted and the population sampled in these areas be considered fairly representative case studies.

TABLE 6.0: PERCENT POPULATION LIVING IN SESPAS REGIONS VS. PERCENT YOUNG CHILDREN SURVEYED IN THE 1981 NUTRITION SURVEY LIVING IN THESE AREAS

REGION	PERCENT TOTAL POP.(1)	PERCENT OF SURVEY SAMPLE	DIFFERENCE
0	27.5	26.2	-1.3
I	10.9	9.2	-1.7
II	23.1	11.4	-11.7
III	11.3	6.9	-4.4
IV	4.8	23.1	+18.3
V	9.2	8.6	-0.6
VI	7.9	6.7	-1.2
VII	5.3	7.5	+2.2

(1) Oficina Nacional de Estadistica. V y VI Censos Nacionales de Población. Santo Domingo, 1981.

7.0 RESULTS

A total of 1251 children from 706 families, with 827 mothers represented, were surveyed. Three hundred nine of these children were new to the study; the remainder had been included in the Tufts Consumption Project. This figure represents over a 98 percent find rate for both children and families.

Throughout this report, significance values (referring to as probability values, or the probability that a given occurrence could happen by chance) are defined as "significant" ($p=0.05$, or the probability that this event could only occur five times in 100 purely by chance), "highly significant" ($p=0.01$), and "very highly significant" ($p<0.001$). Results are termed "approaching significance" if the probability value is in the range (>0.05 - <0.10).

7.1 ANTHROPOMETRICS AND NUTRITIONAL STATUS

Table 7.1.1 depicts HAZ, WAZ, and WHZ breakdown for the total population and for SESPAS regions, using NCHS standards as the reference population. Height, a measure of long-term nutritional status, showed the lowest value with a mean of -1.11. This roughly corresponded to the 15th percentile; interpretation follows that the average sampled Dominican preschooler was about as tall as 15 percent of the reference (NCHS) population. HAZ also showed the greatest variation, with a large standard deviation (1.31). Nearly 15 percent of all children in the sample fell below 90 percent median of height-for-age (HA).

WHZ, a measure of nutritional status in the short run, averaged -0.03 (approximately the 50th percentile) and also showed a large standard deviation (0.93). Together these two measurements indicated that on average, Dominican infants and preschoolers were not suffering from severe malnutrition. They were somewhat stunted, yet retained sufficient body reserves to resist accute malnutrition. This is not an uncommon scenario for Latin America.

As shown in Table 7.1.1, average birthweight was 3351 grams. This was somewhat higher than the birthweight of 3200 grams found in the study undertaken as part of this project (ref. Appendix 2) and can be attributed to the fact that children surveyed had survived the trauma of birth; most had lived past the crucial weaning period. Hence, the sample may have represented those of higher birthweight.

Table 7.1.1 also illustrates regional HAZ, WAZ, and WHZ breakdown. Here it can be seen that children in Region 2 (Western Cibao) were better nourished than the remainder of the sample. This region included the wealthy city of Santiago, and the good growth evidenced in the sample could well be a result of higher income in that area.

TABLE 7

NUTRITIONAL STATUS OF THE DOMINICAN REPUBLIC BY SESPAS REGIONS
(Mean Value and Standard Deviation)

VARIABLE	POPULATION TOTAL N=1248	0 N= 327	I N=116	II N= 143	III N= 87	IV N= 289	V N= 108	VI N= 84	VII N= 94	NUMBER & SIGNIFICANCE
Height for age (Z - Score)	-1.11 ±1.31	-0.95 ±1.12	-0.84 ±1.24	-0.78 ±1.33	-1.47 ±1.49	-1.50 ±1.40	-0.99 ±1.43	-1.01 ±1.21	-1.37 ±1.33	N= 1250 P= 0.000
Weight for age (Z - Score)	-0.74 ±1.14	-0.58 ±1.10	-0.53 ±1.08	-0.51 ±1.12	-0.99 ±1.30	-1.07 ±1.17	-0.80 ±1.22	-0.39 ±0.97	-0.79 ±0.93	N= 1249 P= 0.000
Weight for height (Z - Score)	-0.03 ±0.93	-0.05 ±0.95	-0.02 ±0.86	-0.00 ±0.86	-0.09 ±0.98	-0.16 ±0.87	-0.19 ±1.04	-0.29 ±0.92	-0.09 ±0.99	N= 1249 P= 0.000
Birthweight (grams)	3351 +593	3299 +560	3323 +507	3411 +600	3292 +605	3404 +675	3451 +748	3295 +425	3399 +559	N= 1056 NS
Sex										
% Males	51.9%	53.8%	49.2%	51.0%	59.1%	50.5%	50.9%	48.8%	50.5%	N= 1250
% Females	48.1%	46.2%	50.8%	49.0%	40.9%	49.5%	49.1%	51.2%	49.5%	P= 0.000
Kcals per Capita	1723 ±743	1661 ±587	1634 ±659	1825 ±815	1542 ±812	1831 ±824	1789 ±710	1490 ±829	1875 ±744	N= 1126 P= 0.000
G Protein per Capita	39.2 ±19.4	40.5 ±16.4	35.5 ±14.7	41.8 ±20.2	34.4 ±21.7	42.6 ±22.7	42.2 ±19.6	28.9 ±18.3	36.9 ±16.1	N= 1126 P= 0.000
Kcals per Adult Male Equivalent	2482 ±1132	2318 ±820	2440 ±1159	2574 ±1236	2227 ±1166	2670 ±1174	2777 ±1496	2156 ±1191	2612 ±991	N= 1123 P= 0.000
G Protein per Adult Male Equivalent	56.9 ±29.8	55.9 ±23.9	52.6 ±27.5	58.9 ±32.2	49.9 ±30.8	63.3 ±32.6	66.4 ±38.1	43.4 ±26.0	52.5 ±23.0	N= 1123 P= 0.000
Percent Caloric Adequancy	107.9% ±49.2	100.7% ±35.6	106.0% ±50.4	119.9% ±53.7	96.8% ±50.7	116.1% ±51.0	120.7% ±65.0	93.7% ±51.8	113.6% ±43.4	N= 1123 P= 0.000
Percent Protein Adequancy	108.4% ±56.8	106.4% ±45.6	100.2% ±52.5	112.2% ±61.3	95.1% ±58.8	120.7% ±62.1	126.5% ±72.6	82.8% ±49.5	100.0% ±43.8	N= 1123 NS

Table 7.1.2 breaks weight-for-age (WA) into the Gomez classification by region. Here it is shown that over 40% of all Dominican children surveyed suffered from some degree of malnutrition, but that the main problem lay in first degree malnutrition (30.6% of the sample). Although roughly seven percent of children suffered with second degree malnutrition, only 13 of the entire sample (1 percent) had third degree malnutrition. Again, this indicates that the sample was marginally malnourished and that acute malnutriture was not the main problem.

Dividing these groupings into SESPAS health regions, it was apparent that children in the Eastern Cibao and Southwest (Regions 3 and 4) had the highest rates of malnutrition, while children in the South-Central Cibao and the west (Regions 1 and 6) did fairly well in comparison. Again, small sample size may complicate interpretation of results: only 84 children were sampled in Region 6 and 88 in Region 3. Figure 7.1.1 graphically depicts the relationships between degree of malnutrition and region.

Examining sample breakdown by strata, it was obvious that the Frontier had the greatest problem with long-term nutritional status. In this area, HAZ fell to -1.51, the lowest of any breakdown. Interestingly, this strata contained both Regions 4 and 6.

Table 7.1.4 breaks WA by Gomez classification into strata. This table and Figure 7.1.2 which accompanies it emphasize again that the greatest nutritional problem of the sample lay in the Frontier region.

Table 7.1.5 depicts this information for all income quartiles, and for the lowest and highest income deciles. Here it can be seen that nutritional status generally rose with income. WAZ peaked in the highest decile at -0.26, as did HAZ. Table 7.1.6 and Figure 7.1.3 depict the Gomez classification for income quartile groupings: graphically, those in the 90-100% WA group rose from less than 60 percent to greater than 70 percent of group samples. A corresponding fall in second and third degree malnutrition was also apparent. Yet perhaps most striking was the relationship depicted in Figure 7.1.4 between income decile and HAZ, WAZ, and WHZ. If nutriture were the same for all groups (and optimal), these curves would be straight horizontal lines following or rising above zero. As shown, those at the second through fourth decile seemed to be faring the worst; those at the highest two deciles grew relatively well. This difference was very highly significant.

A trend toward improved nutrition in the urban sector was noted (Table 7.1.8, Figure 7.1.5). However, although this trend was present, no significance was evident.

7.2 DIETARY INTAKE

As mentioned in the Methods section, dietary intake was measured at the household level. Figures for per capita and per male equivalent consumption were later derived by number present in the household and family composition. Thus, figures for intake can only be used as a reliable indicator of number of calories and grams of protein available for household members to consume (in this case, children under six years of age). The data do not explain intra-familial food distribution, nor do they provide information regarding individual consumption.

TABLE 7.12

NUTRITIONAL STATUS
By SESPAS REGION

PERCENT OF CHILDREN

Number of Children: 1250; p=0.0000

REGION	0 N=327	1 N=117	2 N=142	3 N=86	4 N=289	5 N=108	6 N=84	7 N=95	TOTAL N=1250
Normal	N=201	N=78	N=93	N=43	N=130	N=57	N=58	N=54	N=714
	61.5	66.7	65.5	46.9	45.0	52.8	69.0	56.8	57.1%
First Degree	N=111	N=34	N=40	N=32	N=117	N=40	N=24	N=35	N=433
	33.9	29.1	28.2	36.4	40.5	37.0	28.6	36.8	34.6%
Second Degree	N=15	N=4	N=7	N=10	N=37	N=9	N=2	N=6	N=90
	4.6	3.4	4.9	11.4	12.8	8.3	2.4	6.3	7.2%
Third Degree		N=1	N=2	N=3	N=5	N=2			N=13
		.9	1.4	3.4	1.7	1.9			1.0%

DEGREE OF MALNUTRITION
By SESPAS Region

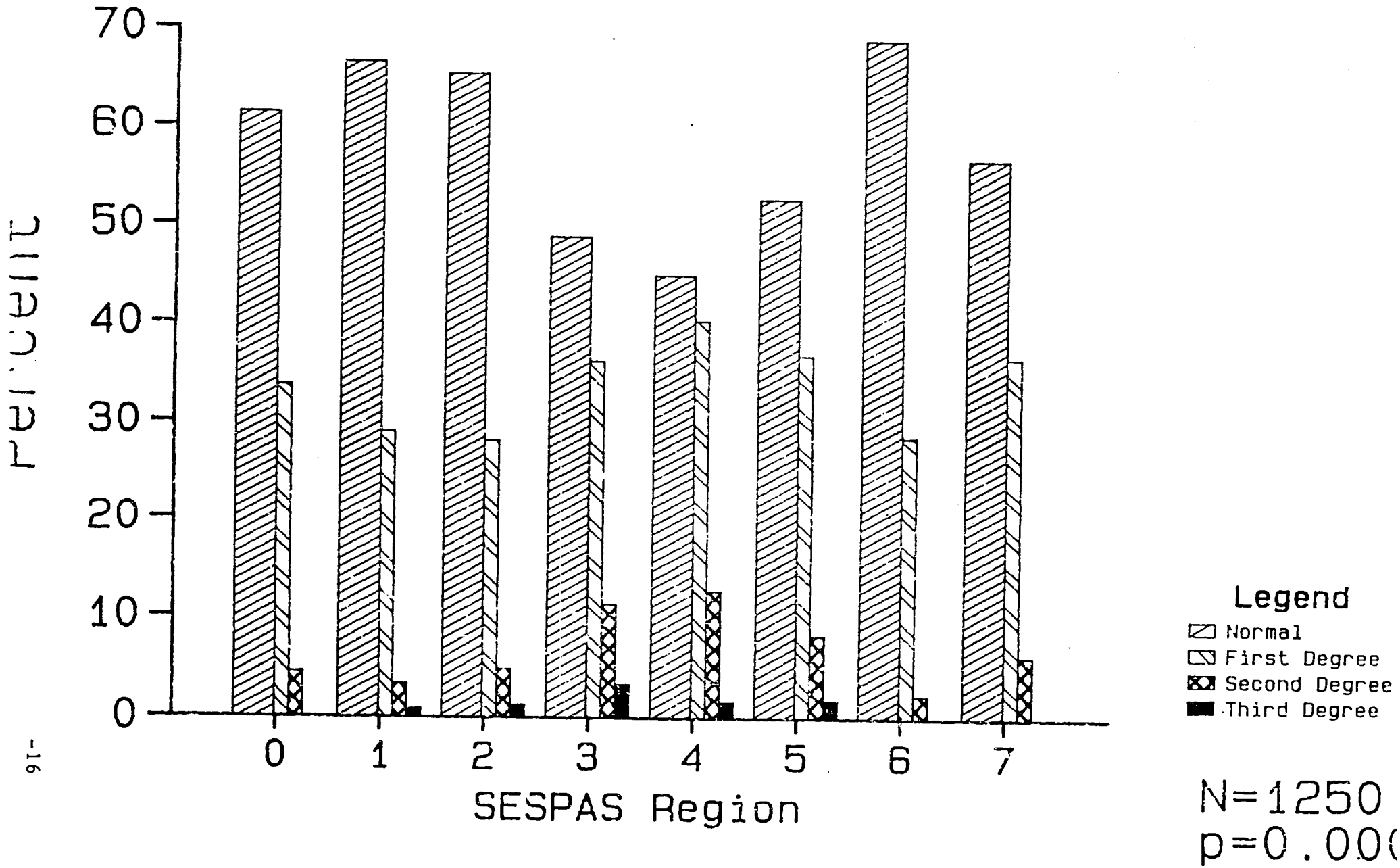


TABLE 7.13
NUTRITIONAL STATUS OF THE DOMINICAN REPUBLIC BY STRATA
(Mean Value and Standard Deviation)

VARIABLE	POPULATION TOTAL	SANTO DOMINGO N=327	OTHER URBAN N=318	FRONTIER N=221	CANE AND LIVESTOCK N=147	OTHER RURAL N=203	NUMBER & SIGNIFICANCE N=1216
Height for age (% - Score)	-1.11 ±1.31	-0.95 ±1.12	-1.8 ±1.39	-1.51 ±1.32	-0.82 ±1.34	-1.20 ±1.33	N= 1216 P= 0.000
Weight for age (% - Score)	-0.74 ±1.14	-0.58 ±1.10	-0.73 ±1.17	-1.02 ±1.08	-0.63 ±1.16	-0.76 ±1.19	N= 1215 P= 0.000
Weight for height (% - Score)	-0.03 ±0.93	-0.05 ±0.95	-0.05 ±1.00	-0.08 ±0.83	-0.12 ±0.87	-0.0 ±0.94	N= 1212 NS
Birthweight (Grms)	3351 ±593	3299 ±560	3399 ±593	3397 ±668	3306 ±698	3380 ±565	N= 991 NS
Sex							
% Males	51.9%	53.8%	51.3%	49.8%	49.7%	52.0%	N= 1168
% Females	48.1%	46.2%	48.7%	50.2%	50.3%	48.0%	NS
Kcals per Capita	1719 +760	1661 +587	1755 +789	1824 +747	1752 +739	1710 +897	N= 1042 NS
G Protein per Capita	39.8 +19.6	40.5 +16.4	42.5 +21.8	38.5 +18.9	37.5 +17.8	37.7 +21.1	N= 1042 P= 0.027
Kcals per Adult Male Equivalent	2491 +1183	2318 +820	2511 +1163	2595 +1014	2660 +1410	2544 +1382	N= 1041 P= 0.033
G Protein per Adult Male Equivalent	57.8 +30.6	55.9 +23.9	61.4 +33.5	55.7 +25.9	58.0 +35.1	56.3 +31.8	N= 1041 NS
Percent Caloric Adequancy	108.3% +51.4	100.7% +35.6	109.1% +50.5	112.8% +44.1	115.6% +61.3	110.6% +60.1	N= 1041 P= 0.033
Percent Protein Adequancy	110.1% +58.4	106.4% +45.6	116.9% +63.9	106.2% +49.4	110.5% +66.8	107.2% +60.6	N= 1041 NS

Table 7.1.4
NUTRITIONAL STATUS
BY STRATUM

N=1166; p=0.2605 (NS)

	Santo Domingo N=329	Other Urban N=320	Frontier N=42	Cane/ Livestock N=167	Other Rural N=309	Total N=1166
Normal	N=202 61.5	N=194 60.7	N=19 44.8	N=100 59.9	N=177 57.1	N=691 59.3%
First Degree	N=112 33.9	N=97 30.2	N=18 43.4	N=53 32.0	N=102 33.0	N=382 32.7%
Second Degree	N=15 4.6	N=23 7.2	N=5 10.9	N=11 6.8	N=26 8.4	N=80 6.9%
Third Degree		N=6 1.9	.9	N=2 1.4	N=5 1.5	N=13 1.1%

FIGURE 7.12

DEGREE OF MALNUTRITION
By Strata

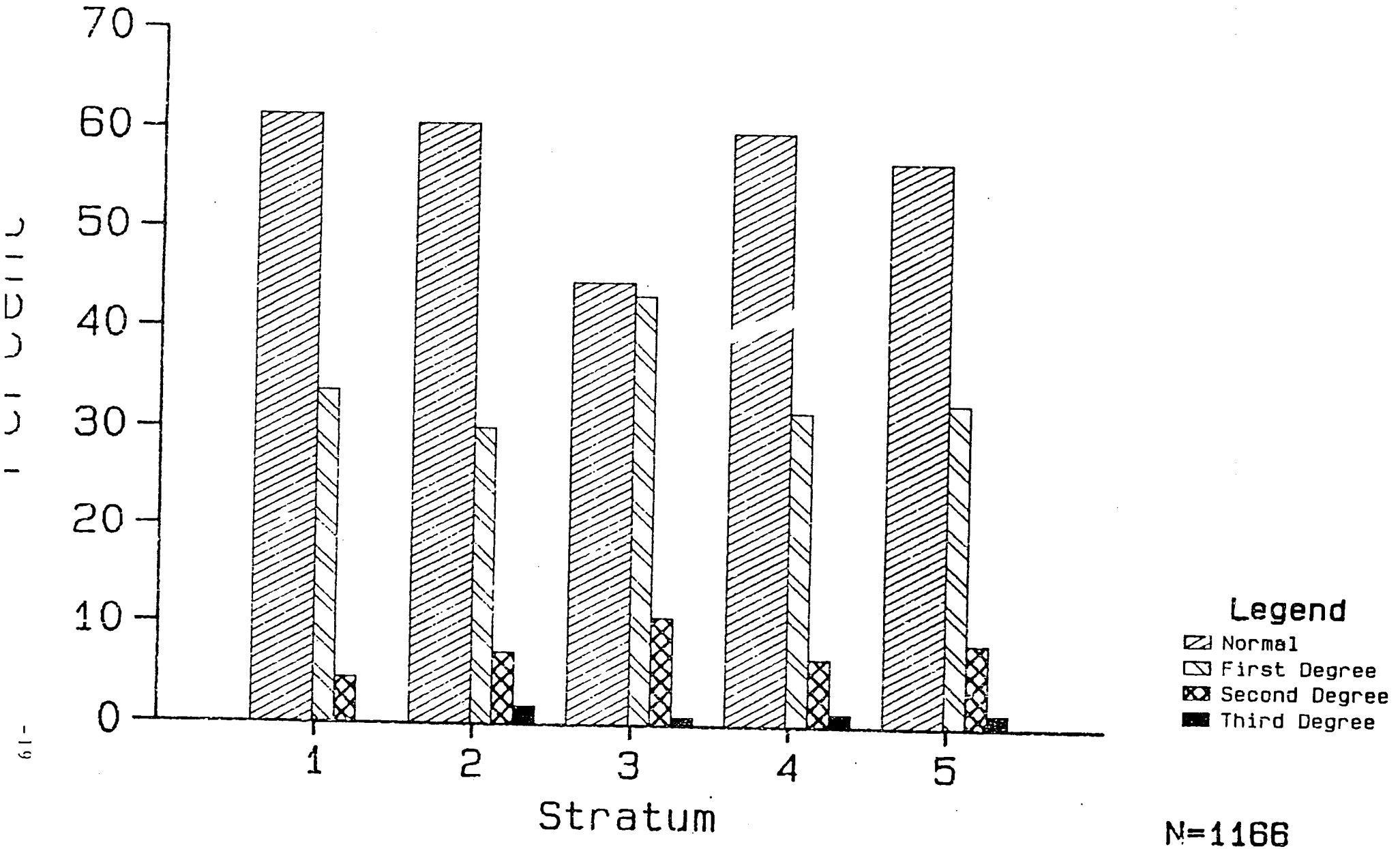


TABLE 7.15

NUTRITIONAL STATUS OF THE DOMINICAN REPUBLIC BY INCOME
(Mean Value and Standard Deviation)

VARIABLE	POPULATION TOTAL	DECILE 1 (LOWEST) N=75	QUARTILE 1 (LOWEST) N=277	QUARTILE 2 N=279	QUARTILE 3 N=147	QUARTILE 4 (HIGHEST) N=275	DECILE 10 (HIGHEST) N=60	NUMBER & SIGNIFICANC N=1041
Height for age (Z - Score)	-1.11 ±1.31	-1.26 ±1.31	-1.38 ±1.25	-1.15 ±1.24	-0.82 ±1.38	-1.06 ±1.24	-0.78 ±1.34	N= 1041 P= 0.000
Weight for age (Z - Score)	-0.74 ±1.14	-0.57 ±1.05	-0.91 ±1.15	-0.81 ±1.14	-0.70 ±1.12	-0.30 ±1.11	-0.26 ±1.12	N= 1041 P= 0.000
Weight for height (Z - Score)	-0.03 ±0.93	-0.26 ±0.92	-0.03 ±0.89	-0.12 ±0.98	-0.04 ±0.82	-0.27 ±0.96	-0.34 ±0.99	N= 1039 P= 0.000
Birthweight (Grams)	3351 ±593	3415 ±571	3326 ±595	3334 ±529	3375 ±672	3352 ±599	3348 ±608	N= 813 NS
Sex								
% Males	51.9%	53.8%	58.2%	50.8%	48.3%	47.4%	52.3%	N= 970
% Females	48.1%	46.2%	41.8%	49.2%	51.7%	52.6%	47.7%	P= 0.07
Kcals per Capita	1719 ±760	974.7 ±676.9	1348 ±690	1684 ±677	1871 ±770	1710 ±785	2137.7 ±907.5	N= 959 P= 0.000
G Protein per Capita	39.8 ±19.6	19.9 ±14.8	27.9 ±15.0	38.7 ±18.1	43.6 ±19.2	50.4 ±20.4	54.4 ±20.5	N= 959 P= 0.000
Kcal per Adult Male Equivalent	2491 +1183	1466.9 +133.9	1997 +1053	2481 +1113	2613 +1024	2916 +1218	3017.8 +1266.5	N= 957 P= 0.000
G Protein per Adult Male Equivalent	57.8 +30.6	29.9 +23.5	41.6 +23.0	58.4 +32.1	60.6 +25.2	71.7 +32.7	77.1 +29.3	N= 957 P= 0.000
Percent Caloric Adequancy	108.3% ±51.4	63.7% ±45.3	86.8% ±45.8	107.8% ±48.4	113.6% ±44.5	126.6% ±60.1	131.2% ±55.7	N= 957 P= 0.000
Percent Protein Adequancy	110.1% +58.4	57.0% +44.9	79.3% +43.8	111.2% +61.3	115.5% +48.1	136.6% +62.3	147.0% +55.9	

Table 7.1.6
NUTRITIONAL STATUS
BY INCOME QUARTILE

N=1166; p=0.000

	LOWEST QUARTILE N=245	QUARTILE 2 N=265	QUARTILE 3 N=249	HIGHEST QUARTILE N=210	TOTAL N=969
Normal	140 57.4	143 54.2	154 61.9	154 73.1	N=592 61.1%
First Degree	69 28.1	98 37.1	81 32.5	51 24.1	N=299 30.8%
Second Degree	31 12.8	19 7.2	13 5.1	4 2.0	N=67 7.0%
Third Degree	4 1.7	4 1.5	1 .5	2 .7	N=11 1.1%

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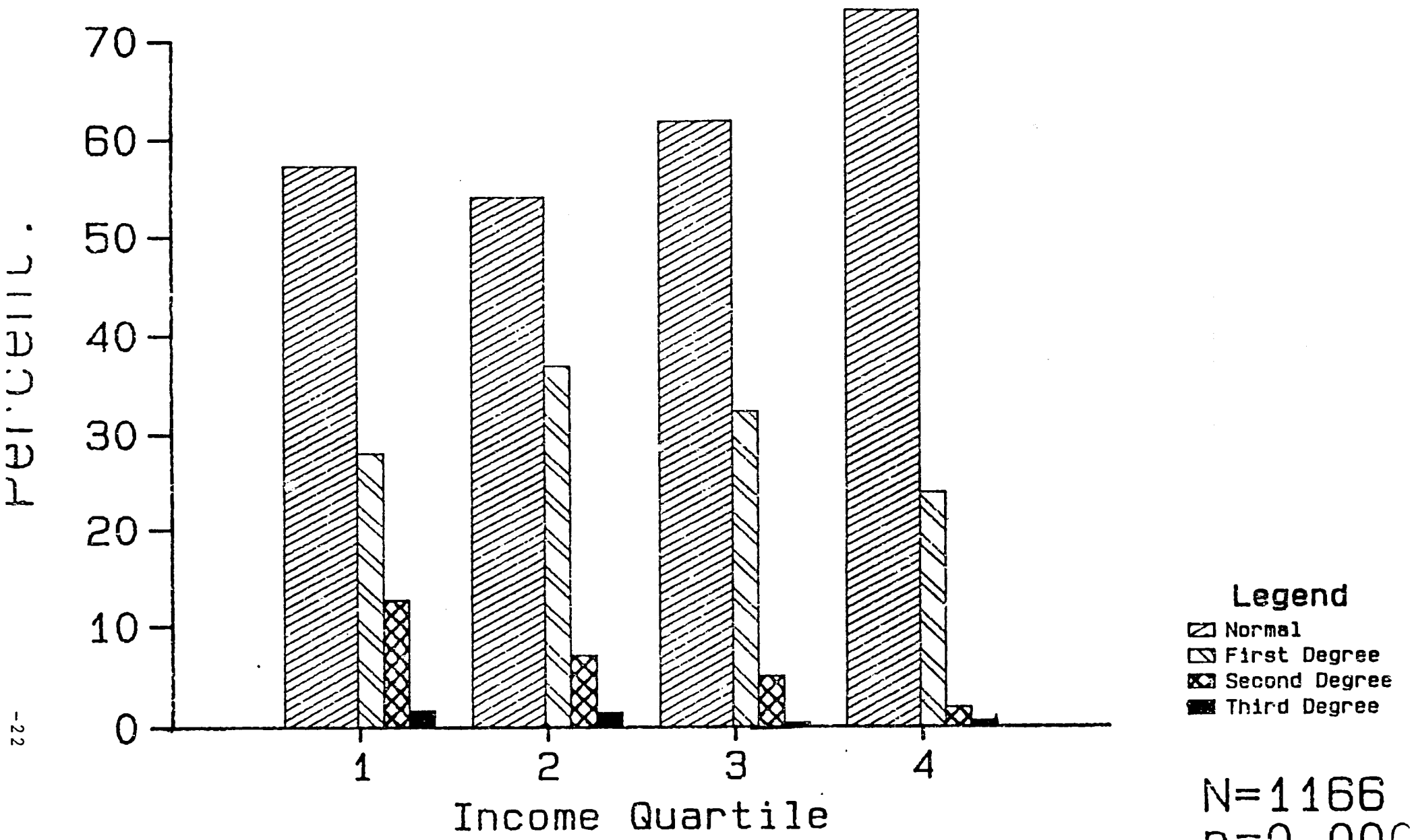
DEGREE OF MALNUTRITION
By Income Quartile



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ANTHROPOMETRICS BY INCOME DECILE

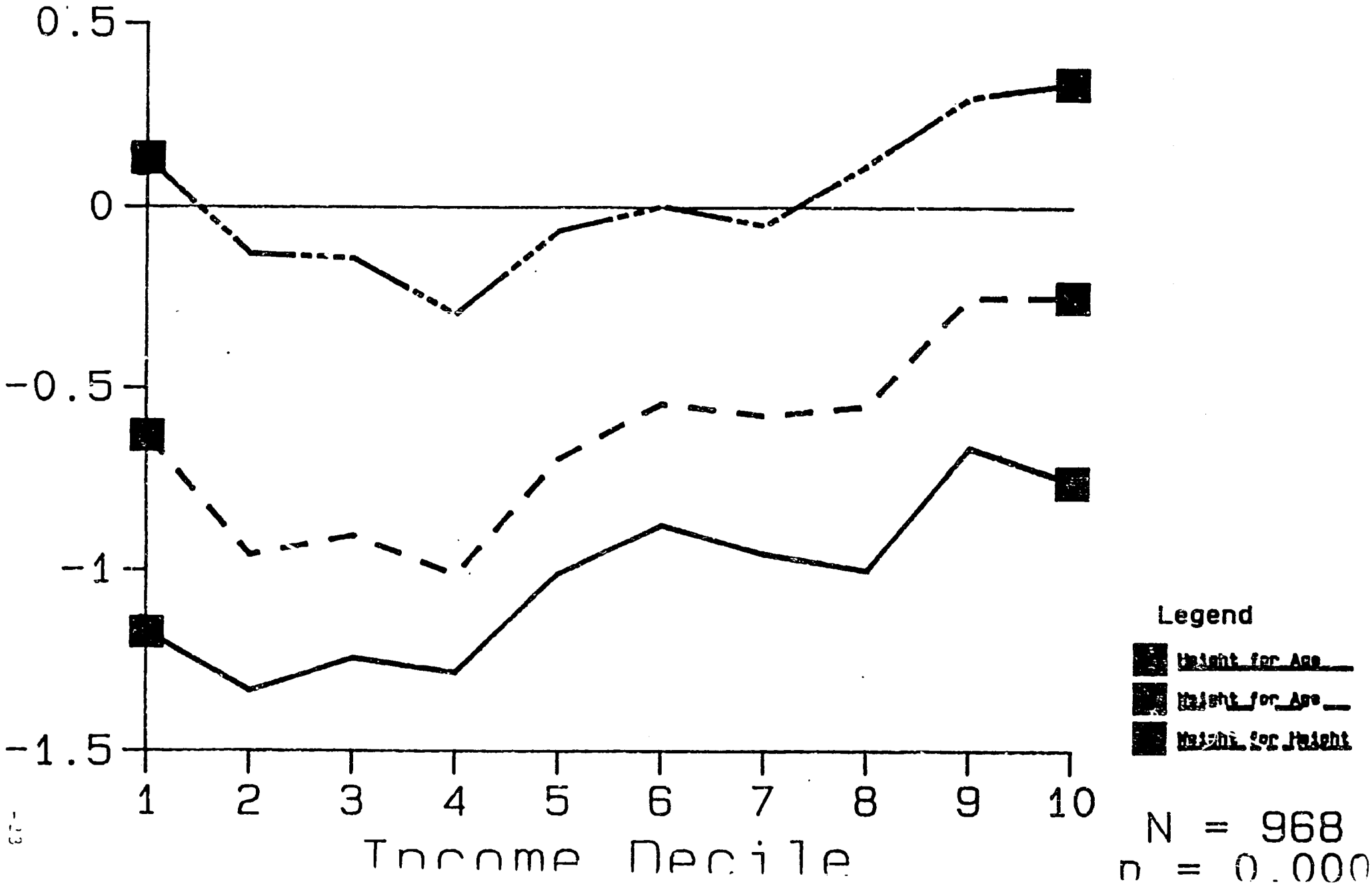
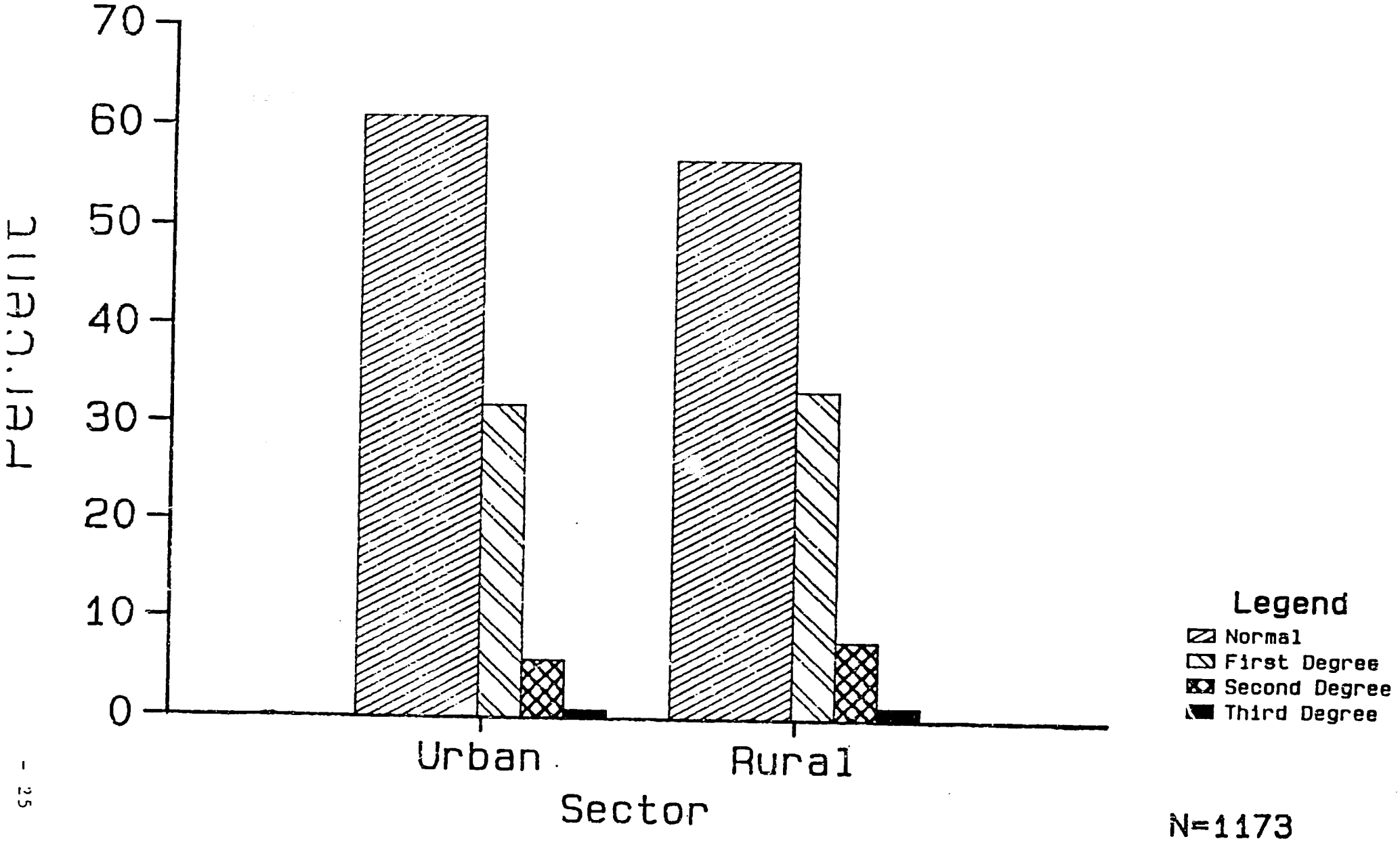


Table 7.1.8
NUTRITIONAL STATUS
BY URBANIZATION

N=1021; p=0.3243 (NS)

	SECTOR RURAL N=524	SECTOR URBANO N=649	TOTAL N=1173
Normal	N=298 56.9	N=396 61.1	N=695 59.2%
First Degree	N=176 33.7	N=208 32.1	N=385 32.8%
Second Degree	N=42 8.0	N=38 5.9	N=80 6.8%
Third Degree	N=7 1.4	N=6 .9	N=13 1.1%

DEGREE OF MALNUTRITION
By Urban and Rural Sector



For the total sample, per capita calorie consumption averaged 1723 kilocalories; per capita protein consumption averaged 39.2 grams. Calories per adult male equivalent averaged 2482 kcals; corresponding protein was 56.9 grams. Tables 7.1.1, 7.1.3, and 7.1.5 show these values by region, strata, and income quartile, respectively.

Figure 7.2.0 depicts the calories per adult male equivalent by SESPAS region. As shown, calories available for children in the home ranged from a low of 2156 in the Southwest (Region 6) to a high of 2777 in the East (Region 5). A similar trend was noted with protein, with a low of 43 grams in Region 6 and a high of 66 grams in Region 5 (Figure 7.2.1). Figure 7.2.2 illustrates regional differences between percent adequacy of caloric and protein consumption. Once again, it is clear that those living in Region 6 were at a disadvantage: on average, they consumed less than 85 percent of requirement for protein and approximately 95 percent of calories.

Examining these differences by income decile was even more striking. Those of the lowest decile consumed less than 60 percent of required protein and less than 65 percent of required calories (Figure 7.2.3). In contrast, those in the highest decile consumed nearly one and one-half times the amount of calories required, and approximately 130 percent protein.

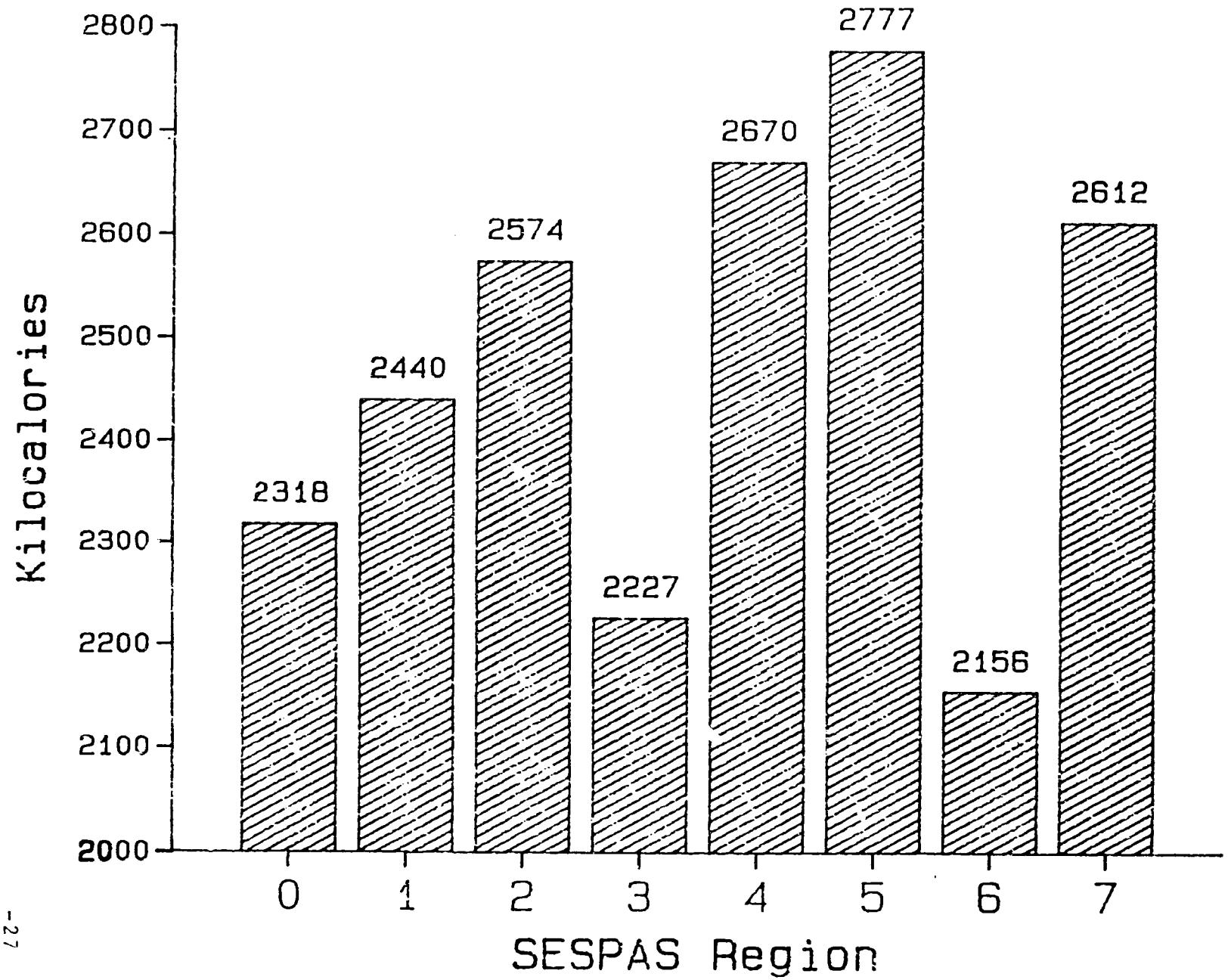
The relationship between these discrepancies and nutritional status was dramatic. Figures 7.2.4-7.2.6 depict the level of calories, protein, and percent caloric and protein adequacy by degree of malnutrition. Consistently and significantly, those who are in second and third degree malnutrition showed less caloric and protein consumption in the home than their better-nourished counterparts.

In terms of breakdown from major food sources, Figures 7.2.7 and 7.2.8 illustrate percentage of total calories and protein obtained from major the food sources which contributed significantly to protein and calorie intake. Rice was clearly a preferred staple in this culture, accounting for nearly one-third of the calories and 28% of the protein values. Starchy staples ("viveres") accounted for nearly one-fifth of calories, but their low protein value rendered them an inferior source of protein. Animal proteins accounted for approximately 13 percent of total calories and 40 percent of protein intake. It is clear that protein deficit from a balanced intake of amino acids was not a large problem for the majority of the Dominican populance, with the exception of those at the lowest income deciles. Surprisingly, fat only comprised 13 percent of calories, which was a bit low for many Latin cultures.

Figures 7.2.4 and 7.2.5 compare percentage calories and protein from major food sources by low and high income quartile. These figures demonstrate that those of low income status were forced to consume less nutrient-dense foods and thus opted for inferior nutriture, consuming significantly more rice, sugar, and pastas, but less milk, meat, and eggs. As noted previously, these differences are even more striking at the lowest income quartile.

FIGURE 7.2.0

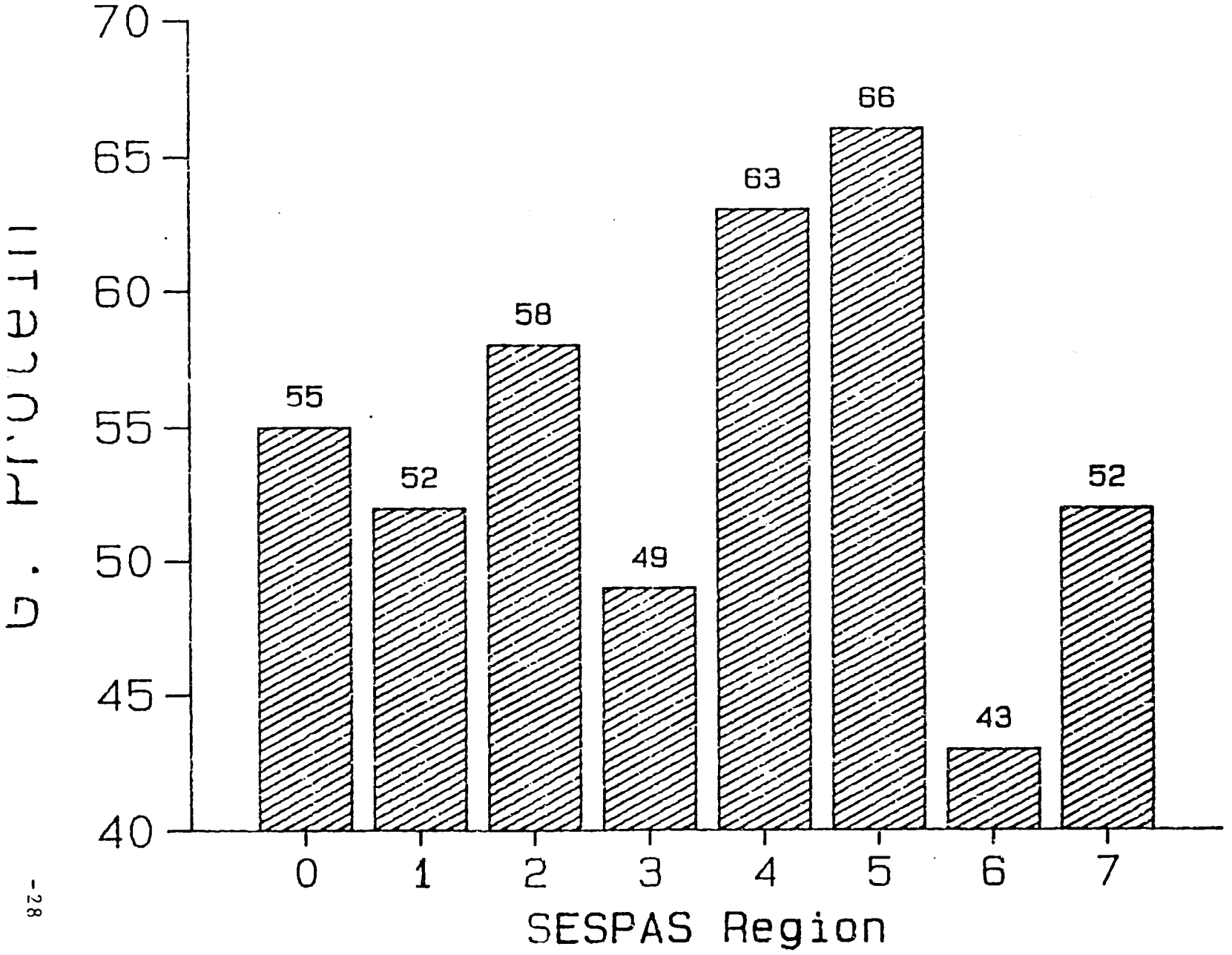
CALORIES PER ADULT MALE EQUIVALENT By SESPAS Region



N=1123

FIGURE 7.2.1

GRAMS PROTEIN PER ADULT MALE EQUIVALENT
By SESPAS Region



N=1123
p=0.000

FIGURE 7.2.2

PERCENT CALORIC AND PROTEIN ADEQUACY

By SESPAS Region

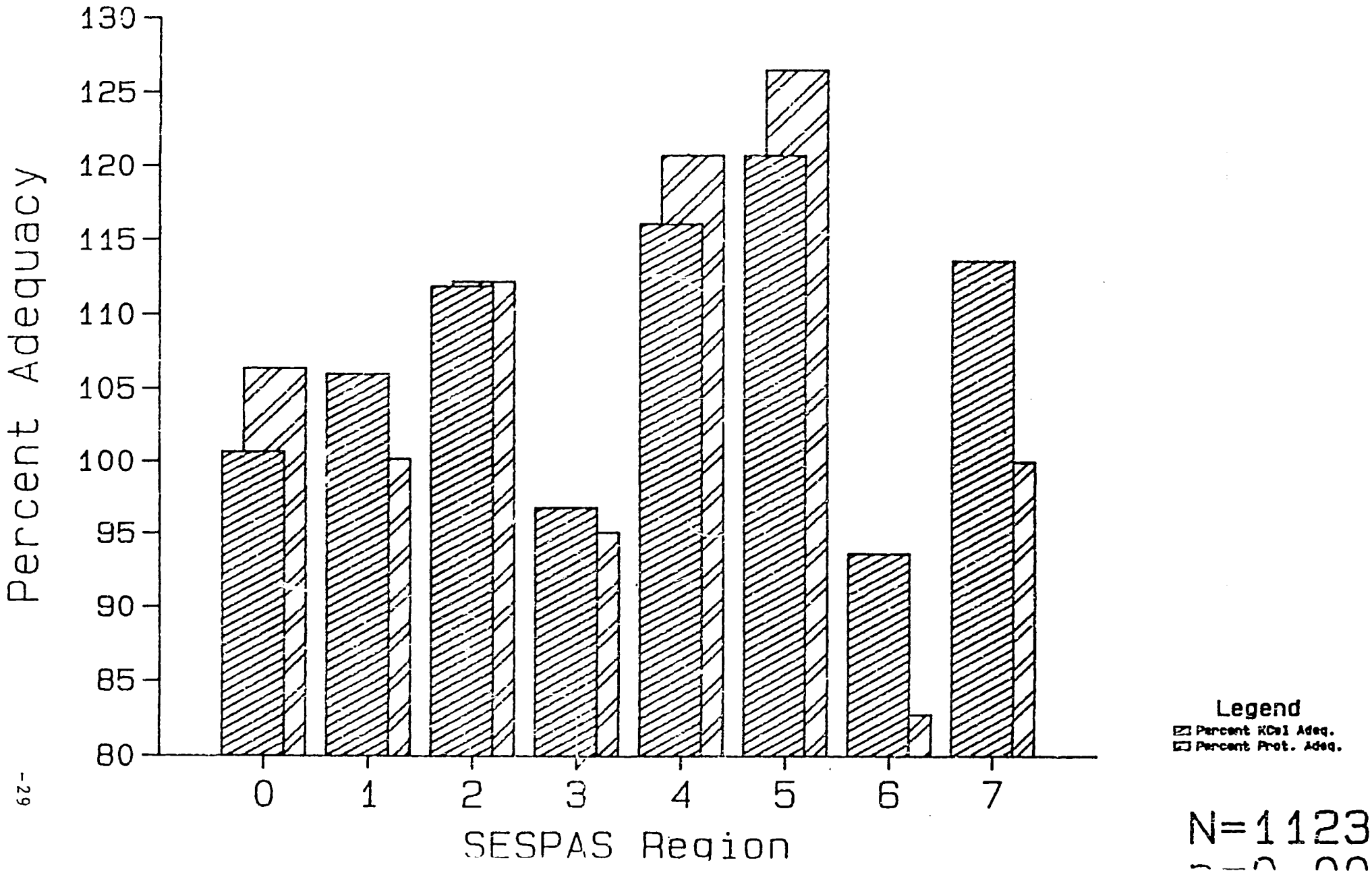


FIGURE 7.2.2

PERCENT CALORIC AND PROTEIN ADEQUACY

By SESPAS Region

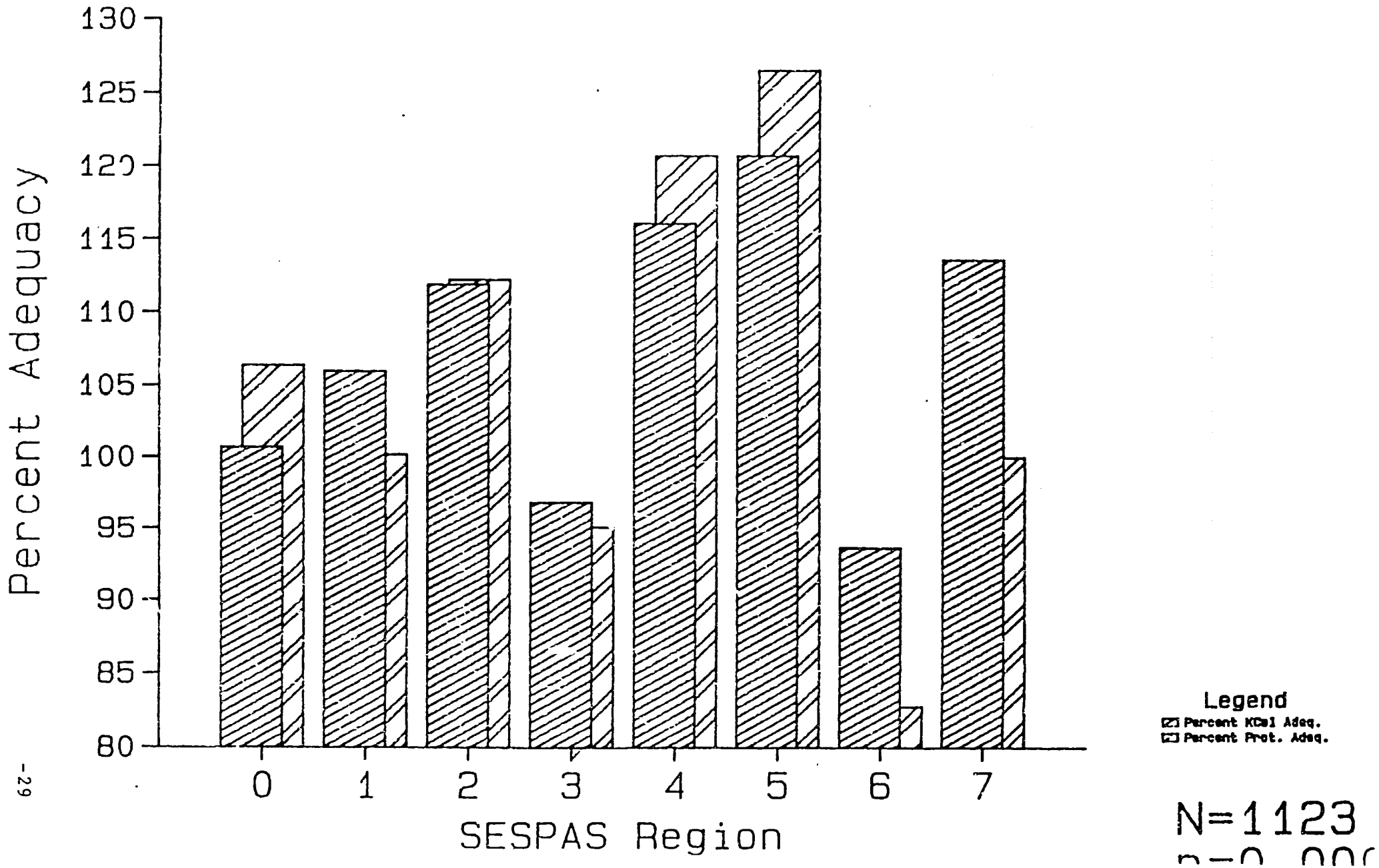


FIGURE 7.2.3

PERCENT CALORIC AND PROTEIN ADEQUACY
BY INCOME DECILE

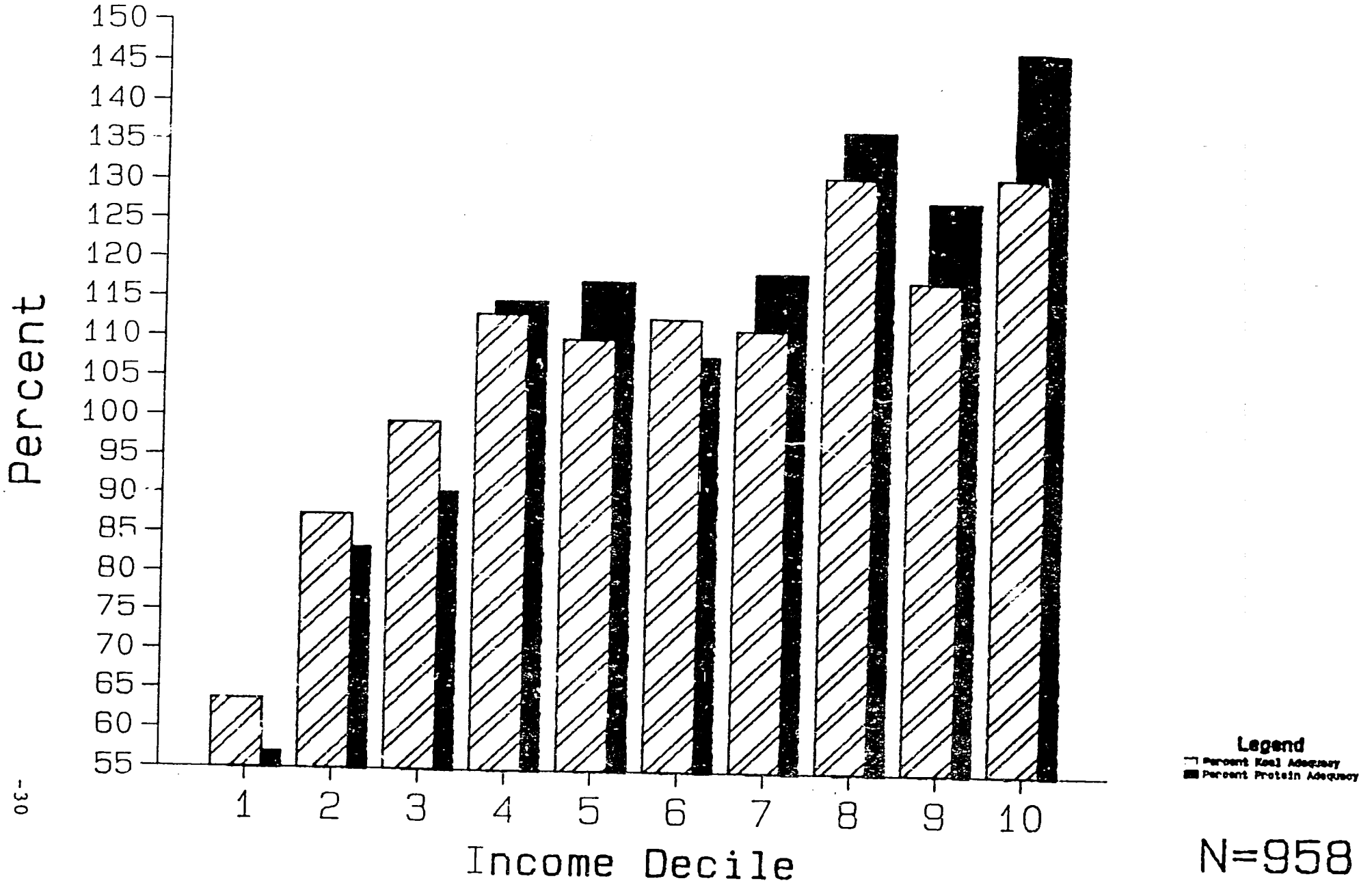
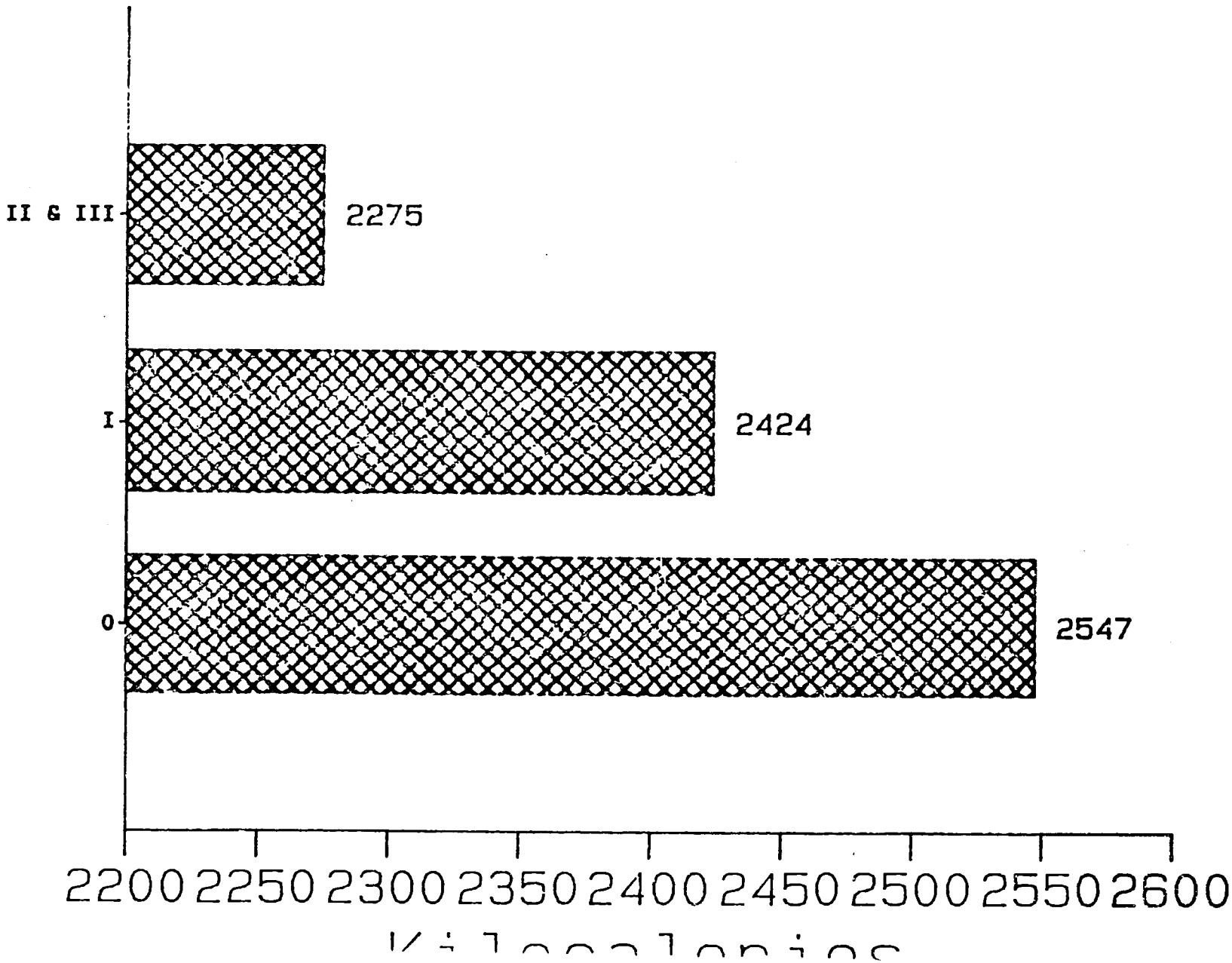


FIGURE 7.2.4

BREAKDOWN OF CALORIES
(Adult Male Equivalent)
By Degree of Malnutrition



N=104
n=0.0

FIGURE 7.2.5

BREAKDOWN OF PROTEIN
(Adult Male Equivalent)
By Degree of Malnutrition

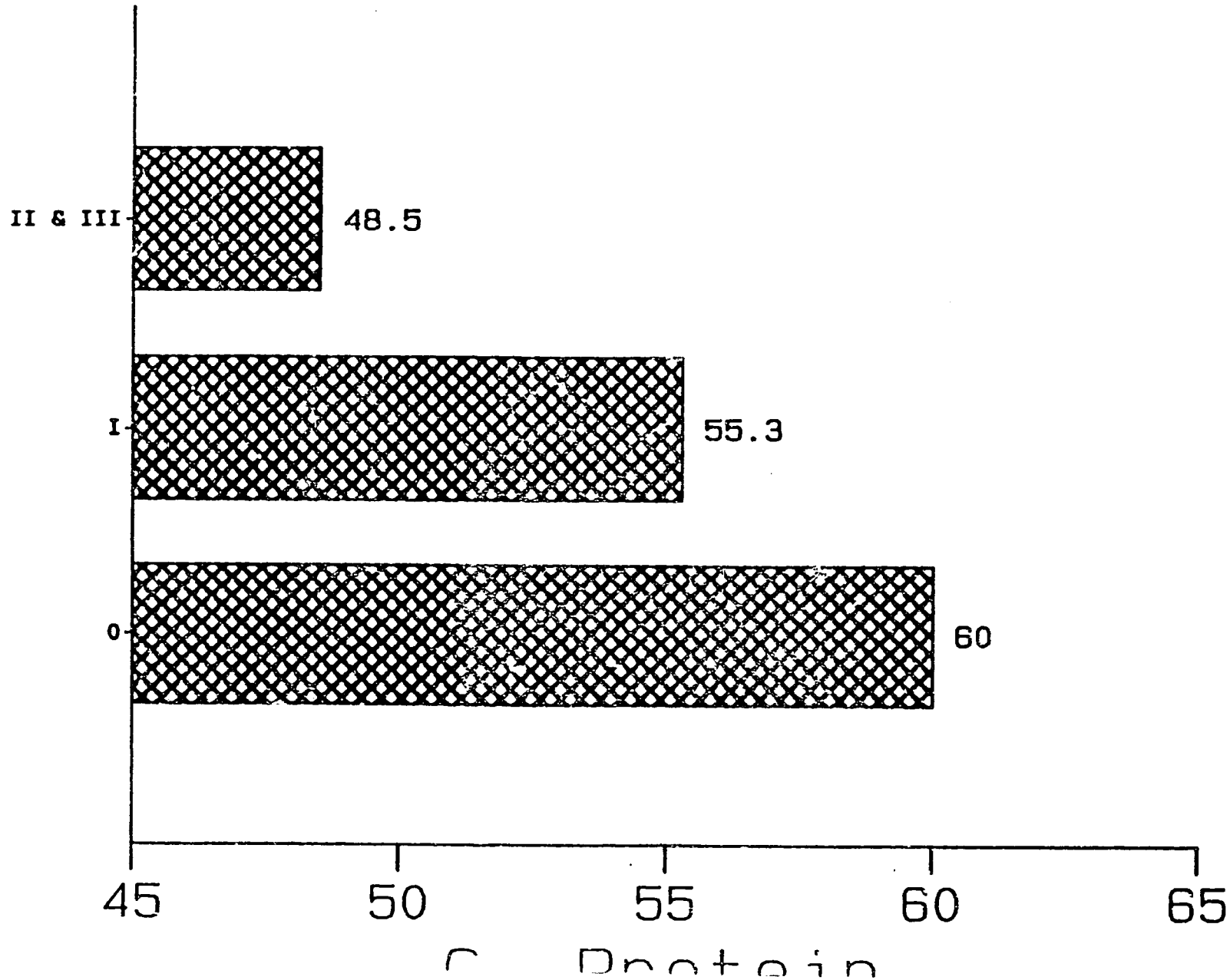
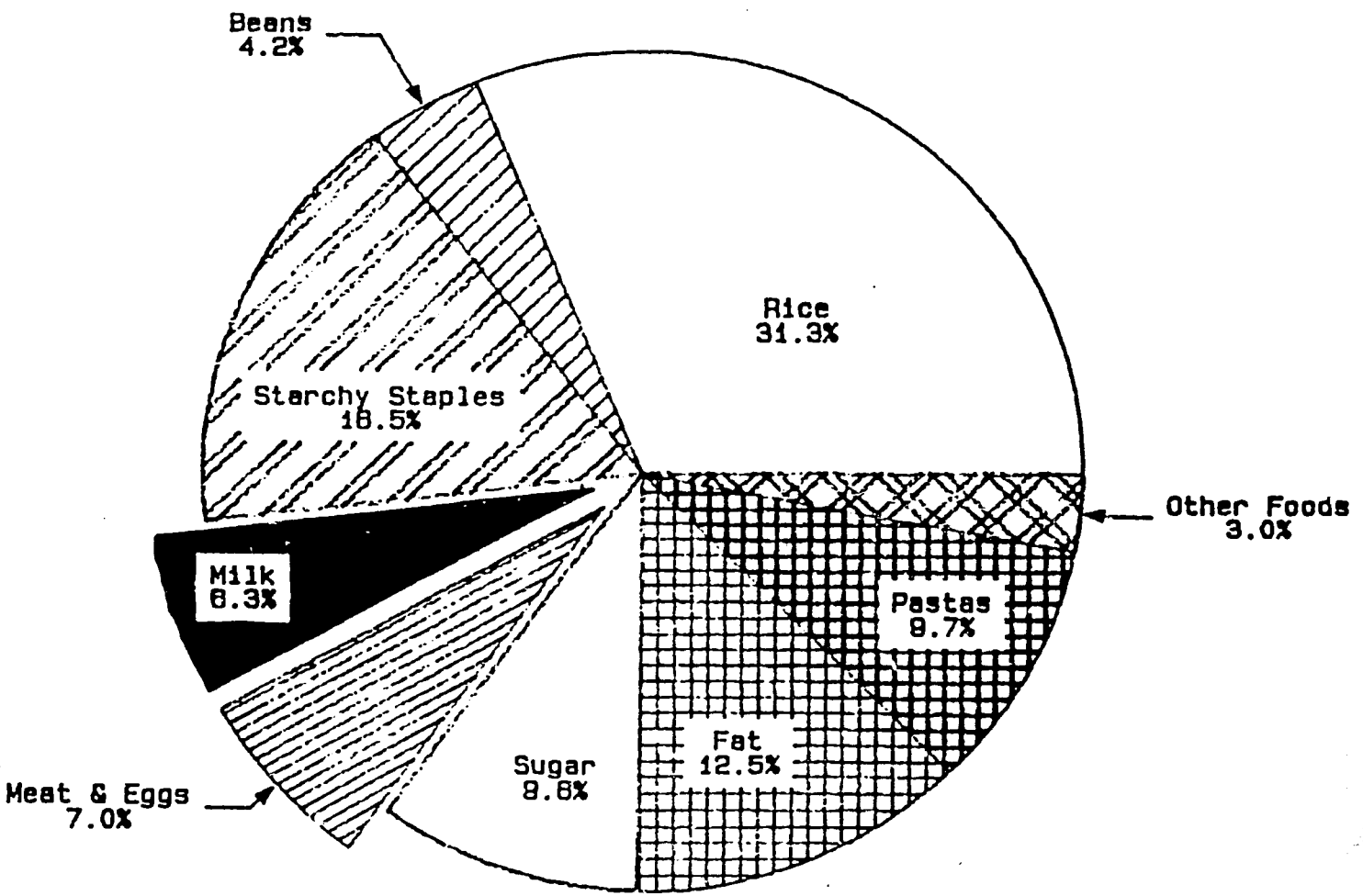


FIGURE 2.7

PERCENT CALORIES FROM MAJOR FOOD SOURCES

Total Population

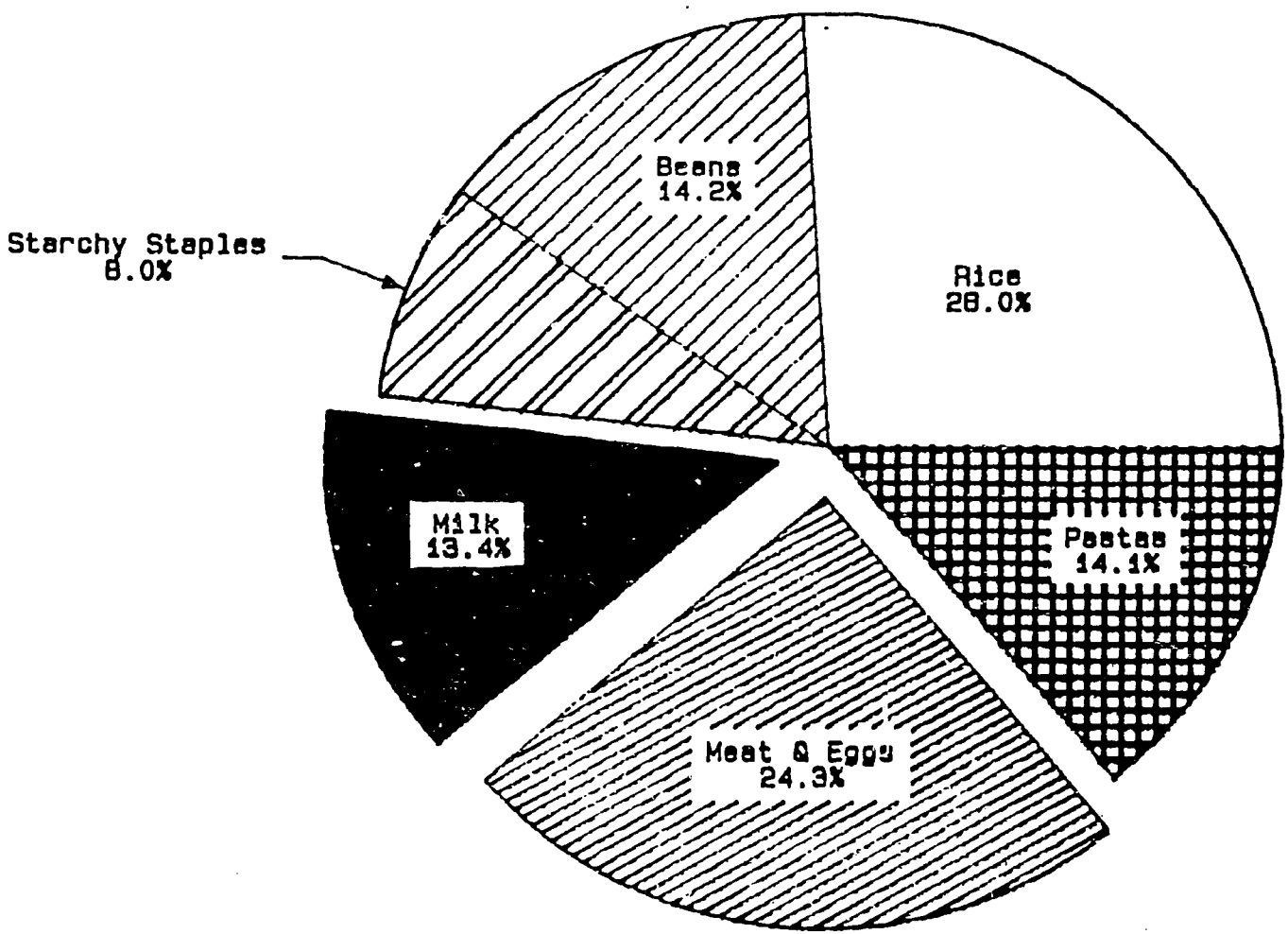


N=1105

FIGURE 7.2.8

PERCENT PROTEIN FROM MAJOR FOOD SOURCES

Total Population



N=1105

FIGURE 7.2.9

PERCENT CALORIES FROM MAJOR FOOD SOURCES

By Low and High Income Quartile

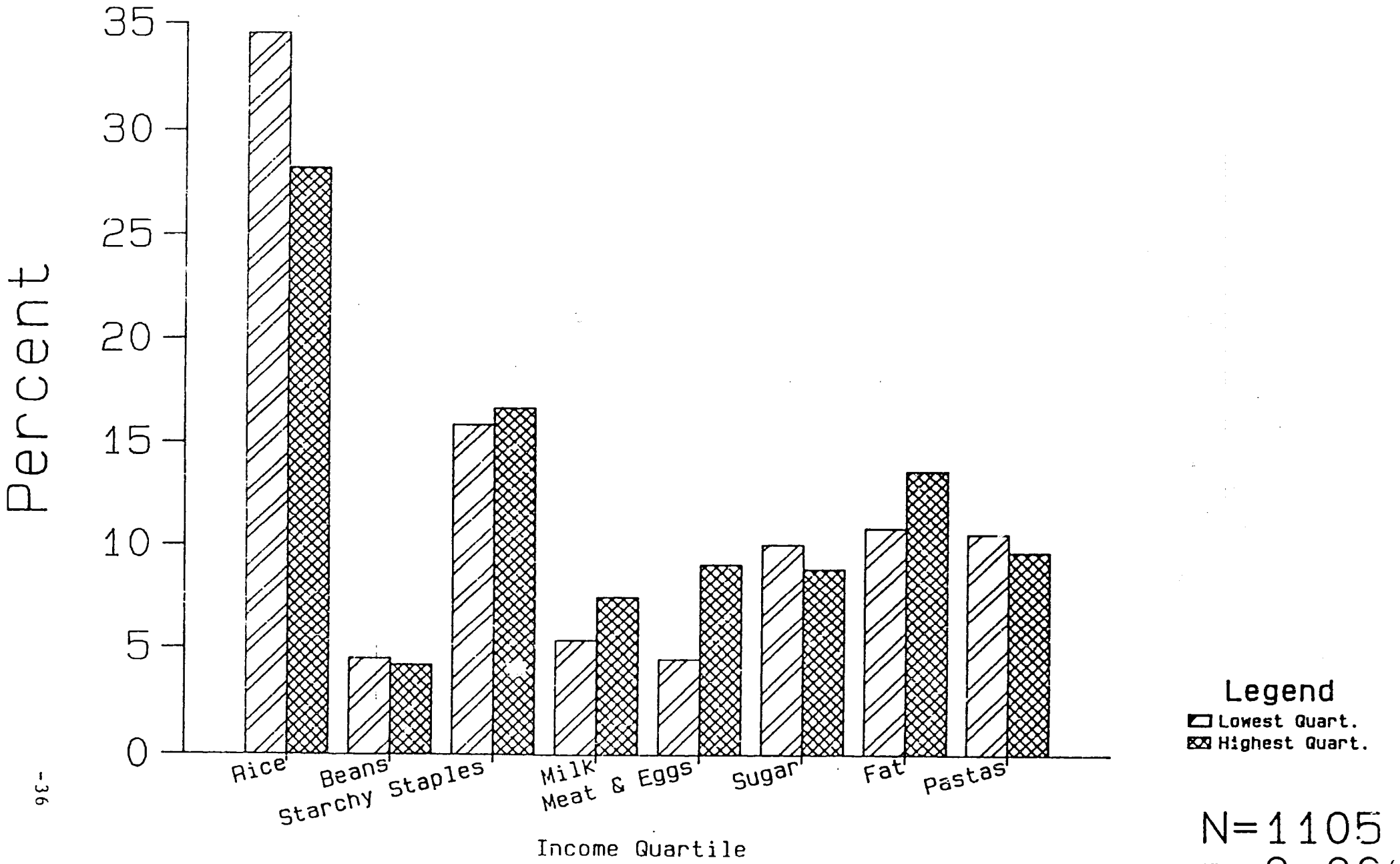
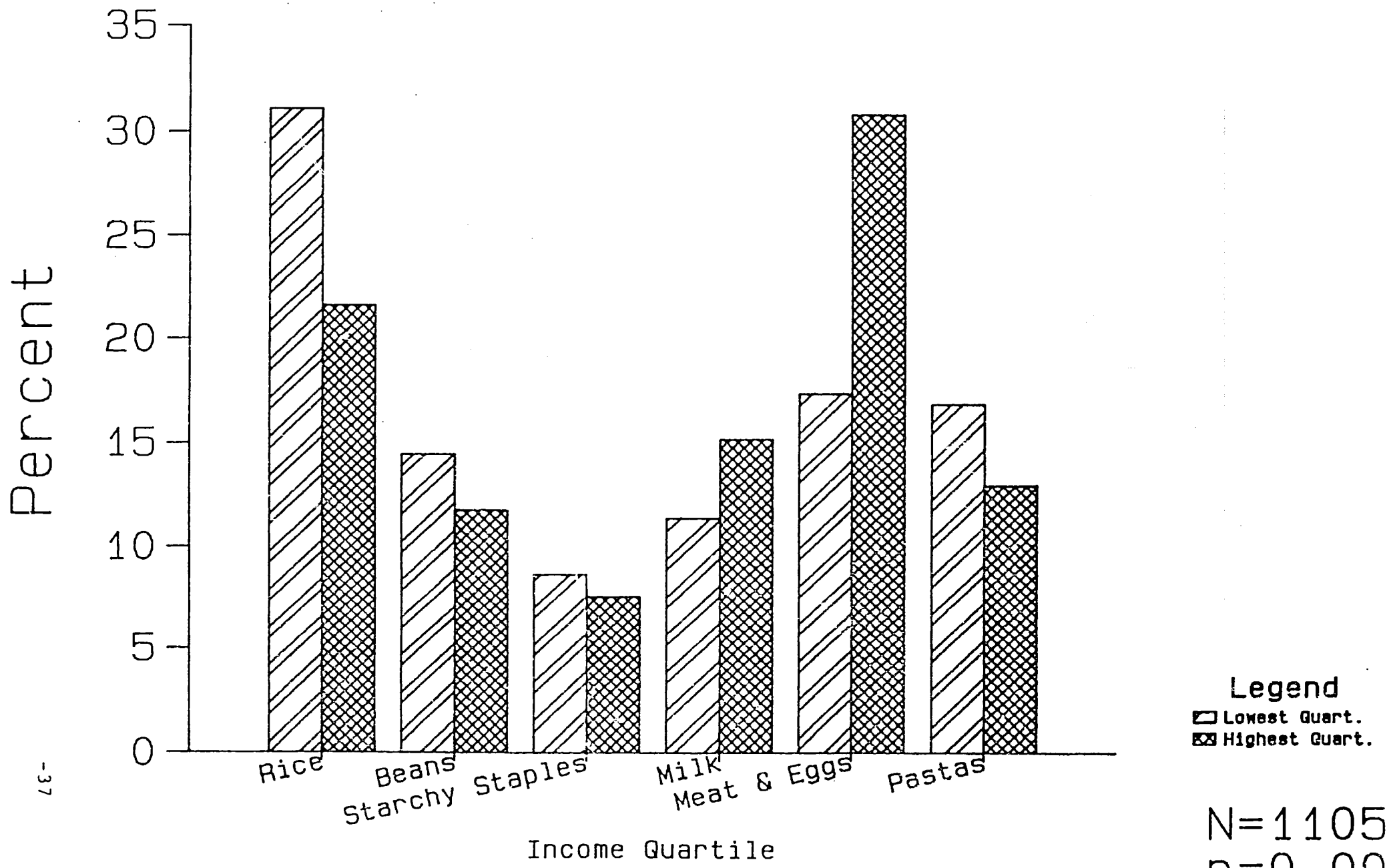


FIGURE 7.2.10

PERCENT PROTEIN FROM MAJOR FOOD SOURCES

By Low and High Income Quartile



7.3 INCOME

Figures 7.3.1 and 7.3.2 illustrate breakdown of real (including in-kind income) and earned income by SESPAS region and by strata. The difference between real income in the capital (Region 0: 538 pesos per month) and the West (Region 6: 288 pesos per month) was striking. These differences were further emphasized by strata breakdown. At 141 pesos per month, Stratum 3 (the Frontier) had the lowest earned income of the sample. Undoubtedly, main income source was by means other than cash earnings (e.g. agriculture). Nontheless, the trend toward urbanization is not surprising when such startling differences between incomes are noted. These relationships are crucial in understanding the conditions of poverty which lead to malnutrition.

7.4 GENERAL CHARACTERISTICS OF HOUSEHOLDS

Tables 7.4.0 and 7.4.1 examine selected housing and community variables by regional breakdown. On the whole, 64 percent of children in the sample lived in homes with separate kitchen for cooking; 75 percent had electricity, and garbage was collected for about one-fifth of those surveyed.

In terms of sanitary facilities, 17 percent of the total had no facilities; nearly half of all children studied in the West (Region 6) lacked these services. Shared latrines were most common in the capital and the Southwest. Tables 7.4.2-7.4.5 include these data for strata and income quartile breakdown.

A highly significant effect was noted between type of sanitary facility and nutritional status (Table 7.4.6). Children with lowest HAZ were from homes with no facilities (HAZ = -1.36). Table 7.4.7 depicts impact on morbidity: children who used comunal services had higher rates of diarrheal and respiratory illness than did the rest of the sample.

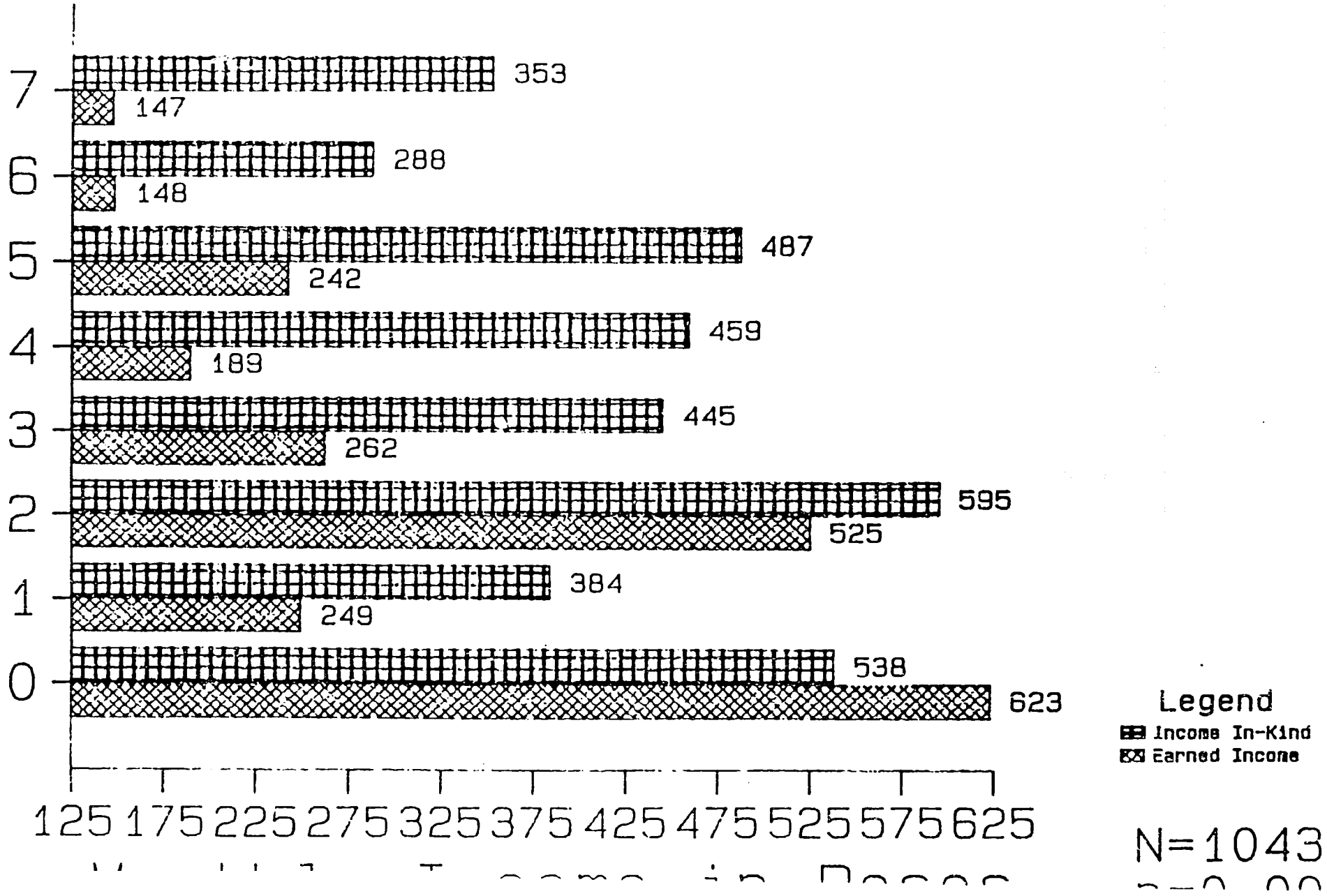
Water was usually obtained from an outdoor faucet, but for many families the primary water source was rivers, wells, etc. Two-thirds of children sampled in the West (Region 6) lived in situations where the main source of water was a river. By contrast, all those living in the capital obtained their water by faucet (albeit nearly one-third obtained it in the street) or, in a few cases, from cisterns. Examining the frontier as a whole (Table 7.4.9) revealed that none of the children surveyed were from families that had indoor faucets. Wells were fairly common, but nearly one-third of the sample obtained water from a river. Again, a strong income effect was evident (Table 7.4.10): inside faucets rose from 3.8 percent in the lowest quartile to 36.3 percent in the highest quartile.

The strong income bias masked the independent effect of water supply on nutrition. However, it is interesting to note that children from homes obtaining water in another home had the significantly lowest HAZ scores (-1.32), indicating again the impact of crowded living conditions and contamination.

Children whose families obtained water in the street had the highest duration of illness (7.5 days vs. 5.5 days for the entire sample, Table 7.4.12). The time they suffered with diarrhea was also highest (0.84 days vs. 0.56 days for the total population).

FIGURE 7.31

EARNED AND IN-KIND INCOME
By SESPAS Region



IGU 7.3

EARNED AND IN-KIND INCOME
By Strata

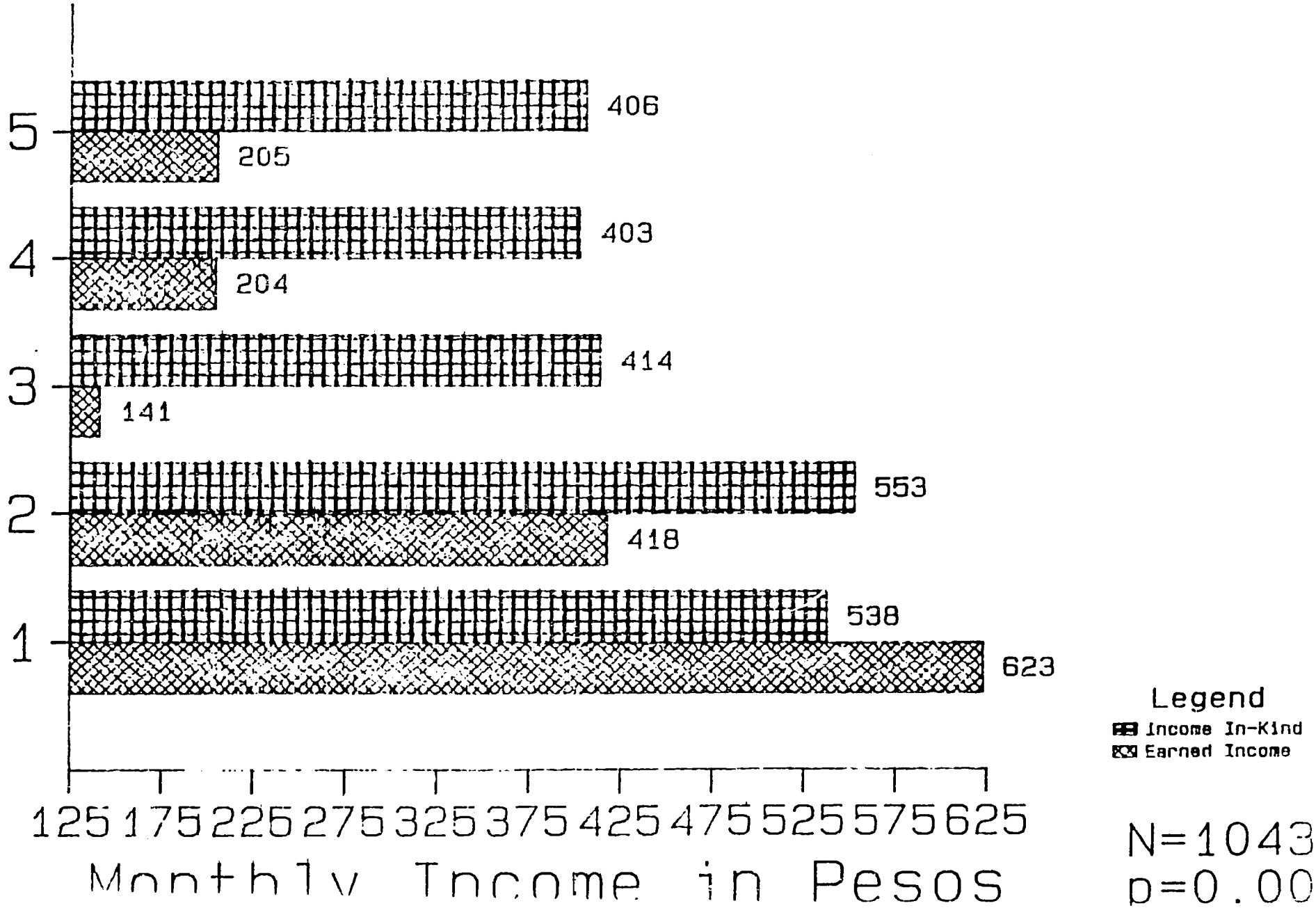


TABLE 7.4.0

SERVICES
BY SESPAS REGION

(PERCENT OF CHILDREN)

Number of Children: 1136

REGION	0 N=292	I N=108	II N=130	III N=81	IV N=253	V N=96	VI N=84	VII N=92	TOTAL N=1136
Separate Kitchen	N=171	N=57	N=116	N=75	N=148	N=60	N=42	N=67	N=736
	58.6	52.8	89.2	92.6	58.5	62.5	50.0	72.8	64.8%
Electricity	N=285	N=79	N=124	N=51	N=197	N=53	N=29	N=30	N=848
	100.0	77.5	95.4	63.0	77.9	55.2	34.5	32.6	75.5%
Garbage Collection	N=123	N=24	N=41	N=16	N=18	N=4	N=14	N=4	N=244
	43.2	23.1	32.0	19.8	7.3	4.3	16.7	4.3	21.9%

TABLE 7.4.1

TYPE OF SANITARY FACILITIES
BY SESPAS REGION

(PERCENT OF CHILDREN)

Number of Children: 1125; p=0.0000

REGION	0 N=286	I N=108	II N=130	III N=81	IV N=253	V N=96	VI N=83	VII N=92	TOTAL N=1129
PRIVATE TOILET	27.3	9.3	24.7	17.3	10.3	11.5	1.2	12.0	16.2%
SHARED TOILET	15.7	4.6	3.8		5.9	1.0	9.6	3.3	7.3%
PRIVATE LATRINE	19.6	49.1	56.9	64.2	15.0	28.1	14.5	70.7	33.4%
SHARED LATRINE	37.4	18.5	10.0	7.4	36.4	19.8	26.5	13.0	25.8%
NONE		18.5	4.6	11.1	32.4	39.6	48.2	1.1	17.4%

Table 4.2
DESCRIPTIVE CHARACTERISTICS
OF THE HOME AND COMMUNITY
BY STRATA
N=1166

	Santo Domingo N=329	Other Urban N=320	Fron_ tier N=42	Cane/ Livestock N=167	Other Rural N=309	Total N=1166
SEPARATE KITCHEN	58.6	62.4	64.9	63.1	74.7	64.8%
ELECTRICITY	100.0	93.2	47.8	48.9	75.3	82.0%
GARBAGE COLLECT.	43.2	39.7			5.1	24.3%

Table 7.4.3
TYPE OF SANITARY FACILITIES
BY STRATA
N=1046

	Santo Domingo N=288	Other Urban N=282	Fron_ tier N=39	Cane/ Livestock N=160	Other Rural N=277	Total N=1046
Indoor Private	27.3	28.5	5.4	2.8	5.5	17.3%
Indoor Comunal	15.7	8.9	4.4	2.1		7.2%
Private Latrine	19.6	33.1	21.0	51.8	61.5	39.3%
Comunal Latrine	37.4	19.2	39.5	9.9	13.7	22.1%
None		10.3	29.8	33.3	19.2	14.1%

Table 7.4.4
DESCRIPTIVE CHARACTERISTICS
OF THE HOME AND COMMUNITY
BY INCOME QUARTILE
N=948; p=0.000

	LOWEST QUARTILE N=235	QUARTILE 2 N=263	QUARTILE 3 N=244	HIGHEST QUARTILE N=206	TOTAL N=948
SEPARATE KITCHEN	51.5	59.1	71.8	74.3	63.7%
ELECTRICITY	62.8	80.2	88.2	92.5	80.5%
GARBAGE COLLECT.	6.4	23.6	26.8	37.6	23.2%

Table 7.4.5
TYPE OF SANITARY FACILITIES
BY INCOME QUARTILE
N=964; p=0.000

	LOWEST QUARTILE N=245	QUARTILE 2 N=265	QUARTILE 3 N=247	HIGHEST QUARTILE N=207	TOTAL N=964
INDOOR PRIVATE	5.4	9.3	16.7	40.1	16.8%
INDOOR COMUNAL	6.0	3.4	10.7	10.7	7.5%
PRIVATE LATRINE	38.3	42.8	36.4	32.8	37.9%
COMUNAL LATRINE	24.6	27.2	26.4	10.4	22.7%
NONE	25.7	17.4	9.8	5.9	15.1%

Table 7.4.6
ANTHROPOMETRICS AND INCIDENCE OF DIARRHEA
TYPE OF SANITARY FACILITY
N=1050

GROUP	COUNT	HAZ	WAZ	WHZ
Indoor Private	180	-0.60	-0.32	0.11
Indoor Comunal	75	-0.94	-0.72	-0.10
Private Latrine	411	-1.11	-0.71	-0.02
Comunal Latrine	231	-1.05	-0.63	0.06
None	151	-1.36	-0.95	-0.13
TOTAL	1050	-1.03	-0.66	0.00
SIGNIFICANCE		p=0.00	p=.000	(NS)

Table 7.4.7
TYPE OF SANITARY FACILITY
BY TYPE OF ILLNESS
N=1052

FACILITY	%ILL WITH ANY DIARRHEA	%ILL WITH ONLY DIARRHEA	% ILL WITH RESPIRATORY ONLY
INDOOR PRIVATE	8.7	4.3	21.8
INDOOR COMUNAL	13.3	5.3	28.6
PRIVATE LATRINE	11.2	4.3	21.3
COMUNAL LATRINE	16.8	3.3	27.5
NONE	9.1	2.4	19.8
SIGNIFICANCE	p=0.07	(NS)	(NS)

TABLE 7.4.8

SOURCE OF WATER
BY SESPAS REGION

(PERCENT OF CHILDREN)

Number of Children: 1136; p=0.000

REGION	0 N=292	I N=108	II N=130	III N=81	IV N=253	V N=96	VI N=84	VII N=92	TOTAL N=1136
Faucet Inside	24.0	17.6	35.7	13.6	7.8	7.3	2.4	8.7	16.1%
Faucet Outside	26.4	34.3	28.7	16.0	36.5	33.3	15.5	1.1	26.6%
Faucet in street	31.6	9.3		13.6	2.7			2.2	10.8%
Faucet in other house	11.3	6.5	15.5	9.9	22.4	21.9	14.3		13.9%
River		6.5	6.2	4.9	8.6	11.5	67.9	56.5	14.2%
Well		20.4	6.2	34.6	18.4	1.0		1.1	9.4%
Spring			4.7	2.5		17.7		6.5	2.7%
Cistern	6.5								1.7%
Tank		.9	3.1		2.4				1.0%
Other source		4.6		4.9	1.2	7.3		23.9	3.6%

Table 7.4.9
WATER SUPPLY BY STRATUM
N=1054

	Santo Domingo N=294	Other Urban N=286	Frontier N=39	Cane/ Livestock N=160	Other Rural N=276	Total N=1154
INDOOR FAUCET	24.0	31.3		10.6	5.0	18.1%
OUTDOOR FAUCET	26.4	35.9	22.9	19.1	27.6	28.1%
FAUCET IN STREET	31.8	5.6	1.5	7.1	.6	11.7%
OTHER HOUSE	11.3	22.9	12.2	7.1	13.8	14.5%
RIVER			31.7	17.0	21.0	9.2%
WELL		.7	21.5	16.3	21.0	8.9%
SPRING			2.9	12.1	4.4	3.1%
CISTERN	6.5					1.8%
TANK			2.9	2.1	1.1	.7%
OTHER		3.5	4.4	8.5	5.5	3.9%

Table 7.4.10
AVAILABILITY OF POTABLE WATER
BY INCOME QUARTILE
N=969· p=0.000

	LOWEST QUARTILE N=245	QUARTILE 2 N=266	QUARTILE 3 N=248	HIGHEST QUARTILE N=210	TOTAL N=969
INSIDE FAUCET	3.8	13.4	20.8	36.3	17.8%
OUTSIDE FAUCET	20.5	23.1	33.3	24.6	25.4%
FAUCET IN STREET	9.0	14.3	14.0	12.0	12.4%
OTHER HOME	17.4	16.1	11.1	13.0	14.5%
RIVER	19.9	14.8	3.0	2.5	10.4%
WELL	19.7	5.8	9.4	3.4	9.7%
SPRING	5.6	4.4	2.9		3.4%
CISTERN		1.1	2.0	3.8	1.7%
TANK	.2	2.0	.1	.7	.8%
OTHER	3.9	5.0	3.4	3.7	4.0%

Table 7.4.11
ANTHROPOMETRIC BREAKDOWN
BY SOURCE OF WATER SUPPLY
N=1029; p=0.000[illegible]

GROUP	COUNT	HAZ	WAZ	WHZ
Faucet Inside	181	-0.71	-0.39	0.09
Faucet Outside	289	-0.99	-0.62	0.01
In Street	122	-1.21	-0.95	-0.21
In Another Home	148	-1.32	-0.88	-0.07
River	101	-1.01	-0.56	0.12
Well	91	-1.18	-0.79	-0.05
Spring	32	-1.27	-1.07	-0.36
Cistern	18	-0.49	0.08	0.53
Tank	7	-1.48	-1.11	-0.35
Other	36	-0.90	-0.24	0.44
TOTAL	1029	-1.03	-0.66	0.00
SIGNIFICANCE		p=0.00	p=0.00	p=0.00

Table 7.4.12
TOTAL DURATION OF ILLNESS AND DIARRHEA
BY SOURCE OF WATER SUPPLY
N=1019; p=0.0001

GROUP	COUNT	DURATION OF ALL ILLNESS (DAYS)	DURATION OF DIARRHEAL ILLNESS (DAYS)
Faucet Inside	179	5.1	0.58
Faucet Outside	285	5.2	0.57
In Street	120	7.5	0.84
In Another Home	147	6.6	0.63
River	100	4.6	0.34
Well	91	5.0	0.68
Spring	32	4.4	0.01
Cistern	17	6.6	0.00
Tank	7	7.0	0.04
Other	36	2.7	0.36
TOTAL	1019	5.5	0.56

Table 7.4.13
ANTHROPOMETRICS
BY WATER SUPPLY
Inside or Outside Faucet vs. All Other
N=1140; p=0.000

GROUP	COUNT	HAZ	WAZ	WHZ
Faucet In or Out	669	-0.88	-0.53	0.04
All Other	471	-1.19	-0.79	-0.05
TOTAL	1140	-1.06	-0.69	-0.01
SIGNIFICANCE		p=0.00	p=0.00	p=0.09

TABLE 7.4.14

PRINCIPAL FUEL

BY SESPAS REGION

(PERCENT OF CHILDREN)

N=1117; p=0.000

REGION	0 N=290	I N=106	II N=128	III N=73	IV N=252	V N=96	VI N=84	VII N=88	TOTAL N=1117
ELECTRIC STOVE			1.6	1.4					.3%
ELEC. HOT PLATE	4.8					2.1			1.4%
PROPANE GAS	62.4	17.9	35.9	11.0		16.7	2.4	5.7	24.8%
CHARCOAL	32.8	28.3	39.1	37.0	42.1	41.7	27.4	37.5	36.2%
FIREWOOD		51.9	23.4	50.7	57.9	39.6	70.2	56.8	37.2%
OTHER		1.9							.2%

TABLE 7.4.15

SECONDARY FUEL
BY SESPAS REGION

(PERCENT OF CHILDREN)

N=1138; p=0.0000

REGION	0 N=292	I N=108	II N=130	III N=81	IV N=255	V N=96	VI N=84	VII N=92	TOTAL N=1138
NONE	72.6	62.0	66.2	77.8	62.4	78.1	84.5	91.3	71.8%
ELECTRIC STOVE	.7		.8		.8				.4%
ELEC. HOT PLATE	9.9		.8		.8				2.8%
PROPANE GAS	2.4	2.8	3.1	2.5	2.0	2.1	3.6	1.1	2.4%
CHARCOAL	13.4	30.6	24.6	12.3	23.5	14.6	10.7	1.1	17.4%
FIREWOOD	1.0	2.8	4.6	7.4	10.6	5.2	1.2	6.5	5.0%
OTHER		1.9							.2%

Table 7.4.16
TYPE OF PRIMARY FUEL
BY STRATUM
N=1036

	Santo Domingo N=292	Other Urban N=282	Fron_ tier N=37	Cane/ Livestock N=158	Other Rural N=267	Total N=1036
Electric Stove					1.7	.4%
Electric Burner	4.8			1.4		1.6%
Propane	62.4	27.0		5.0	7.4	27.6%
Charcoal	32.8	56.6	29.8	26.6	30.9	37.7%
Firewood		16.4	70.2	65.5	60.0	32.4%
Other				1.4		.2%

Table 7.4.17
TYPE OF SECONDARY FUEL
BY STRATUM
N=1036

	Santo Domingo N=294	Other Urban N=286	Fron_ tier N=39	Cane/ Livestock N=160	Other Rural N=277	Total N=1055
No Secondary Fu.	72.6	61.3	79.5	78.0	68.1	69.4%
Electric Stove	.7	.7			.5	.5%
Electric Burner	9.9	.7			.5	3.1%
Propane	2.4	4.6		2.8	1.6	2.8%
Charcoal	13.4	23.9	14.1	12.8	24.2	19.0%
Firewood	1.0	8.8	6.3	5.0	4.9	5.0%
Other.				1.4		.2%

Table 7.4.18
TYPE OF PRIMARY FUEL
BY INCOME QUARTILE
N=953; p=0.000

	LOWEST QUARTILE N=240	QUARTILE 2 N=260	QUARTILE 3 N=246	HIGHEST QUARTILE N=207	TOTAL N=953
ELECTRIC STOVE				1.5	.3%
ELECTRIC BURNER	3.9	1.2	1.2		1.6%
PROPANE	8.6	16.6	34.0	53.7	27.1%
CHARCOAL	30.8	47.6	38.0	26.2	36.3%
FIREWOOD	55.8	34.7	26.8	18.7	34.5%
OTHER	.9				.2%

Table 7.4.19
TYPE OF SECONDARY FUEL
BY INCOME QUARTILE
N=970; p=0.000

	LOWEST QUARTILE N=245	QUARTILE 2 N=266	QUARTILE 3 N=249	HIGHEST QUARTILE N=210	TOTAL N=970
NO SECOND. FUEL	77.0	74.2	63.5	67.7	70.7%
ELECTRIC STOVE		1.3	.4	.5	.6%
ELECTRIC BURNER	1.6	1.5	7.7	2.6	3.4%
PROPANE	3.1	1.9	2.9	2.5	2.6%
CHARCOAL	11.8	16.6	21.8	22.6	18.0%
FIREWOOD	5.5	4.5	3.7	4.1	4.5%
OTHER	.9				.2%

A highly significant difference was noted in HAZ and WAZ between those who enjoyed use of indoor or outdoor faucets and those who obtained their water from other sources. Inferior growth status was evident for children living with families who had less access to a clean water supply. Again, income is most probably one of the causal factors present to create this effect.

Tables 7.4.13-7.4.19 note the primary and secondary fuel sources by SESPAS region, strata, and income quartile. Over eighty percent of the homes in the lowest income quartile cooked with either charcoal or firewood (55.8 percent firewood and 30.8 percent charcoal, Table 7.4.18). This contrasted sharply with the highest income quartile, where over half cooked with propane.

7.5 MOTHER PROFILE

Tables 7.5.1-7.5.3 depict regional, strata, and income breakdown of pregnancies. Number of pregnancies was significantly different between regions and strata, but not income quartile. The average number of pregnancies for the entire population was 3.8 per mother.

The percent of pregnancies that had died ranged from a low of 3.3 in Santo Domingo (Region 0) to a high of 5.8 in the Southwest (Region 4). The number of pregnancies did not differ significantly between income quartile; similarly, percentage of stillbirths, abortions, and number alive showed little variation across income groups.

From these figures, a crude infant and child death rate was calculated. This was done by summing the number of children who died and the number of stillbirths, and dividing this sum by total number of term pregnancies:

(Number died + Number stillbirths)/
(Number pregnancies - Number abortions)

The ratio was lowest in the Northwest at 1.6 (Region 7) and highest in the Eastern Cibao, West, and the capital at 7.5 (Regions 3, 6, and 0, respectively).

This mortality estimation must be interpreted with care. It was not a certain figure for IMR nor for CMR: ages of those who died were not collected, nor were years in which they died. However, it could be used as one of a series of risk factors to help predict child malnutrition. Table 7.5.4 depicts such a sample calculation; in this example the estimation was examined within degree of malnutrition. As shown, the ratio increased significantly as nutritional status fell.

Tables 7.5.5-7.5.7 illustrate caretaker education status and age, percent of mothers using family planning, and percent of mothers working outside the home by regional, strata, and income breakdown. The average education level of caretakers was 5.2 years, ranging from a low of 3.7 years in the West (Region 6) to a high of 6.3 years in the capital (Region 0). A highly significant relationship was noted between women's education and nutritional status (Figure 7.5.1): as education in years increased, all anthropometric scores correspondingly rose. Examining the mortality ratio calculated above by education level, a highly significant difference can be noted between educational status (Table 7.5.8). As education rose, this ratio fell dramatically.

TABLE 7.51

PRENATAL HISTORY OF THE MOTHER BY SESPAS REGIONS
(Mean Value and Standard Deviation)

VARIABLE	POPULATION TOTAL N=807	0 N=224	I N=78	II N=99	III N=61	IV N=173	V N=75	VI N=42	VII N=55	NUMBER & SIGNIFICANCE
Percent Pregnancies Still Living	84.6 ±20.5	81.6 ±22.4	86.1 ±18.1	86.0 ±19.5	84.0 ±19.5	84.0 ±18.7	85.0 ±18.5	86.8 ±16.6	90.4 ±19.5	N= 803 P= NS
Percent pregnancies aborted	7.4 ±14.7	8.8 ±16.3	7.8 ±14.3	8.2 ±16.3	6.9 ±12.8	5.6 ±11.8	7.0 ±15.5	4.8 ±10.4	4.3 ±11.6	N= 796 NS
Percent pregnancies deceased	4.5 ±11.2	5.2 ±13.7	2.9 ± 9.9	3.6 ±9.4	4.5 ±10.5	5.8 ±11.5	5.3 ±11.2	5.3 ±8.4	1.5 ±5.9	N= 801 NS
Percent pregnancies stillborn	1.2 ±6.2	1.9 ±8.4	0.5 ±3.3	0.1 ±1.6	2.7 ±8.5	1.01 [illegible]	1.12 ±4.7	1.16 ±6.4	0 ±8.0	N= 801 P= 0.06
Total Number pregnancies	3.8 ±2.8	3.3 ±2.2	4.0 ±3.2	3.6 ±2.7	4.4 ±3.4	4.3 ±3.3	3.8 ±2.8	5.5 ±3.4	3.4 ±2.6	N= 803 P= 0.000
Mortality estimation*	6.3 ±13.9	7.5 ±16.7	3.6 ±10.6	4.3 ±10.8	7.5 ±14.9	7.0 ±13.1	6.9 ±15.2	7.5 ±10.6	1.6 ±6.1	N= 642 P= 0.03

*CALCULATION: $\frac{\text{Number Deceased} + \text{Number stillborn}}{\text{Total Pregnancies} - \text{Number Abortions}} \times 100$

Figure 7.5.1

ANTHROPOMETRICS BY MATERNAL EDUCATION LEVEL

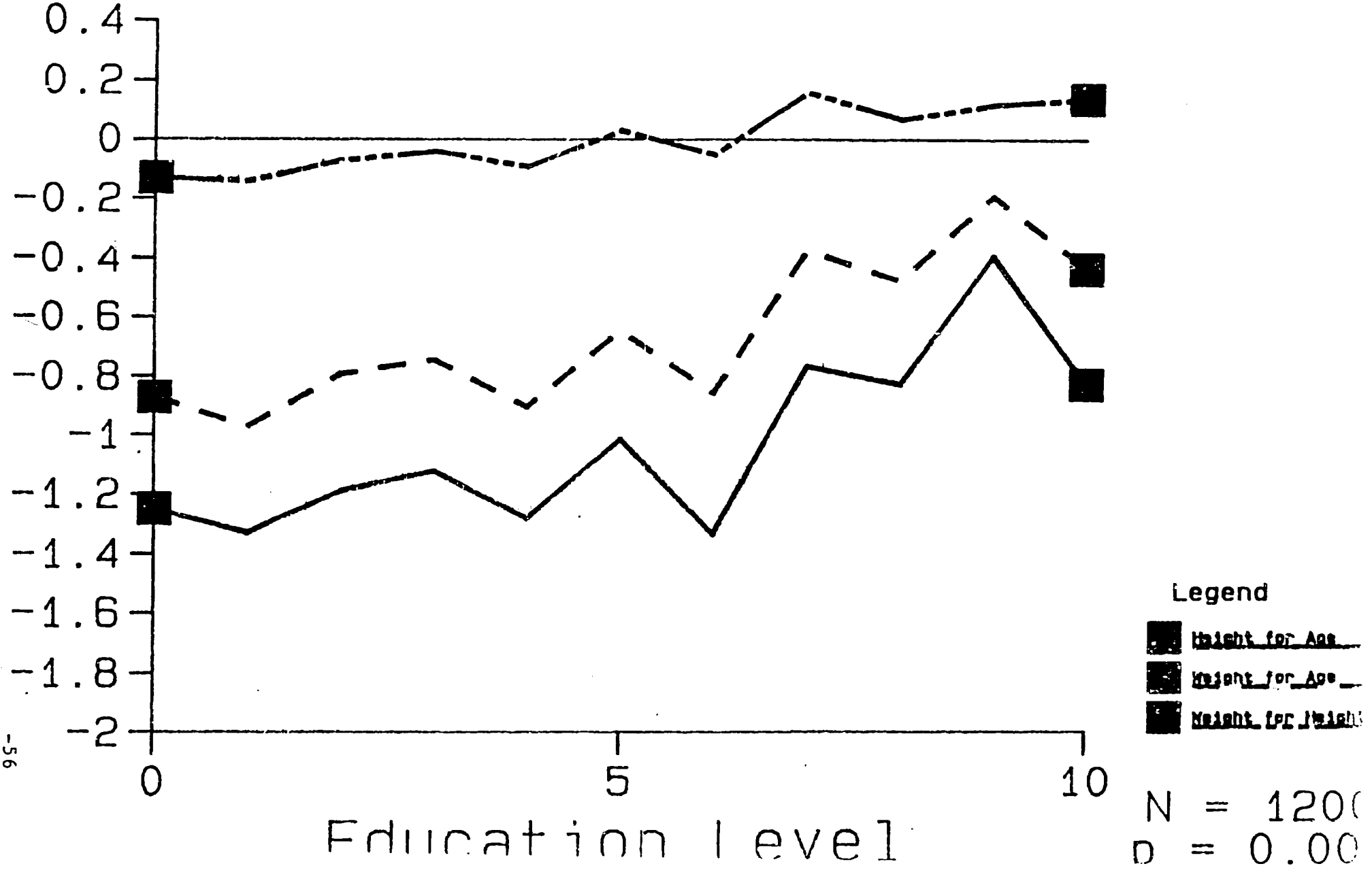


TABLE 7.52

PRENATAL HISTORY OF THE MOTHER BY STRATA
(Mean Value and Standard Deviation)

VARIABLE	POPULATION TOTAL	SANTO DOMINGO	OTHER URBAN	FRONTIER	CANE & LIVESTOCK	OTHER RURAL	NUMBER & SIGNIFICANCE
Percent Pregnancies Still Living	84.6 ±20.5	82.0 ±22.8	83.5 ±21.6	87.8 ±19.5	86.8 ±17.3	87.3 ±17.5	N= 773 P= 0.043
Percent pregnancies aborted	7.4 ±14.7	8.7 ±16.3	8.2 ±15.3	4.1 ±10.1	7.1 ±14.3	5.6 ±12.4	N= 765 NS
Percent pregnancies deceased	4.5 ±11.2	5.2 ±13.7	5.1 ±11.7	4.5 ±10.1	2.0 ±7.4	4.7 ±9.3	N= 772 NS
Percent pregnancies stillborn	1.2 ±6.2	1.9 ±8.4	1.2 ±5.8	0.4 ±2.6	1.0 ±4.8	0.89 ±4.8	N= 773 NS
Total Number of pregnancies	3.8 ±2.8	3.3 ±2.2	3.9 ±2.9	4.4 ±3.5	4.0 ±3.3	4.1 ±2.8	N= 773 P= 0.02
Mortality estimation*	6.3 ±13.9	7.5 ±16.6	6.8 ±14.4	5.2 ±11.2	3.3 ±9.0	6.1 ±12.1	N= 770 NS

*CALCULATION: $\frac{\text{Number Deceased} + \text{Number stillborn}}{\text{Total Pregnancies} - \text{Number Abortions}} \times 100$

Table 7.5.3
PRENATAL HISTORY OF THE MOTHER BY INCOME
(Mean Value and Standard Deviation)

VARIABLE	POPULATION TOTAL N=641	LOWEST QUARTILE N=159	QUARTILE 2 N=160	QUARTILE 3 N=169	HIGHEST QUARTILE N=152	NUMBER & SIGNIFICA
Percent Pregnancies Still Living	84.6 ±20.5	84.0 ±19.5	85.4 ±19.1	84.4 ±19.7	83.9 ±20.9	N= 63 NS
Percent pregnancies aborted	7.4 +14.7	7.0 +13.9	7.4 +14.2	7.4 +15.4	7.7 +15.3	N= 63 NS
Percent pregnancies deceased	4.5 ±11.2	5.5 ±13.7	4.1 ± 9.4	4.1 +10.0	4.5 ±10.6	N= 63 NS
Percent pregnancies stillborn	1.2 ±6.2	0.91 ±5.0	0.71 ±4.0	0.66 ±7.2	1.66 ±8.0	N= 63 NS
Total Number of pregnancies	1.8 ±2.8	3.6 ±2.5	4.1 ±2.9	3.9 ±2.8	3.6 ±2.7	N= 64 NS
Mortality estimation*	6.3 ±13.9	6.5 ±14.7	5.4 ±11.3	6.0 ±12.5	6.5 ±14.9	N= 64 NS

*CALCULATION: $\frac{\text{Number Deceased} + \text{Number stillborn}}{\text{Total Pregnancies} - \text{Number Abortions}} \times 100$

Table 7.5.4
ESTIMATED MORTALITY
BY DEGREE OF MALNUTRITION
N=1136; p=0.06

GROUP	COUNT	MEAN	STANDARD DEVIATION
Normal	676	5.64	12.81
First Degree	371	6.69	12.61
Second Degree	89	8.90	17.24
TOTAL	1136	6.24	13.17

TABLE 7.55

MOTHER/ CARETAKER INFORMATION*
BY REGIONS
(Mean Value and Standard Deviation)

	Population Total	REGIONS 0 N=226	I N=77	II N=98	III N=61	IV N=174	V N=75	VI N=41	VII N=54	Num. Si
ducation (Years) (C)	5.2 ±3.9	6.3 ±3.7	4.4 ±3.7	6.1 ±3.9	5.4 ±4.0	4.1 ±4.1	3.6 ±3.5	3.7 ±3.8	4.7 ±3.0	N= P=0.
ge (Years (C)	32.8 ±13.2	30.0 ±12.0	34.1 ±12.8	33.0 ±13.5	32.5 ±9.6	33.2 ±13.9	34.9 ±15.5	33.9 ±13.5	33.9 ±11.7	N= P=0.
ercent using amily planning	43.0%	49.3	42.6	38.8	37.3	36.1	32.8	44.4	48.0	N=
ercent Working utside the home	25.2%	24.1	18.2	35.0	21.7	18.7	34.7	19.0	21.1	N= P=0.

(M)= Mother
(C)= Caretaker

TABLE 7.56

MOTHER/CARETAKER INFORMATION*
BY STRATA
(Mean Value and Standard Deviation)

VARIABLE	Population Total	Santo Domingo N=227	Other Urban N=215	Frontier N=26	Cane & Livestock N=112	Other Rural N=191	Number and Significance
EDUCATION (C) (Years)	5.2 ±3.9	6.2 ±3.7	5.2 ±4.1	3.6 ±3.8	3.7 ±3.2	5.2 ±3.8	N=772 P=0.000
AGE (C) (Years)	32.8 ±13.2	30.0 ±12.0	34.1 ±14.6	31.9 ±12.0	34.4 ±13.5	33.8 ±12.3	N=696 P=0.007
Percent Using Family planning (M)	43.0%	49.3%	40.5%	34.3%	38.5%	41.5%	N=720 NS
Percent working outside the home (M)	25.2%	24.1	34.9	14.7	16.8	22.2	N=769 P=0.008

* (M) = Mother
(C) = Caretaker

TABLE 7.57

MOTHER/ CARETAKER INFORMATION
BY INCOME QUARTILE
(Mean Value and Standard Deviation)*

VARIABLE	Population Total	Quartile Lowest	Quartile 2	Quaratile 3	Quartile Highest	Number & sig.
Education (Years) (C)	5.2 ±3.9	4.2 ±3.3	4.8 ±3.7	5.6 ±4.0	6.4 ±4.3	N=640 P=0.000
Age (Years) (C)	32.8 ±13.2	33.7 ±14.5	31.9 ±12.4	31.9 ±13.2	34.8 ±13.2	N=570 NS
Percent Using Family planning	43.0%	40.2%	45.0%	45.2%	44.8%	N=603 NS
Percent working outside the home	25.2%	15.1%	23.4%	28.3%	37.5%	N=644 P=0.000

* (M)= Mother
(C)= Caretaker

Table 7.5.8
ESTIMATED MORTALITY RATIO OF INFANTS AND CHILDREN
BY YEARS OF CARETAKER EDUCATION
N=1136; p=0.000

YEARS OF EDUCATION	COUNT	MEAN	STANDARD DEVIATION
No Education	180	8.28	15.35
One to Two	109	8.75	14.14
Three	116	9.02	15.38
Four	135	6.93	13.23
Five	103	7.63	15.44
Six	98	4.70	11.88
Seven	71	6.57	12.71
Eight	99	3.19	9.12
Nine to Eleven	82	3.56	10.54
Twelve	92	1.28	5.99
Thirteen and More	47	4.20	10.55
TOTAL	1136	6.24	13.17

Table 7.5.9
ESTIMATED INFANT AND CHILD MORTALITY
BY USE OF FAMILY PLANNING
N=1063; p=0.30 (NS)

GROUP	COUNT	MEAN	STANDARD DEVIATION
Uses Family Planning	486	5.7367	12.1235
Does Not Use Family Planning	576	6.5628	13.6094
TOTAL	1063	6.1846	12.9509

TABLE 7.6.2

CARETAKER CHARACTERISTICS AND CHILD ANTHROPOMETRY

FOR TOTAL POPULATION

VARIABLE	NUMBER	HEIGHT FOR AGE (Z-SCORE) ALL CHILDREN	WEIGHT FOR AGE (Z-SCORE) ALL CHILDREN	WEIGHT FOR AGE(Z-SCORE) ALL CHILDREN
1- Anthropometry and Caretaker		X = - .9506 P = .0028	X = - .6776 P = .0202	X = - .0461 P = .0926
- Mother	888	- .9670	- .6656	- .0186
- Grandmother	188	- 1.0459	- .7948	- .1221
- Aunt	35	- .9619	- .7770	- .2079
- Sister/Brother	28	- 1.0756	- .6745	.1691
- Domestic	29	.0017	.0284	.1722
- Other	54	- .7945	- .7828	- .3523
2- Anthropometry and Nutritional beliefs	1,175	X = - .9429 (NS)	X = - .6616 P = .0120	X = - .0260 P = .0024
The best milk for a newborn				
- Breastmilk Superior	1,124	- .9252	- .6456	- .0153
- Infant Formula Superior	28	- 1.2409	- .9645	- .2493
- Any milk appropriate	7	- 1.7803	- 1.9376	- 1.3002
- Other	15	- 1.2785	- .6665	.2829
3- Anthropometrics & Age of Caretaker	1,108	R = .0082 P = .784 (NS)	R = - .0391 (NS)	R = - .0588 P = .05
4- Antropometrics & Educational level of Caretaker	1,200	R = .1781 P = .0001	R = .1863 P = .0001	R = .0889 P = .002

Average age of caretaker was 38.8 years. Children were of highest nutritional status with caretakers aged within the range of 20 to 39 years, and 50 to 69 years. Caretakers younger than 20 years may have been too stressed to provide adequate care; similarly, young children may have posed too difficult a strain on women over 70 years old. Children being cared for by women between the ages of 40 to 49 also tended to be in poorer nutritional status. This may have been because their higher birth order and likelihood of competing with older siblings for scarce resources predisposed them to poorer overall health.

Forty-three percent of the sample reported using family planning; this ranged from a low of 32.8 percent in the East (Region 5) to a high of 49.3 percent in the capital (Region 0). Interesting to note is that the estimation for mortality rate was lower for mothers who reportedly used a family planning method (Table 7.5.9).

7.6 BREASTFEEDING AND WEANING

7.6.1. WEANING: BREAST VS. BOTTLE

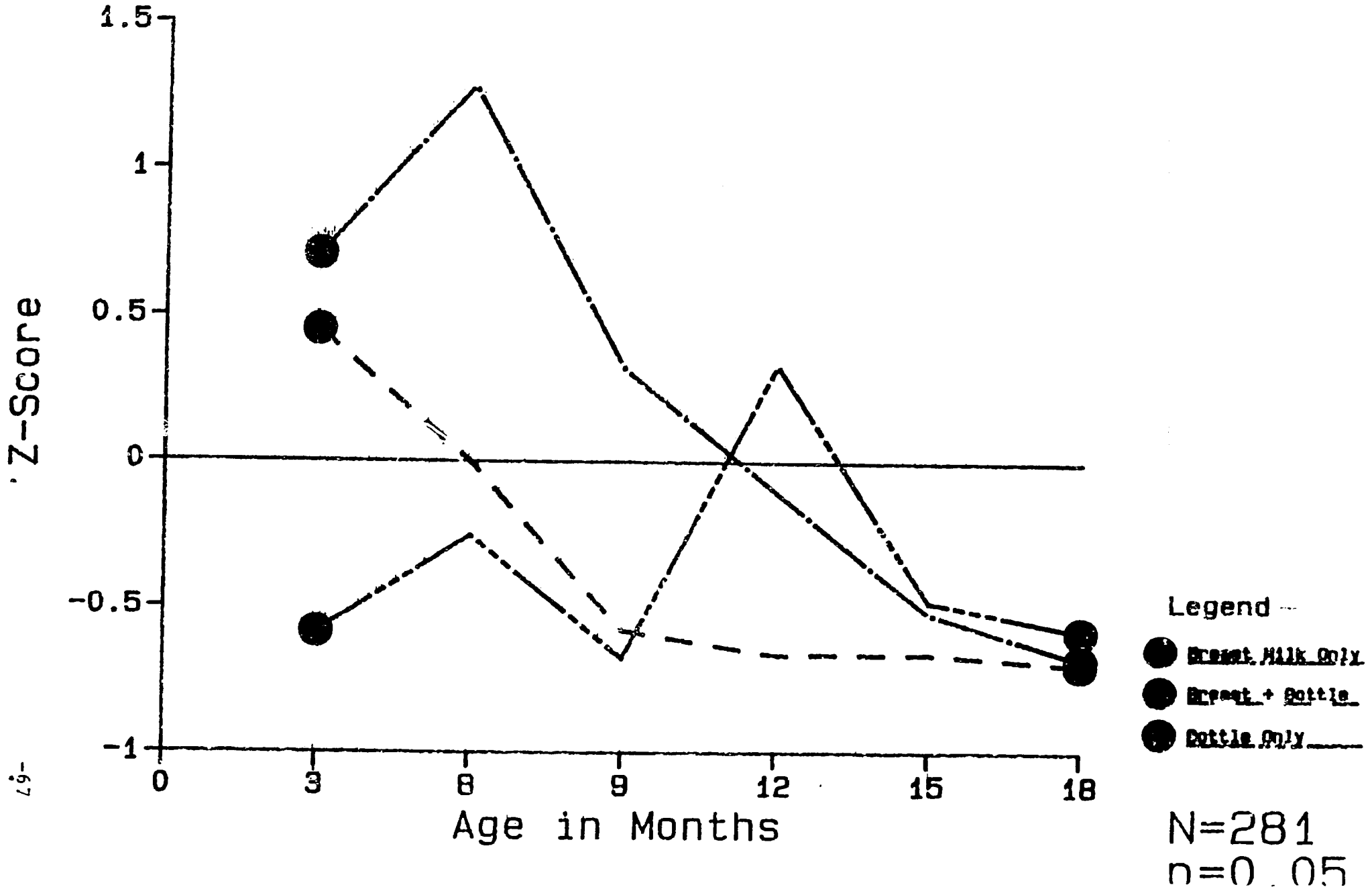
As mentioned in the preliminary report, 93% of all children were breastfed; 90% were also bottlefed. Weaning from breast occured at around eight to nine months, with 30% weaning at three months, 50% weaning at 5 months, and 75% weaning at 13 months. Thus, only 25% of children in the sample were breastfed for the first year of life.

Over 92 percent of all mothers breastfed; indeed, there was a strong belief that breast milk was the most superior food to offer a newborn (Tables 7.6.1 and 7.6.2). Unfortunately, there was also a concomitant belief that bottle feeding was also necessary for a healthy infant. Early introduction of the bottle (1.1 months) thus was the norm. Tables 7.6.11 and 7.6.12 also note the reasons why mothers discontinued bottlefeeding. In nearly 45 percent of the cases, the reasons could be attributed to bottle feeding (baby refused, milk ceased/insufficient milk supply).

Figure 7.6.1 depicts what occurred during the first 18 months of life with babies solely breastfed, breast and bottlefed, and solely bottlefed. As shown, those who were solely breastfed reached their peak in growth at six months, far surpassing their bottlefed counterparts in WHZ. Those who were combination fed also sustained growth levels above those solely bottlefed. This relationship is crucial in the examination of infant health, as it may account for the rapid decline of growth during the first six months: those who are combination or bottlefed decline in growth velocity during this period, while those solely breastfed advance.

It is believed that the growth of breastfed infants fell precipitously after six months due to late age of introduction of solid foods (ref. Table 7.6.11). Average age of introducing solids in this culture was nearly seven months, and similar for all regions and income quartiles. At the age of four to six months, breastmilk alone is no longer sufficient to sustain growth. It is postulated that earlier introduction of solids, particularly those which are nutrient dense, and intensive feeding (holding infant, actively interracting during each feeding episode) would curtail this effect.

WEIGHT-FOR-HEIGHT OF BREAST AND BOTTLE-FED INFANTS



7.6.2 CHARACTERISTICS OF CARETAKER AND NUTRITION

Table 7.6.2 elaborates the relationship between child nutrition and relationship to primary caretaker, caretaker's age, and educational level. Beliefs about neonatal feeding are also compared with anthropometric outcomes. Not surprisingly, those working in the home were ranked the best caretakers; again, this was most probably an income effect. Surprisingly, children's aunts did quite well in terms of reliable caretaking practices. Grandmothers and older siblings were not adequate, most probably because extreme age would not be conducive to optimal child rearing practices, especially when considering the demands of a very young child or infant. These data strongly indicate that the social networking sytem in place in the Dominican Republic was highly conducive to mother's absence, and that in the case of maternal employment outside the home, there would be a high likelihood of the child receiving adequate care.

It must also be noted that the "other" category listed as primary caretaker was mostly comprised of women who had adopted children. Many of these women were caring for a neighbor or friend's child, and often had no children of their own. Children were either legally or informally adopted. Other than children of wealthier homes who were cared for by domestic workers, these children fared the best. Perhaps they were considered to be even more special to these women who had no children of their own, and so were given even more careful treatment. Because this trend is not completely uncommon in the Dominican Republic, it is encouraging to note such positive results.

7.6.3 WEANING FOODS

Most commonly used weaning foods were potatoes and soup ("sopa", commonly made with pasta) (Figure 7.6.31). Fruit purees, rice, eggs, and gruels were also frequently reported as being first solid foods fed to infants. Foods used in bottlefeeding were tea, juice, infant formula, animal milks, and several indigenous blends such as rice tea, and rice and milk (Figure 7.6.32).

Two trends are evident in these tables: (1) the lowest income quartiles, having less means to provide high-quality foods for their offspring, chose less expensive and nutritionally inferior foods (cow's milk, powdered milk rather than infant formula); (2) females consistently received less nutritionally-dense foods than males, and were fed more teas, broths, and gruels. Although for the most part these differences failed to be significant, they nontheless were consistently found throughout the data.

TABLE 7.6.11

NUTRITIONAL BELIEF AND PRACTICES OF CARETAKERS
BY SESPAS REGION

VARIABLE	POPULATION TOTAL N=652	0 N=216	I N=73	II N=96	III N=60	IV N=171	V N=71	VI N=41	VII N=53	NUMBER & SIGNIFICANCE
Best food for a newborn (%)										
Breast Milk	91.4	92.6	85.6	98.3	98.6	84.3	85.1	96.8	91.5	N=775
Infant Formula	2.0	2.1	7.7	0	0	5.0	1.1	0	0	NS
Any type of Milk	0.5	1.5	0.0	0	0	0.9	0	0	0	
Other	1.6	0.3	4.1	0	0	2.5	5.8	3.2	0	
Why discontinued Breastfeeding										
Baby refused	13.5	12.6	14.8	15.5	12.3	17.0	8.9	8.5	6.2	N= 708
*Milk ceased/insuffic.Milk	29.4	33.0	28.0	39.6	35.7	16.4	19.3	17.0	26.2	NS
Medical Advice	0.5	0.3	0.0	1.2	1.4	0.0	0.0	0.0	4.2	
Mother refused	2.1	0.9	2.1	3.5	1.4	1.3	2.9	0.0	8.4	
Mother worked outside home	2.5	0.0	0.0	7.9	0.0	1.3	5.8	0.0	5.4	
Chil more than 6 months old	29.2	9.5	9.0	19.2	35.7	36.1	28.0	49.4	28.9	
Mother became ill	3.9	10.8	5.3	2.5	1.8	4.8	8.2	6.9	9.5	
Age of first solid feed:										
beans paste		77.7	48.0	90.1	88.3	43.0	48.2	52.8	77.2	
Potatoe puree		76.4	51.9	64.8	73.2	17.9	32.1	12.0	51.1	
Fruit puree		36.0	14.2	15.7	25.0	7.1	20.7	12.6	17.1	
Rice paste		15.3	6.7	2.5	3.6	9.5	27.5	16.6	2.0	
Soup		62.4	39.2	42.3	65.6	32.8	27.1	35.7	24.6	
Age of introduction of solids	6.9 ±14.4	8.2 ±18.2	5.0 ±7.6	6.2 ±12.2	8.3 ±13.2	7.4 ±16.0	8.6 ±17.1	5.3 ±13.2	7.2 ±14.4	N=775 NS

SUMMATION OF = (1) Mothers milk supply ceased
(2) Mother with insufficient milk

TABLE 7.6.12

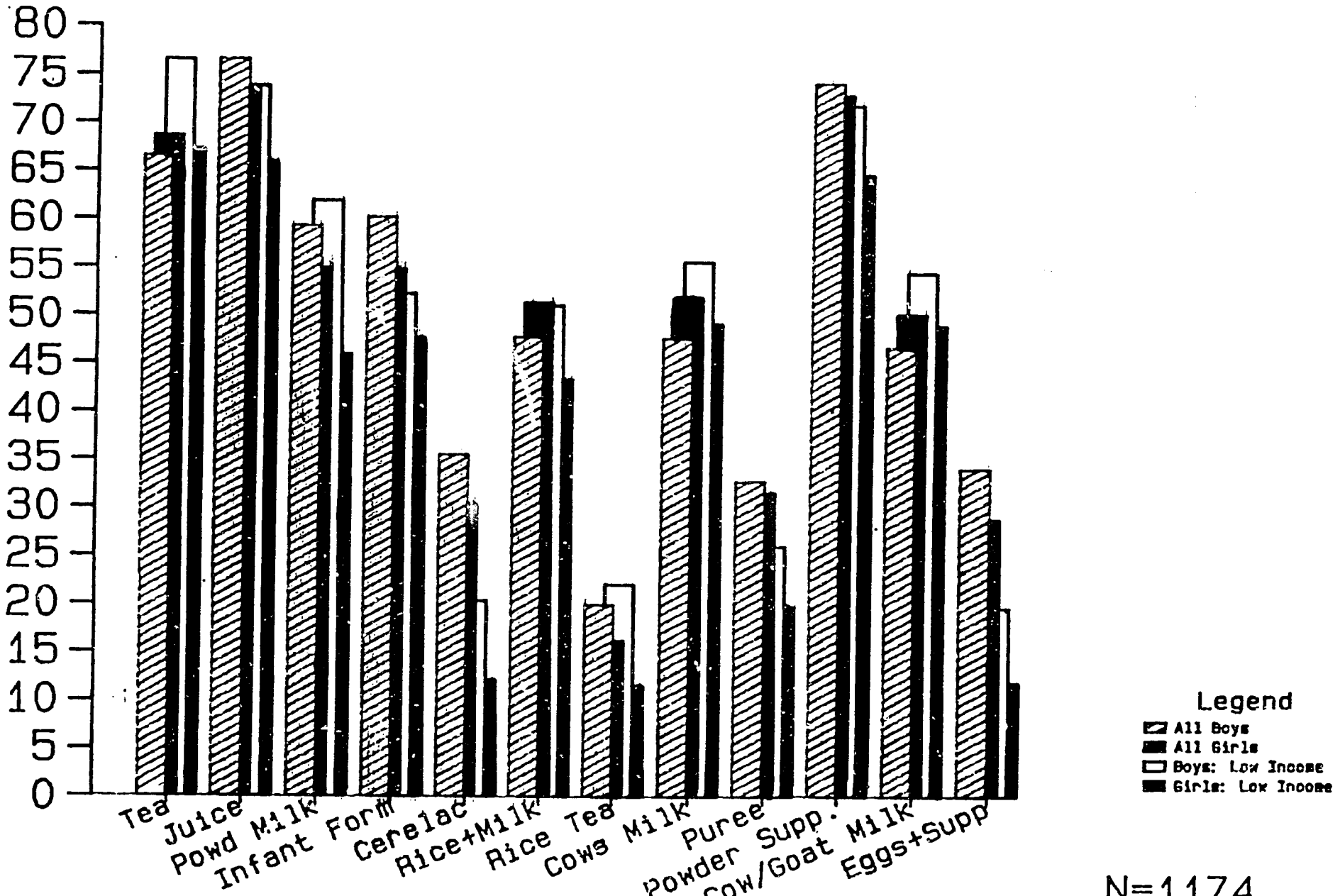
NUTRITIONAL BELIEF AND PRACTICES OF CARETAKERS
BY INCOME QUARTILE

VARIABLE	POPULATION TOTAL N=652	LOWEST QUARTILE N=161	QUARTILE 2 N=164	QUARTILE 3 N=171	HIGHEST QUARTILE N=156	NUMBER & SIGNIFICANCE
Best food for a newborn (%)						
- Brest Milk	91.4	92.4	93.8	88.1	91.4	N= 652
- Infant Formula	2.0	1.6	0.9	4.1	1.3	NS
- Any type of Milk	0.5	0.6	1.2	-	-	
- Otra	1.6	1.9	0.6	1.9	1.9	
Why discontunued Breastfeeding						
- Baby refused	13.5	15.4	14.0	11.7	12.7	N= 625
- *Milk ceased/insufficient milk	29.4	25.4	29.0	28.8	34.7	NS
- Medical advisedo	0.5	1.0	1.0	-	-	
- Mother refused	2.1	1.0	2.4	2.5	2.5	
- Mother worked outside home	2.5	0.7	2.0	2.5	5.1	
- Child more than 6 months old	29.2	33.9	28.9	30.8	23.1	
- Mother became ill	3.9	2.8	4.2	2.8	6.1	
Age of introduction of solids	6.9 ±14.4	8.0 ±17.1	7.3 ±15.0	6.7 ±14.2	5.6 ±10.4	N= 616 NS

* SUMMATION OF = (1) Mothers milk supply ceased
(2) Mother with insufficient milk

IGU 7.6

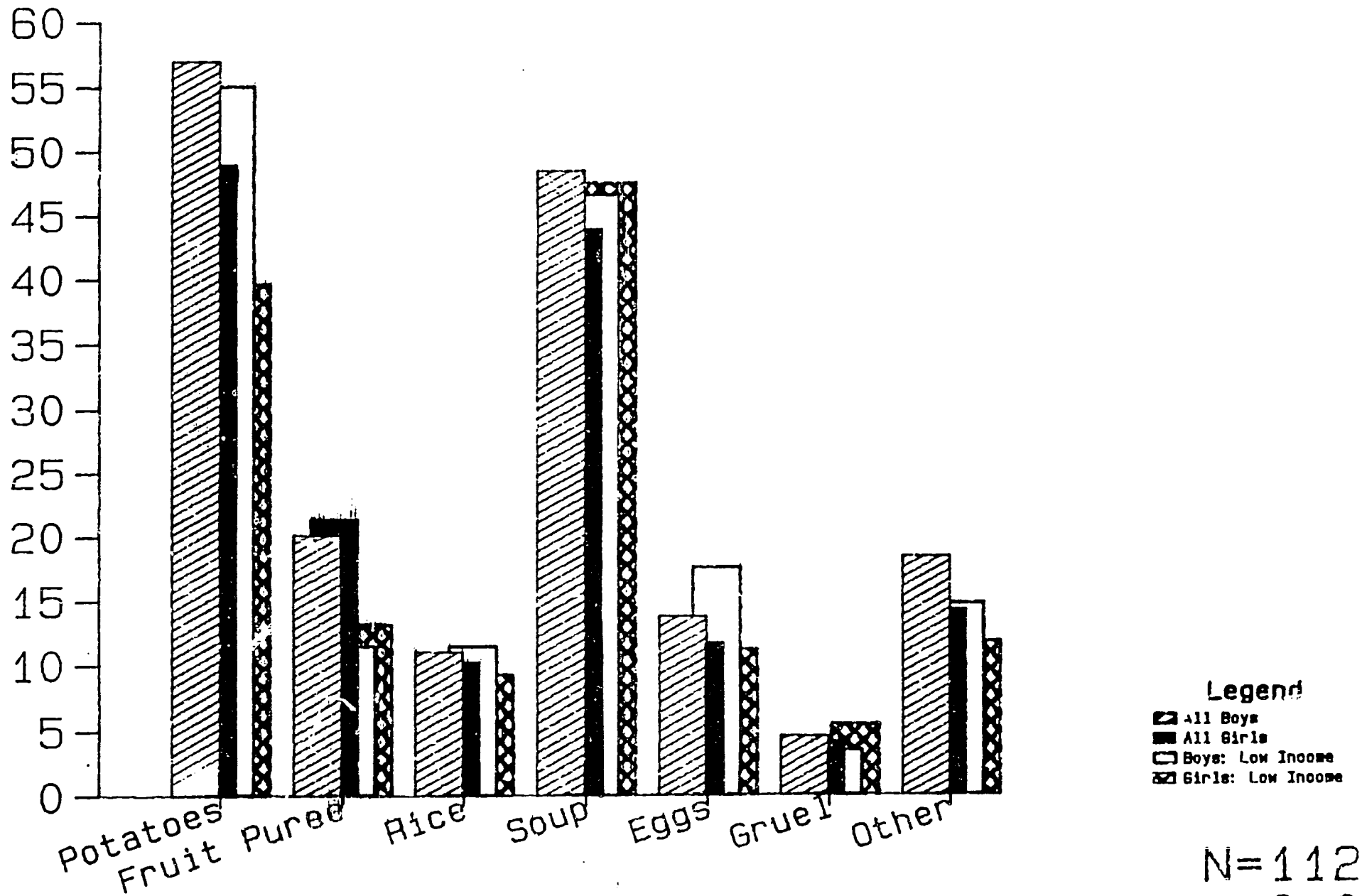
BOTTLE CONTENTS OF MALE VS. FEMALE INFANTS
Total Population and Lowest Income Quartile



N=1174
p=0.23 (NS)

FIGURE 7.6.32

FIRST SOLID FOODS OF MALES VS. FEMALES
Total Population and Lowest Income Quartile



7.8 AGE EFFECT

A strong age effect was apparent in the data. As shown in Figure 7.8.1, at birth children seemed to do well. Birthweights also demonstrated this fact, which was underscored by the additional study undertaken by the Tufts Nutrition Survey. It is apparent that infants usually began life in the Dominican culture in a well-nourished state. However, weaning age became problematic: growth rapidly fell during the first 18 months, rebounded somewhat during the second year (HAZ) and third year (WHZ), and again dropped. The steep drop during the first 12 months of life was not replicated at any other age period. Thus, it seems that although Dominican infants were born well-nourished, they quickly fell to chronically malnourished states, and this usually occurred during the first year of life. Furthermore, the vast majority seemed not to attain the level of nutriture they enjoyed during the first few weeks of life. Figures 7.8.2 and 7.8.3 emphasize these observations using absolute values for WA. As shown, both males and females were born well above the 50th percentile. However, weight fell immediately as age increased, so that before the first year of life the sample had lost their initial advantage and fallen off their growth curves.

Viewing age within Gomez classification, children in second and third degree malnutrition were approximately 32 months old; those in first degree were roughly 39 months old. The average age of children who did not suffer from some degree of malnutrition was 35 months. Age range was fairly evenly distributed throughout these three nutrition classifications.

7.9 WOMEN'S EMPLOYMENT

The percentage of women working outside the home (four or more hours per day, four or more days per week) increased dramatically with income level. As shown in Table 7.9.1, 15 percent of women in the lowest income quartile fit this description vs. 38 percent in the highest income quartile.

On the whole, women's employment seemed to result in improved nutrition for their children (Table 7.9.2). As can be seen in this table, children of working mothers were significantly taller and weighed significantly more than those of mothers who did not work outside the home. Examining these results by income, this trend was most highly significant in the second income quartile. It was also evident in the third quartile, but failed to be shown in the lowest and highest quartiles. Interestingly, the trend was most significant for long-term nutritional status (HAZ) and reversed for WHZ in the second quartile, but not the third.

Another trend indicated that children of working mothers are less ill than those of their non-working counterparts. Fifty-nine percent vs. 62 percent of children of working vs. non-working mothers were ill (Table 7.9.1). Although not significant, this trend indicated that Dominican children fared well when their mothers were earning income.

The question then becomes: how did breastfeeding practices differ when women were working outside the home? Not surprisingly, working mothers weaned about 2.6 months earlier those not working; in the

FIGURE 7.6

ANTHROPOMETRICS BY AGE

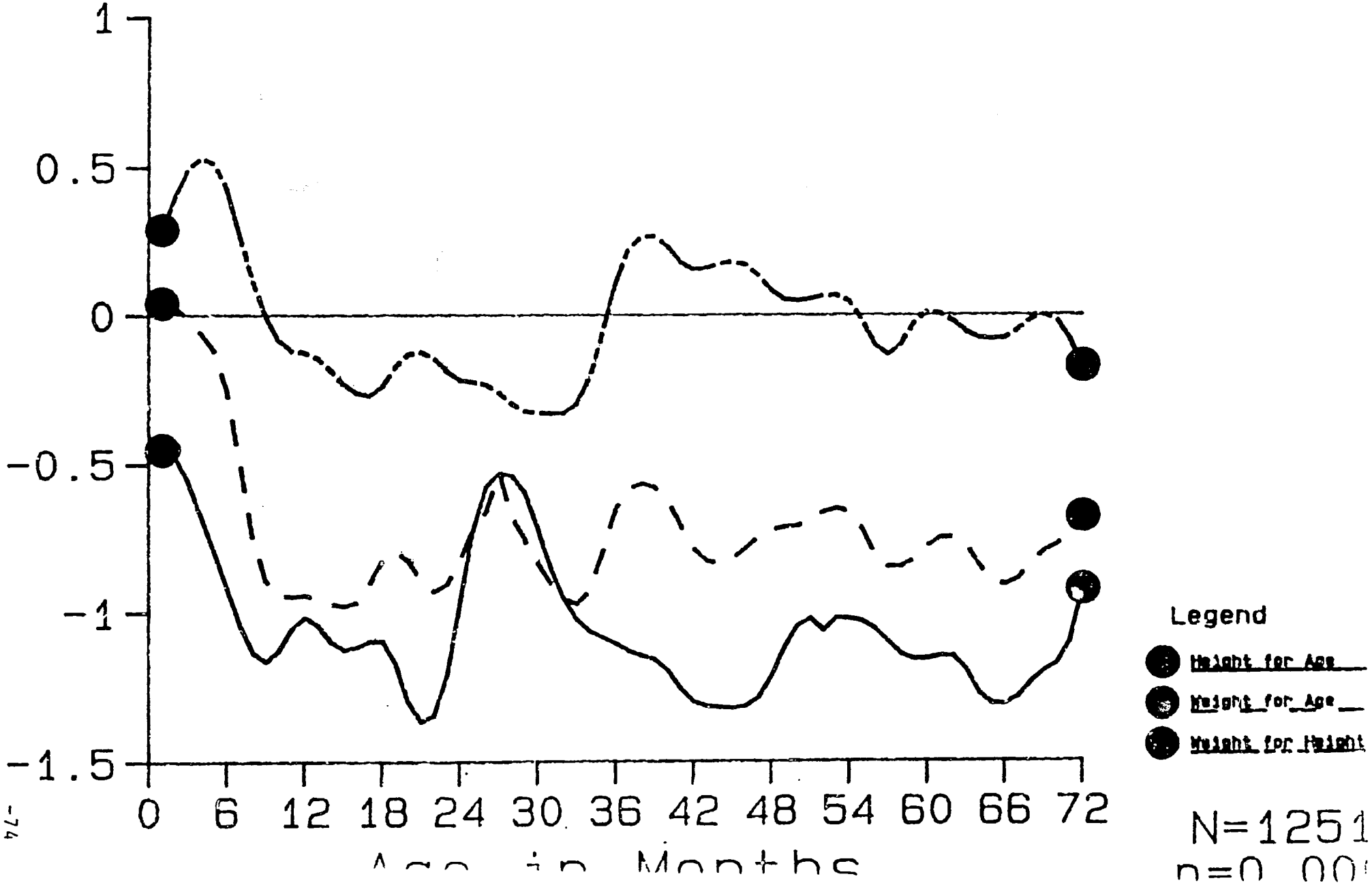


FIGURE 7.82

WEIGHT FOR AGE: Absolute Values of Sample vs. NCHS Standards

(All Males: N=650)

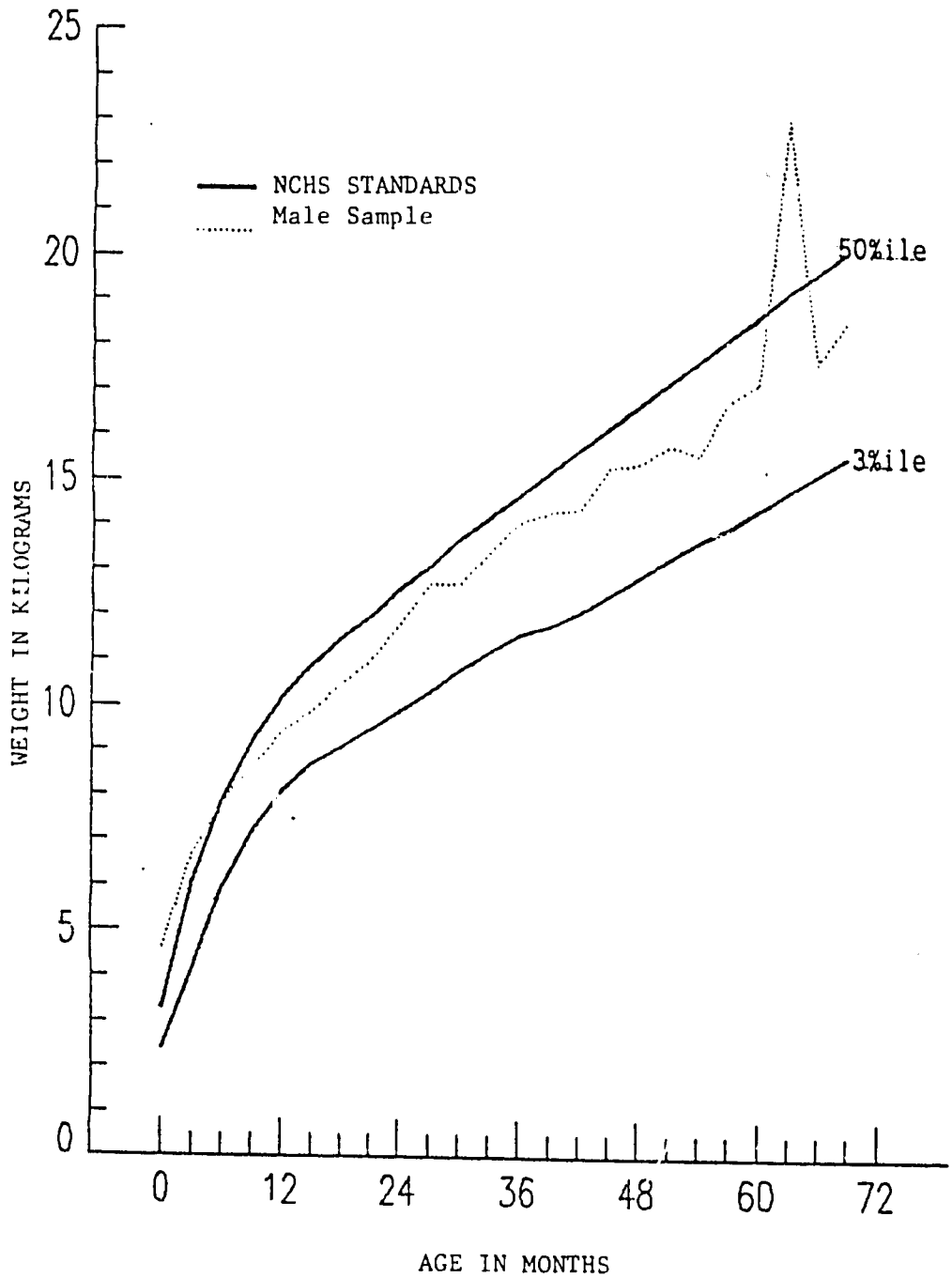


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FIGURE 7.83

WEIGHT FOR AGE: Absolute Values of Sample vs. NCHS Standards

(All Females: N=600)

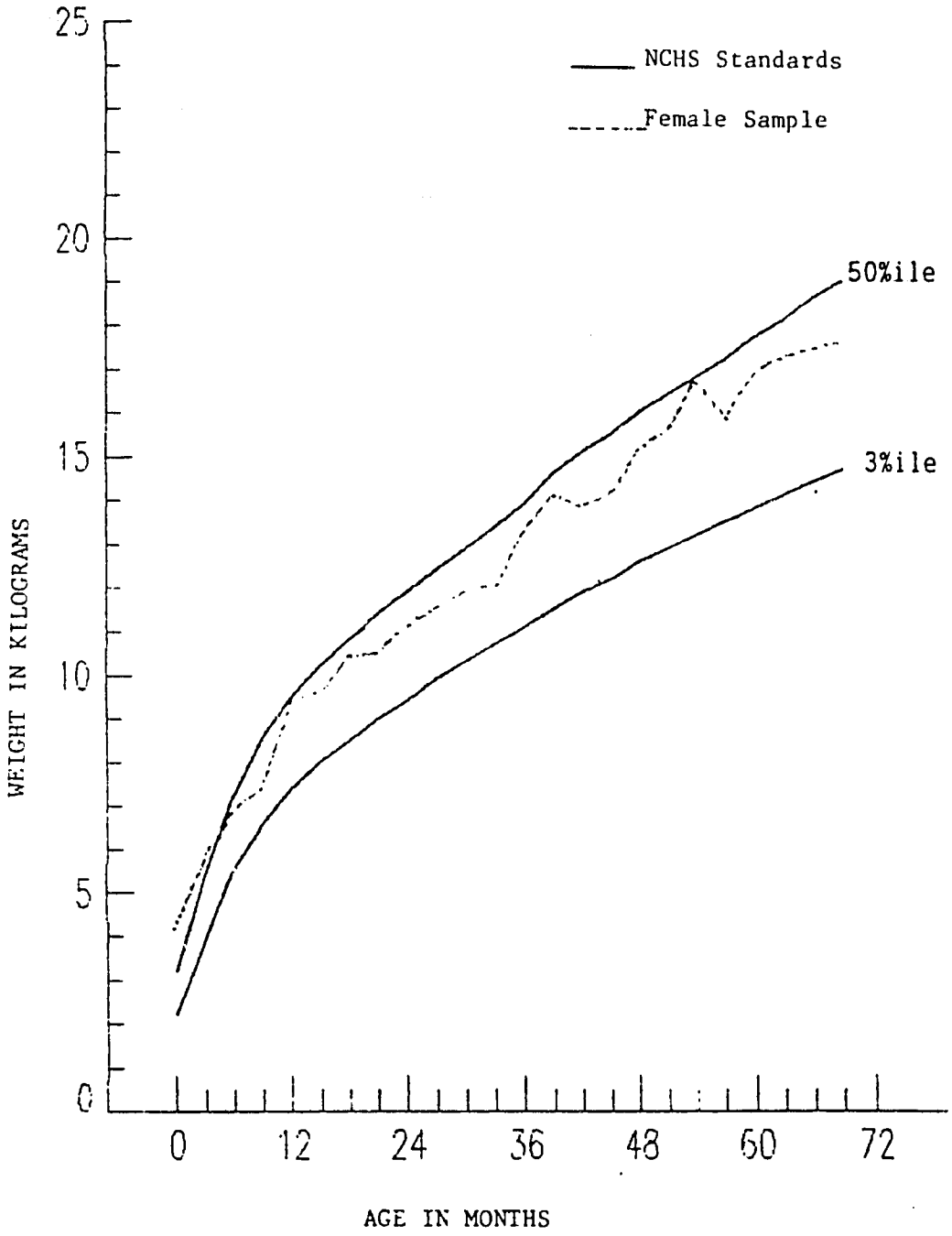


Table 7.9.1
MATERNAL EMPLOYMENT AND NUTRITION
For Total Population

	COUNT	HAZ	WAZ	WHZ	ILL
Working Outside Home	243	-0.9156	-0.5828	0.0026	58.6%
Not Working Outside Home	894	-1.0981	-0.7251	-0.0277	61.5%
TOTAL	1137	-1.0590	-0.6947	-0.0212	69.9%
SIGNIFICANCE		p=.0522	p=0.0863	p=0.1950	p=0.6827

TABLE 7.9.2
MATERNAL EMPLOYMENT VS. NONEMPLOYMENT
IN INCOME QUARTILES 2 AND 3

GROUP: Quartile 2	COUNT	HAZ	WAZ	WHZ
Working Outside Home	49	-0.76	-0.69	-0.27
Not Working Outside Home	209	-1.21	-0.86	-0.13
TOTAL	258	-1.12	-0.83	-0.16
SIGNIFICANCE		p=0.02	p=0.34	p=.37

GROUP: Quartile 3	COUNT	HAZ	WAZ	WHZ
Working Outside Home	49	-0.78	-0.49	0.00
Not Working Outside Home	209	-1.00	-0.60	0.02
TOTAL	244	-0.95	-0.58	0.02
SIGNIFICANCE		p=0.28	p=0.51	p=.85

Table 7.9.3
COMPARISON OF WEANING BEHAVIORS
BETWEEN WORKING AND NON-WORKING MOTHERS
BY INCOME QUARTILE
N=888; p=0.000

	INCOME QUARTILE				
	LOWEST QUARTILE	QUARTILE 2	QUARTILE 3	HIGHEST QUARTILE	TOTAL POP.
BEGIN BOTTLEFEEDING (Months)					
Working	1.7	.2	1.7	.7	.98
Non-Working	1.1	1.4	0.8	1.3	1.14
BREASTFEEDING					
Working	100.0%	87.7%	92.8%	90.0%	91.0%
Non-Working	94.3%	95.7%	95.7%	90.5%	93.6%
BOTTLEFEEDING					
Working	100.0%	100.0%	89.4%	94.6%	94.6%
Non-Working	88.2%	84.7%	90.1%	94.9%	89.2%
WEANING AGE (Months)					
Working	6.6	7.0	7.8	5.0	6.4
Non-Working	8.9	9.4	9.3	8.3	9.0

[illegible] at 3.3 months (Table 7.9.3). On the whole, they were also slightly less likely to be breastfed and much more liable to bottlefeed. They began bottlefeeding about [illegible] week earlier than mothers not working outside the home. The lowest incidence of breastfeeding incidence was found among working mothers in the second quartile (87.7%); the percentage difference in breastfeeding between these mothers and those of similar income who did not work was highly significant. Yet the long-term growth of their children was not adversely affected. One explanation for this may be that the additional income earned overrides the beneficial effect of breastfeeding.

7.10 WOMEN HEADS OF HOUSEHOLD

One of the most remarkable findings of this research was that children of female heads-of-household tended to be better nourished than those of two-parent households. This was true even though families with males as household head earned roughly one-third more than those with females as household head, and had correspondingly more calories and protein available for their families' consumption (Figures 7.10.1-7.10.3). As shown if Figure 7.10.4, there was a trend throughout the entire population for children of female-headed households to be taller and heavier for age then those of two-parent homes: all three anthropometric measures illustrated this finding. Figure 7.10.5 revealed this significant trend in WHZ for children in the lowest income quartile. This startling finding may partially result from two effects: (1) women heads-of-household were probably more likely to be employed. Their extra income increment could well have resulted in better nutrition for children; (2) with fewer adult males present, intra-household food distribution may have been more equitable in female-headed households. Although fewer total calories and protein were present, that which was available may well have been more likely to be fed to children, resulting in their superior growth.

7.11 BIRTH SPACING AND BIRTH ORDER

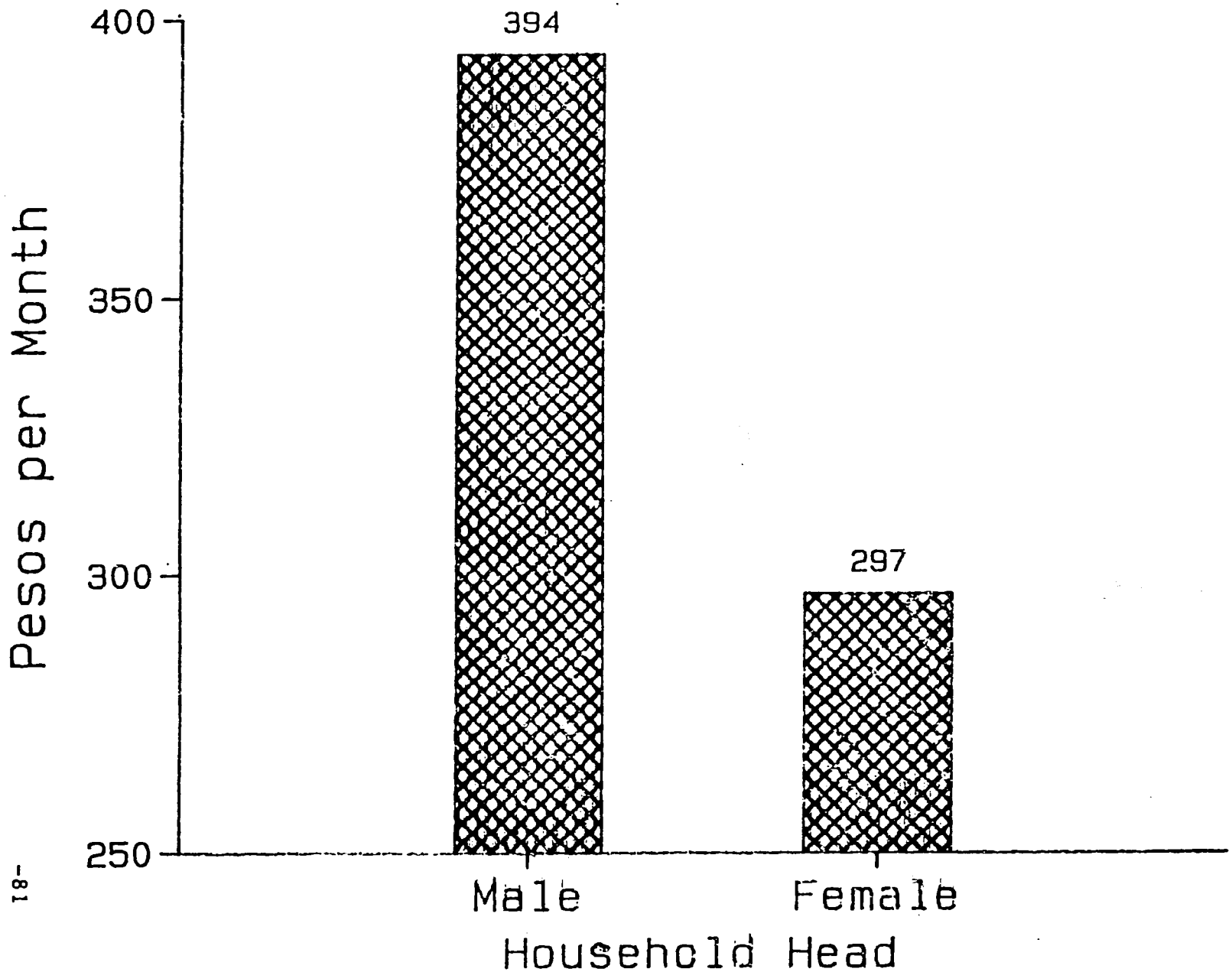
The average birth interval in the sample was approximately 32 months. This varied significantly by region, ranging from a low of 26 months in the Northwest (Region 7) to a high of 38 months in the Eastern Cibao (Region 3). By income quartile, birth spacing increased with income (Table 7.11.2) from 31 months in Quartile 1 to 37 months in Quartile 4.

A highly significant effect on HAZ and WAZ was noted with birth order. First born children had the highest values; HA and WA declined with subsequent birth order. Clearly, long-term nutrition was jeopardized with four or more children born to the same mother in this culture. Interestingly, WAZ failed to show this strong effect. Children were thus able to maintain short-term nutrition even though they were more stunted than their earlier-born siblings.

About 15 percent of the sample children were first-born. Interestingly, an inordinately high sex ratio was present in first-born children (130 vs. 104 for the remainder of the sample, Table 7.11.5), indicating a strong sex bias for first-born males.

FIGURE 7.10

INCOME LEVEL
By Gender of Household Head

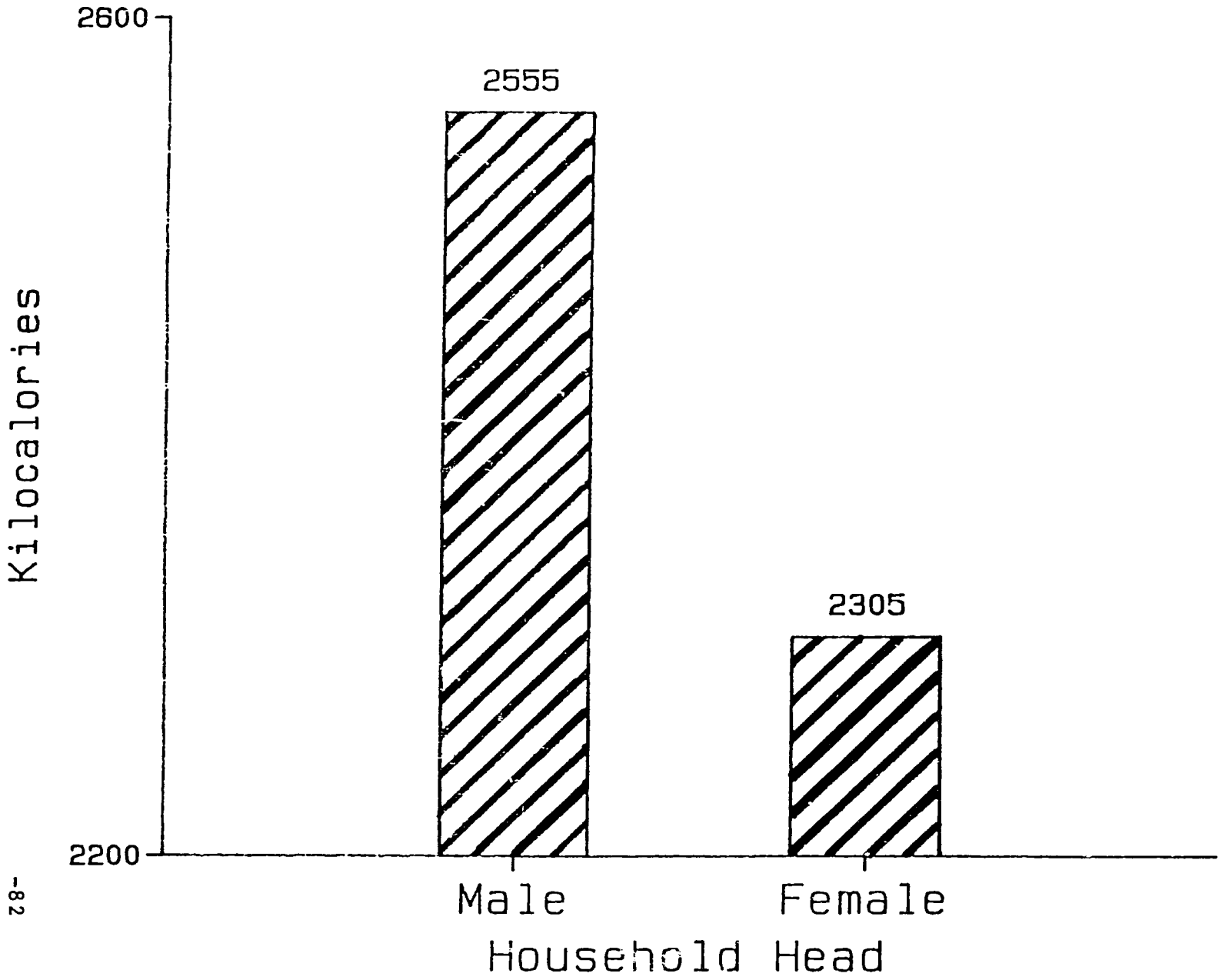


N=1033
p=0.00

FIGURE 7.[illegible]2

CALORIES PER ADULT MALE EQUIVALENT

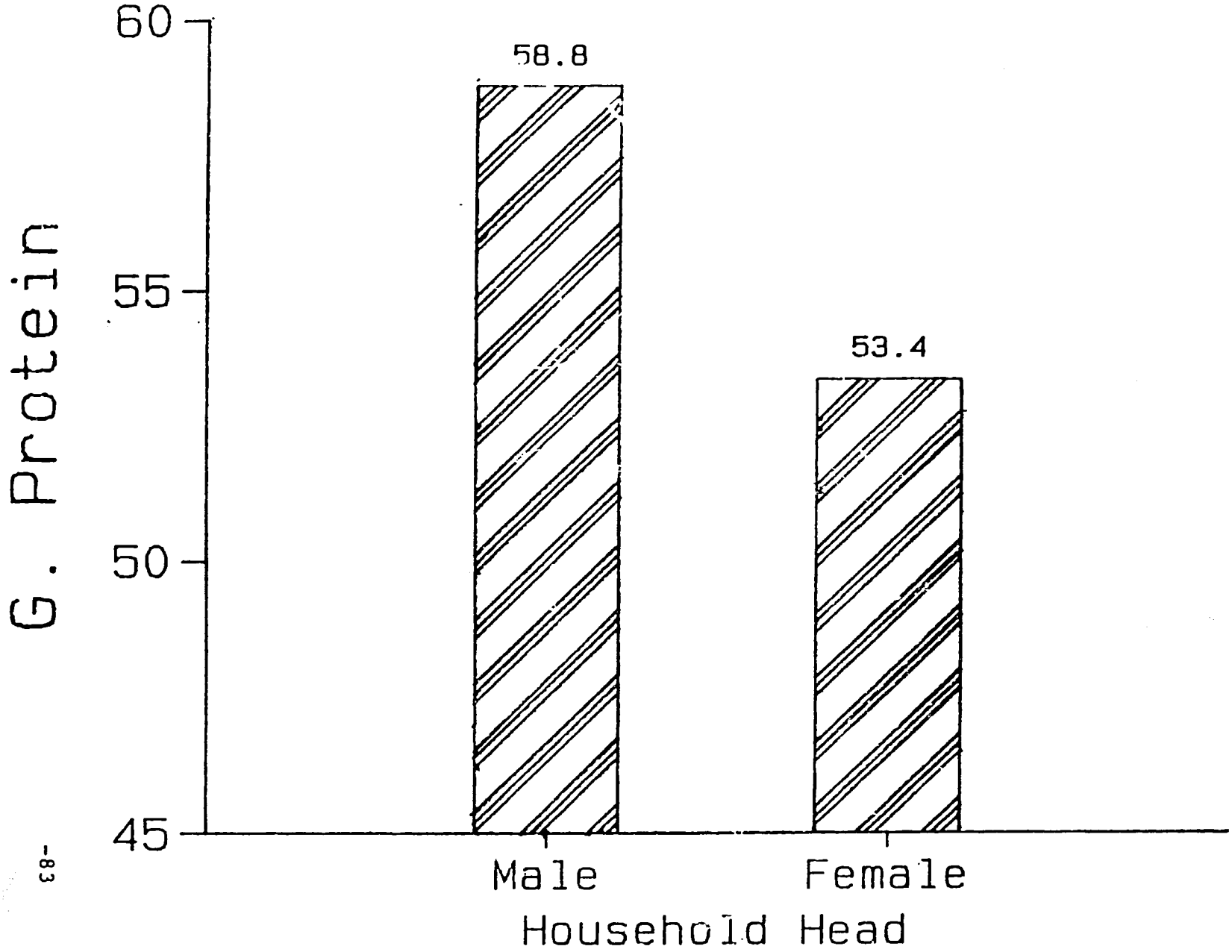
By Gender of Household Head



N=1031
p=0.00[illegible]

PROTEIN PER ADULT MALE EQUIVALENT

By Gender of Household Head



N=103
p=0.0

FIGURE 7.104

ANTHROPOMETRICS (Z-Scores)

By Gender of Household Head

Total Population

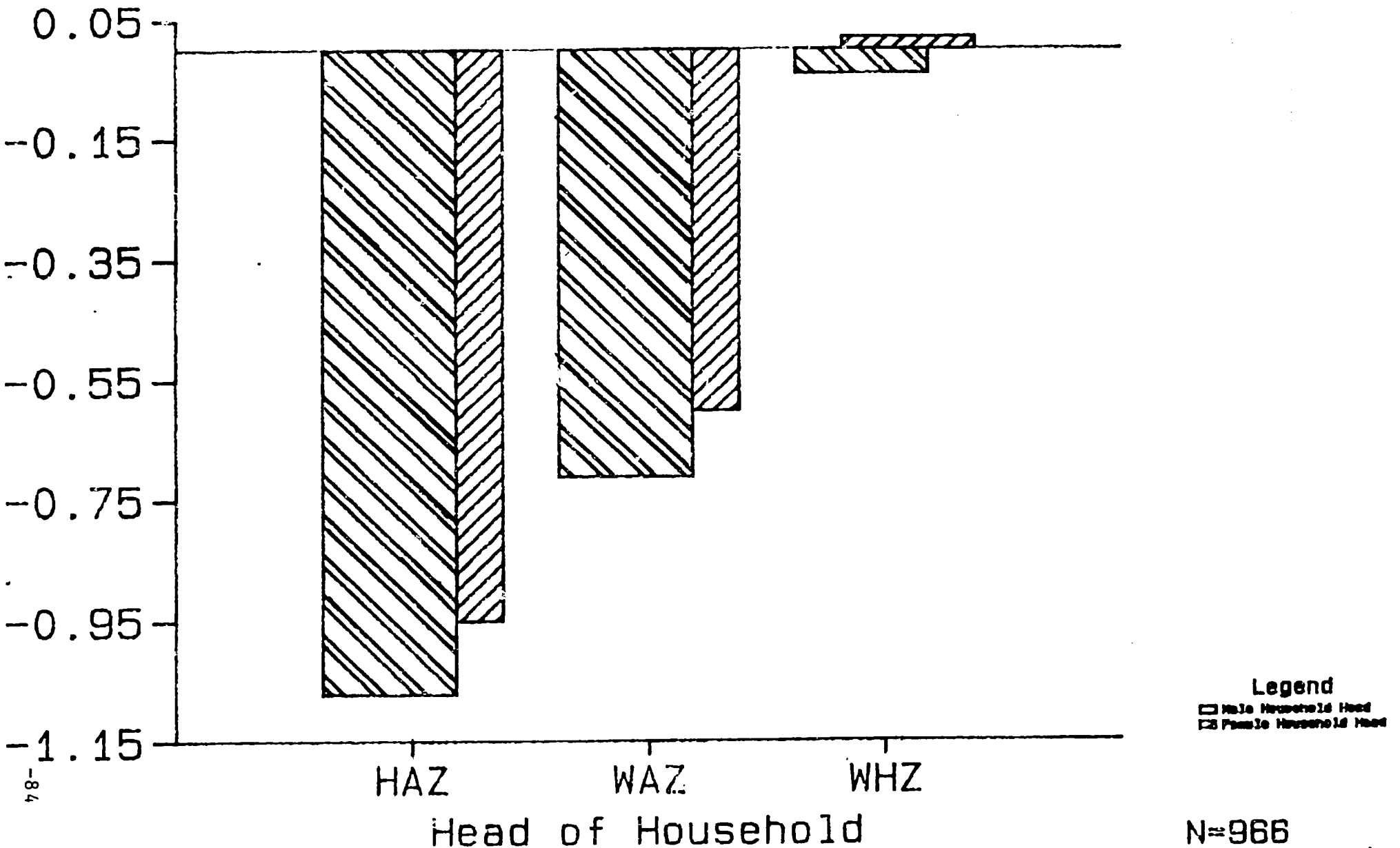


FIGURE 7.105

ANTHROPOMETRICS (Z-Scores)

By Gender of Household Head
In Lowest Income Quartile

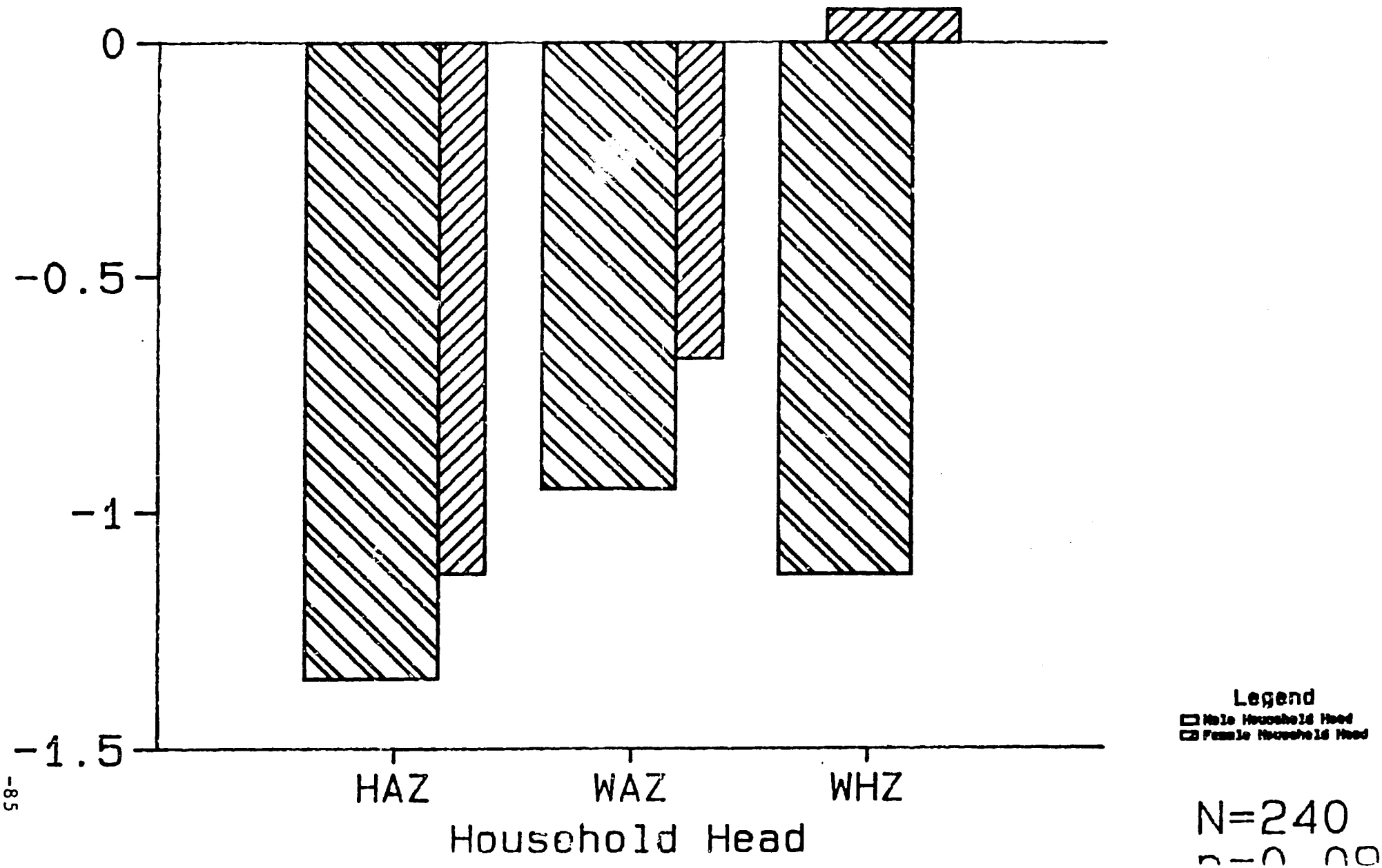


Table 7.11.1
BIRTH INTERVAL IN MONTHS
By REGION
N=656; p=.0051

GROUP	COUNT	MEAN	STANDARD DEVIATION
Region 0	159	32.9748	19.3414
Region 1	56	33.0714	21.6433
Region 2	76	36.0395	18.3102
Region 3	50	38.3200	21.8468
Region 4	153	29.3203	14.2181
Region 5	54	30.9630	16.6620
Region 6	58	29.6552	13.1236
Region 7	50	26.6600	15.9548
TOTAL	656	31.9527	17.7981

Table 7.11.2
BIRTH INTERVAL IN MONTHS
By INCOME QUARTILE
N=505; p=.0028

GROUP	COUNT	MEAN	STANDARD DEVIATION
Quartile 1	128	31.0878	16.8838
Quartile 2	151	30.3494	15.5344
Quartile 3	129	36.7460	20.0221
Quartile 4	95	37.0973	22.0469
TOTAL	505	33.4499	18.6279

Table 7.11.3
ANTHROPOMETRICS (Z Scores)
BY GROUPED BIRTH ORDER
N=1172; p=.0002

GROUP	COUNT	HAZ	WAZ	WHZ
Firstborn	312	-.92	-.53	.09
Second Born	242	-.99	-.64	-.00
Third Born	200	-.96	-.66	-.06
Fourth & Fifth Born	203	-1.06	-.65	.02
Sixth & Seventh Born	98	-1.24	-1.00	-.2[illegible]
Eighth - Eleventh Born	80	-1.62	-1.10	-.11
Twelfth to High Born	35	-1.49	-1.13	-.28
TOTAL	1172	-1.06	-.69	-.01

Table 7.11.4
COMPARISON OF FIRST-BORN
AND NON-FIRST-BORN CHILDREN
N=1173

	COUNT	MONTH AGE	SEX RATIO	HAZ	WAZ	WHZ
First Born	177	44	130	-0.91	-0.63	-0.06
Not First Born	996	34	104	-1.09	-0.70	0.00
SIGNIFICANCE		p=0.00		p=.09	(NS)	(NS)

Table 7.11.5
COMPARISON OF ONLY CHILD
AND REMAINDER OF SAMPLE
N=1174

	COUNT	MONTH AGE	SEX RATIO	HAZ	WAZ	WHZ
Only Child	142	27	101	-0.93	-0.37	0.34
Not Only Child	1032	37	104	-1.08	-0.73	-0.06
SIGNIFICANCE		p=0.00		(NS)	p=.00	p=0.00

Another interesting finding was that even though these children were older than the rest of the sample (44 vs. 34 months), they tended to be taller.

Approximately 12 percent of sample children had no siblings. Not surprisingly, these children were significantly younger than the rest of the sample (27 vs. 37 months, respectively). They tended to be taller and were significantly heavier than their counterparts who were forced to compete with siblings for scarce resources of caretaker time and attention, food, etc. Table 7.11.5 illustrates these data.

The fact that first-born children were of significantly superior health status perhaps could partly be explained by the high percentage of males to females. Mothers with first-born males may have been more likely to offer these children optimal care. This could account for the disproportionate number of males in this sub-sample, as well as help explain the superior growth of these children. Interestingly, a biased sex ratio was not noted for children with no siblings (ref. Table 7.11.5).

7.12 MORBIDITY

7.12.01 General Trends

Table 7.12.01 and Figures 7.12.01-7.12.04 note the percentages of children that were ill during the survey, broken down by region, stratum, income, and child age. Approximately 60% were ill with at least one symptom while only 40% of caretakers claimed no illness symptoms for children. Examining regional breakdown, it is clear that caretakers in the capital (Region 0) reported the highest illness rates (77.4%). This is followed by those in the Eastern Cibao and the Northwest (Regions 3 and 7: 64.4% and 63.8%, respectively). The lowest incidence was reported in the Central West and Western Cibao (Regions 6 and 2: 45.2% and 48.3%, respectively).

Interpretation of these data must be cautious. Illness reporting rates may often be influenced by education, social economic status, and environment. Thus, caretakers from more advantaged families often are more aware of illness and consequently have a higher reporting level than their less-advantaged counterparts. In addition, some illnesses are so common in isolated rural settings that they are not perceived as abnormal events. Only very severe illnesses are reported in these situations. Because illness was only noted when caretaker reported it, children whom field workers perceived as symptomatic but whom caretakers insisted were not were not included in morbidity values.

Examination by income quartile perhaps presents a more accurate picture of illness rates. Here, illness fell from a high of 63.9% in the lowest quartile to 50.8% in the highest. Yet even here, results must be interpreted with the caution noted above.

Table 7.12.04 presents breakdown of illness incidence by age in years. Here it can be seen that children during weaning age (12 to 23 months) were most ill (73.8%), followed by infants less than one year (65.7%). Morbidity generally seems to decline after 35 months, leveling off at 5 years. These differences were very highly significant.

Illness was then examined by type. The five broad categories listed on the questionnaire were first explored, then broken down into more accurate symptom types. General illness symptoms of respiratory, fever, diarrhea, skin/eyes, and "other" were not discrete values, but could include some other combination of symptoms. It was found that nearly 70% of all illness included some respiratory involvement (Figure 7.12.05).

These broad categories were then examined by region, stratum, income quartile, and age (Tables 7.12.02 - 7.12.05). Breakdown by income quartile revealed that respiratory illness seemed to rise with income while diarrhea fell. Again, this could have been due to over-reporting respiratory illness in the highest income quartile and under-reporting in the lowest.

A more accurate way to examine illness trends was by unique symptom and specific combination of symptoms. Figure 7.12.06 pictures this breakdown for the population as a whole; Tables 7.12.06 - 7.12.09 present these breakdowns by region, strata, income quartile, and age.

In Figure 7.12.06, the scenario of morbidity attributed to respiratory illness is again underscored. About 40% of all illness was attributed to respiratory illness alone, and another 30% were combinations of respiratory, fever, skin/eyes, and diarrhea.

Regional breakdown revealed that children sampled in the Eastern Cibao (Region 3) suffered the greatest incidence of diarrheal illness (17.9%), while those in the Northwest (Region 7) demonstrated higher rates of combined respiratory and febrile illness (31.6%).

Examining illness type with income revealed that respiratory illness with no other symptom involvement rose with income, but that combined respiratory and fever fell in the second and third quartiles and was nearly the same in the highest and lowest. Hence, the rise noted earlier in general respiratory illness by income quartile could be attributed to simple respiratory illness with no other symptom involvement. Conversely, diarrheal illness tended to fall with income rises. This was also seen earlier: as income rose, water supply improved and diarrheal incidence declined. As noted in each table, all differences in these breakdowns were very highly significant.

Illness type and age showed interesting relationships. As noted in Figure 7.12.07, diarrheal illness generally declined with age while respiratory illness rose. This is not an unusual finding in a preschool population, and could help account for the decline in growth noted in earlier ages.

7.12.02 Cost of Illness

Figure 7.12.08 illustrates the amount spent per type illness for the entire population that was ill. This breakdown seems appropriate: only an average of 3.4 pesos was spent for respiratory illness, while 18.0 pesos were spent for "other" illnesses, which included such infrequent illnesses as rheumatic fever and leukemia. Clearly, these latter illness are much more costly than a simple cold. It is interesting to note that caretakes spent the next highest funds on diarrheal illness (9.3 pesos).

TABLE 7.12.01

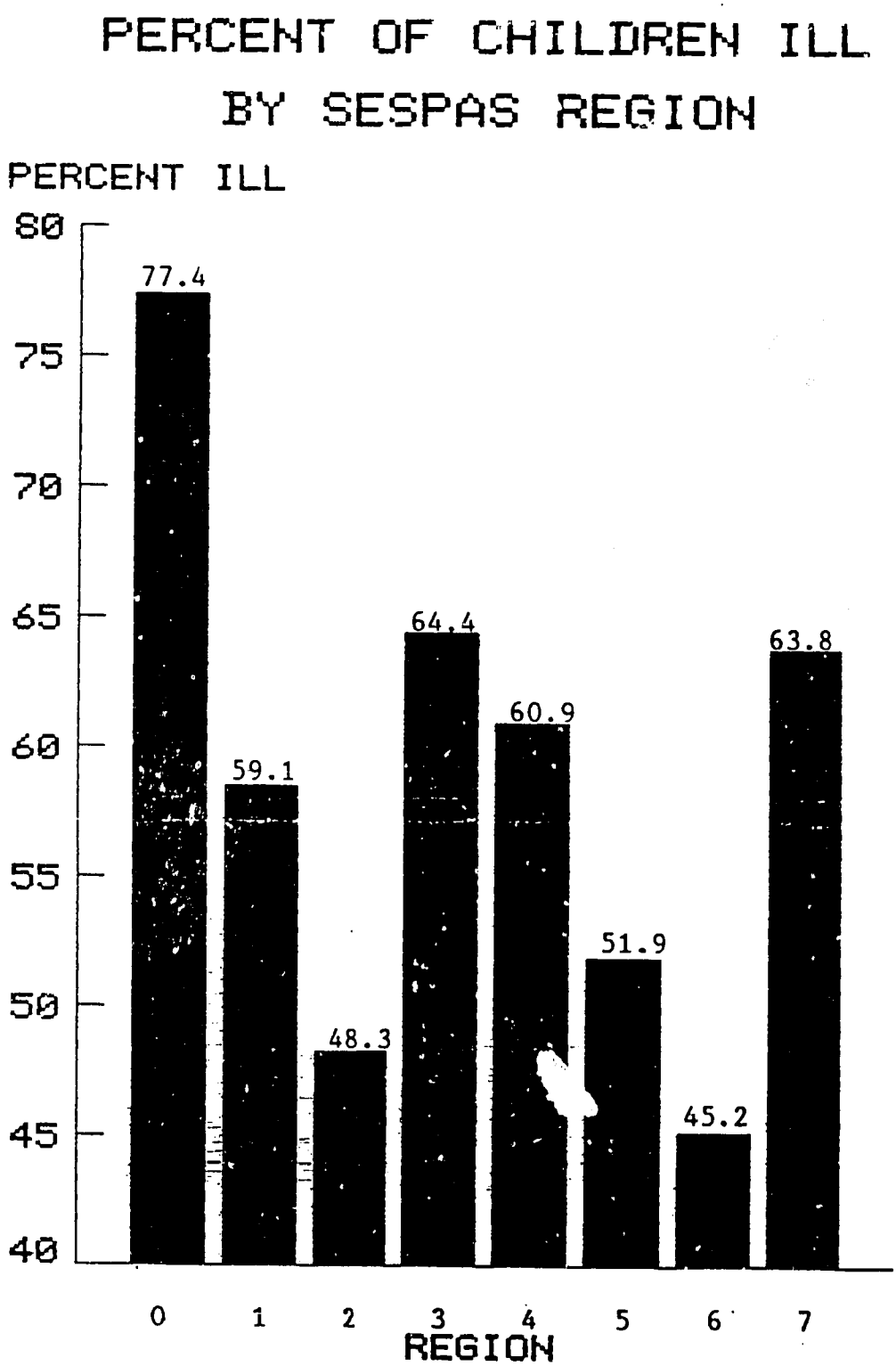
MORBIDITY RATE
BY SESPAS REGION

(PERCENT OF CHILDREN)

REGION	0 N=327	1 N=116	2 N=143	3 N=87	4 N=289	5 N=108	6 N=84	7 N=94	TOTAL N=1248
SICK	N=253 77.4%	N=69 59.5%	N=69 48.3%	N=56 64.4%	N=176 60.9%	N=56 51.9%	N=38 45.2%	N=60 63.8%	N=777 63.8%
NOT SICK	N=74 22.6%	N=47 40.5%	N=74 51.7%	N=31 35.6%	N=113 39.1%	N=52 48.1%	N=46 54.8%	N=34 36.2%	N=471 37.7%

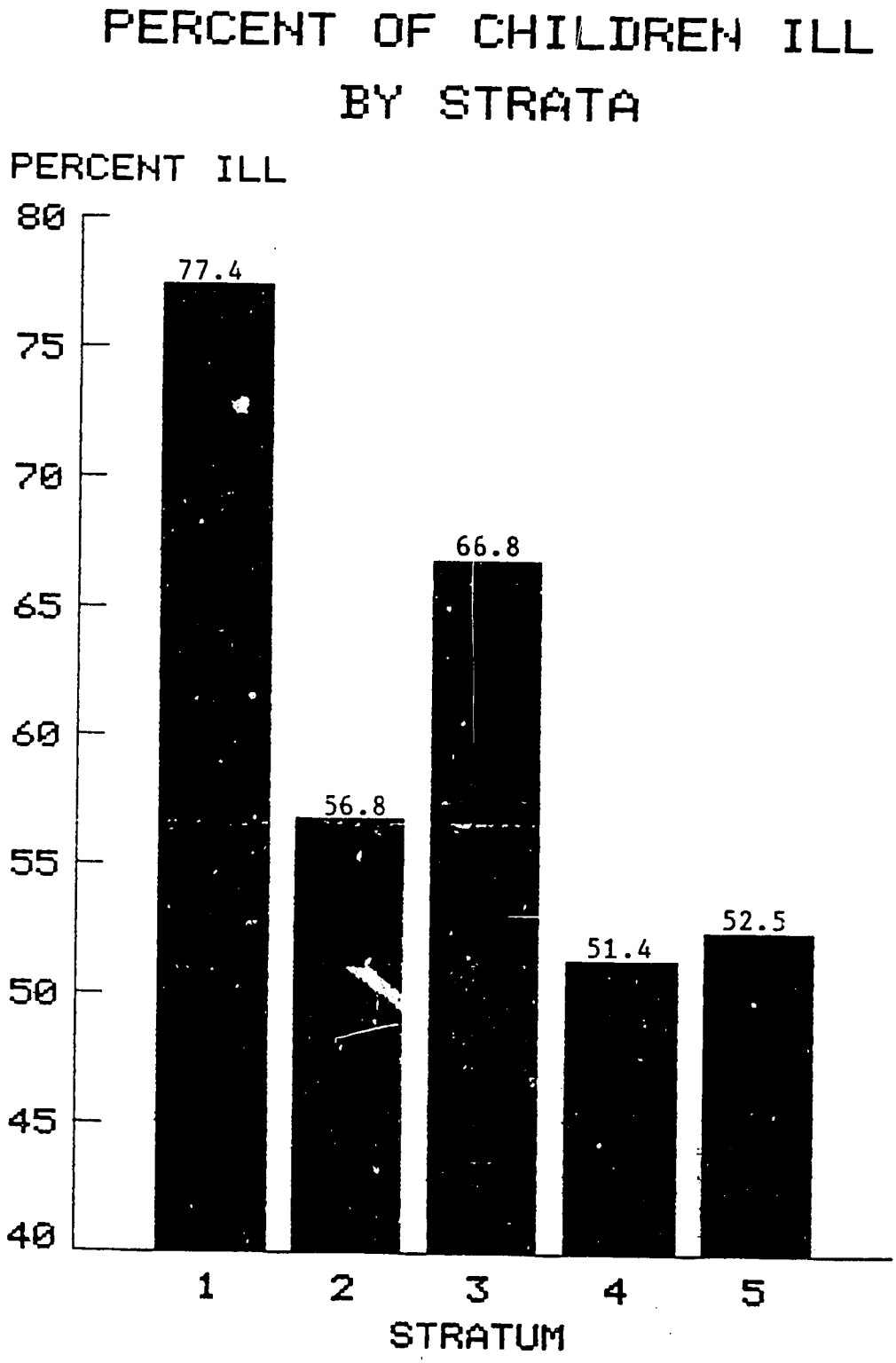
p=0.0000

FIGURE 7.12.01



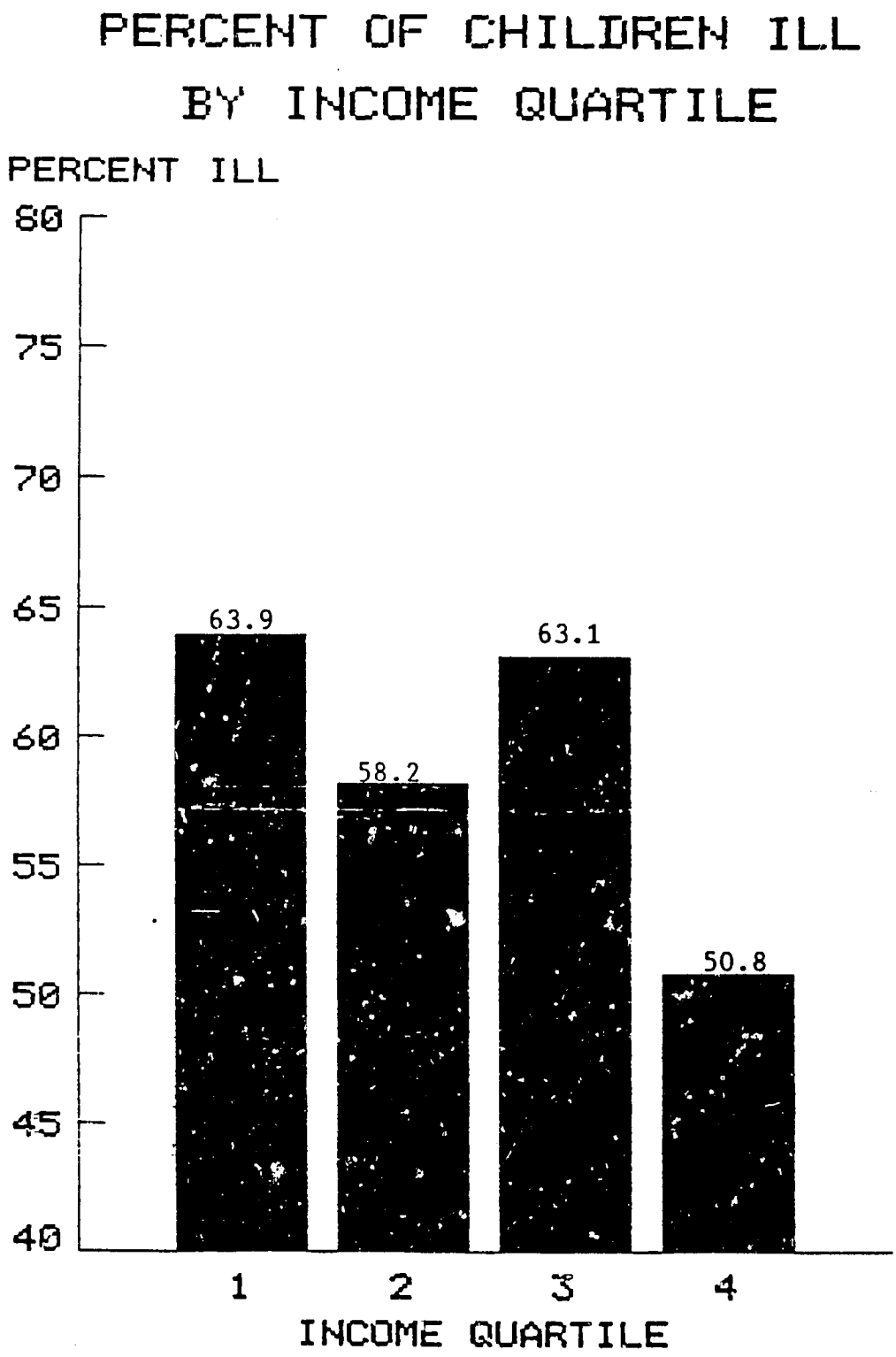
N=1251
p=0.00

FIGURE 7.12.02



N=1251
p=0.00

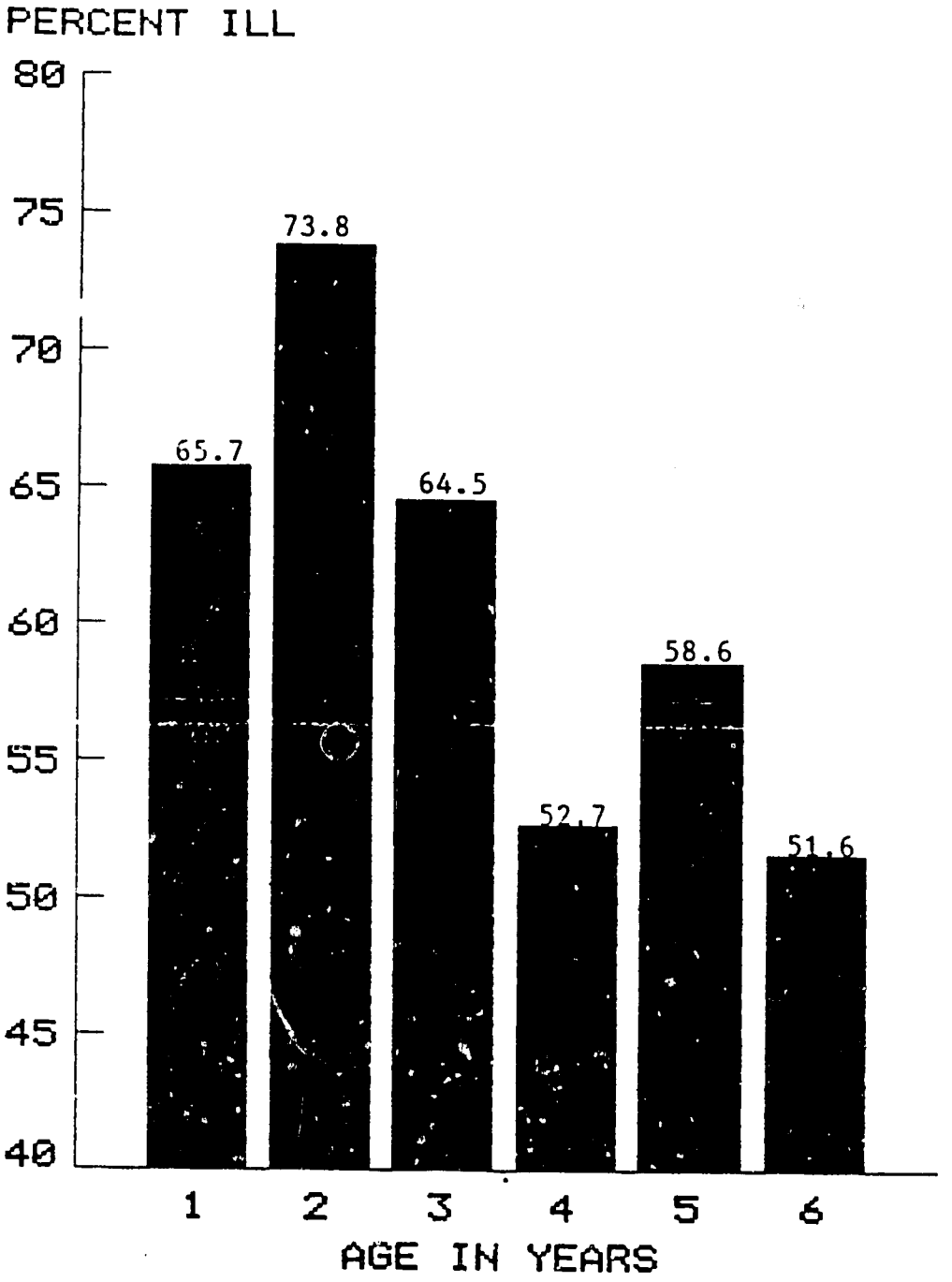
FIGURE 7.12.03



N=1251
p=0.00

FIGURE 7.12.04

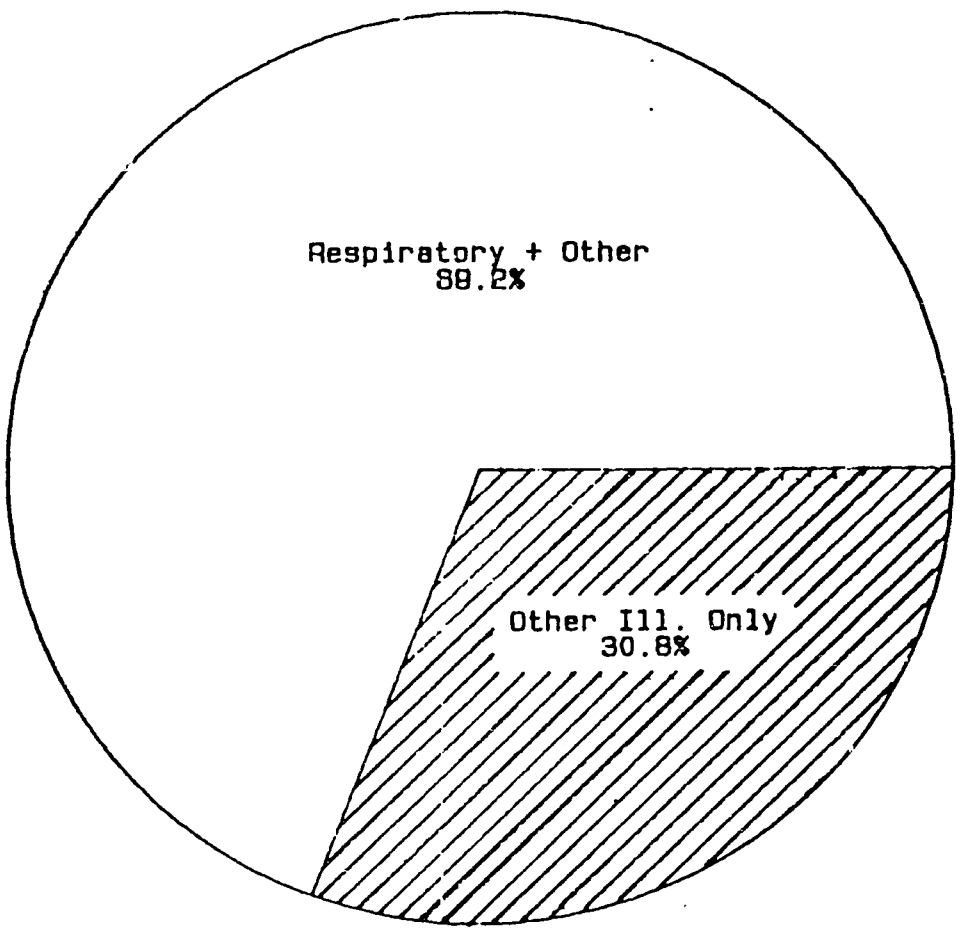
PERCENT OF CHILDREN ILL BY AGE



N=1251
p=0.00

RE 2.0

ALL RESPIRATORY VS. OTHER TYPES ILLNESS



N=752

TABLE 7.12.02

INCIDENCE OF GENERAL ILLNESS
BY SESPAS REGION

(PERCENT OF ILL CHILDREN)

REGION	0 N=250	1 N=67	2 N=66	3 N=56	4 N=164	5 N=56	6 N=36	7 N=57	TOTAL N=747
	0	1	2	3	4	5	6	7	TOTAL
RESPIRATORY	37.3	37.1	45.6	35.7	47.0	35.7	62.2	29.8	N=305 40.6%
FEVER	10.3	22.6	22.1	21.4	26.8	21.4	10.8	31.6	N=145 19.3%
DIARRHEA	22.2	14.5	11.8	28.6	14.0	16.1	10.8	19.3	N=136 18.1%
SKIN OR EYES	24.2	19.4	13.2	7.1	9.1	17.9	10.8	19.3	N=126 16.8%
OTHER ILLNESS	6.0	6.5	7.4	7.1	3.0	8.9	5.4		N=40 5.3%

TABLE 7.12.03

RATE OF GENERAL ILLNESS SYMPTOMS
BY STRATA

(Percent of All Children)
N=1165; p=0.000

	1 N=329	2 N=319	3 N=42	4 N=166	5 N=311	TOTAL N=1165
Any Respiratory	37.3	35.6	44.5	42.3	46.0	N=274 39.6%
Any Fever	10.3	26.6	24.1	23.9	20.0	N=129 18.7%
Any Diarrhea	22.2	20.9	13.9	8.5	18.0	N=131 19.0%
Any Skin	24.2	13.6	16.1	14.1	3.0	N=113 14.4
Any Other	6.0	3.4	1.5	11.3	8.0	N=43 6.2%

TABLE 7.12.04

RATE OF GENERAL ILLNESS SYMPTOM
BY INCOME QUARTILE

(Percent of Ill Children)
N=221 p=0.001

	1	2	3	4	TOTAL
Any Respiratory	31.9	39.0	41.1	48.6	N=221 39.4%
Any Fever	25.0	19.8	12.6	19.7	N=108 19.2%
Any Diarrhea	19.0	21.3	14.2	15.3	N=99 17.6%
Any Skin	15.3	10.4	29.2	16.1	N=94 16.9%
Any Other	8.9	9.5	2.3	6.3	N=39 6.9%

TABLE 7.12.05

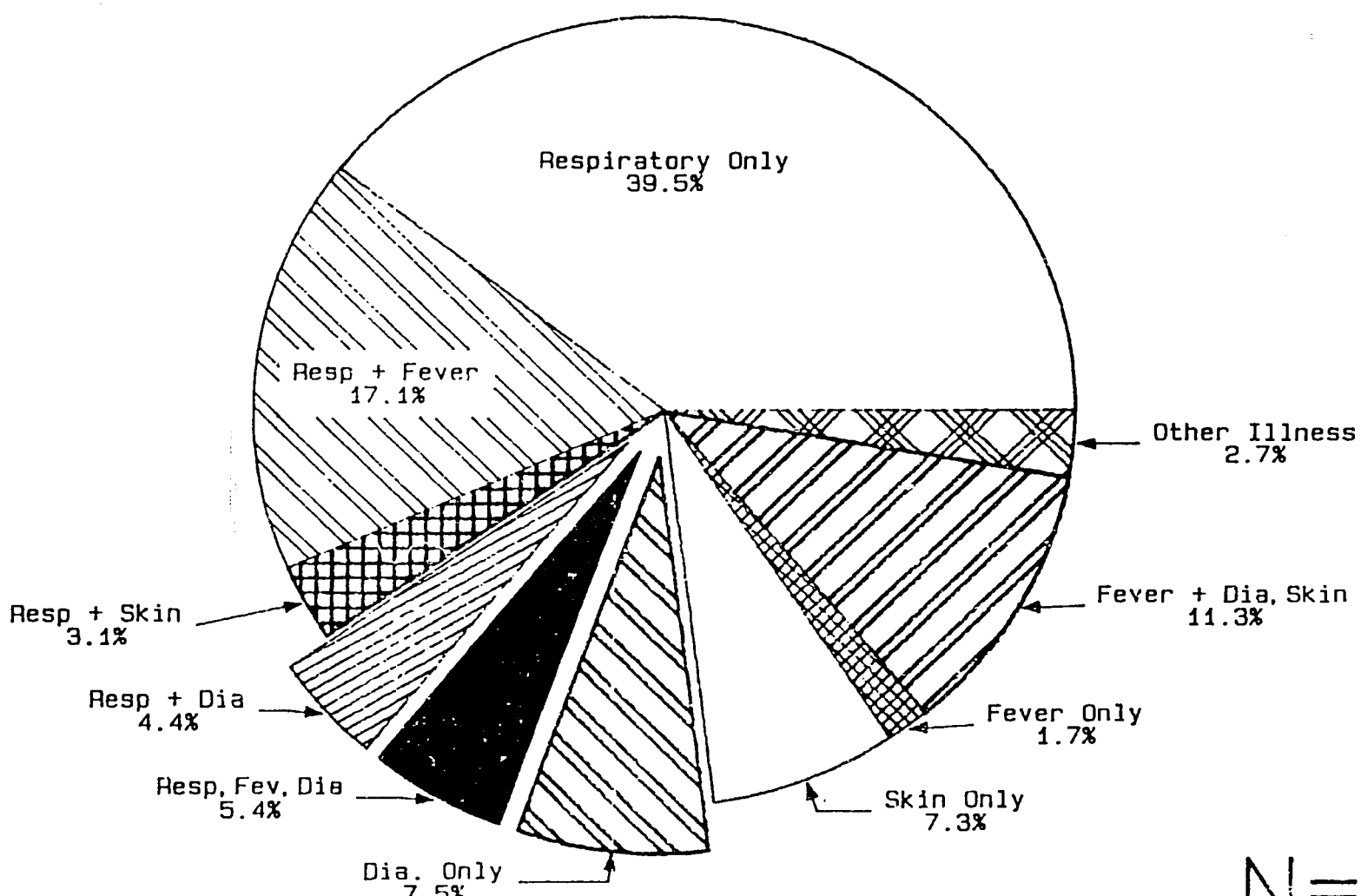
RATE OF GENERAL ILLNESS SYMPTOM
BY AGE

(Percent of Ill Children)
N=690; p=0.000

	0-11 M N=113	12-23M N=147	24-35M N=116	36-47M N=103	48-59M N=118	>59M N=94	TOTAL N=690
Any Respiratory	33.8	32.0	39.1	46.4	51.5	39.8	39.8%
Any Fever	17.1	17.1	19.0	17.9	20.3	18.6	N=128 18.6%
Any Diarrhea	32.8	29.6	17.6	11.8	6.2	19.0	N=131 19.0%
Any Skin	13.8	17.3	16.7	15.9	16.6	16.4	N=113 16.4%
Any Other	2.6	4.0	7.5	8.1	5.3	6.2	N=43 6.2%

FIGURE 12

BREAKDOWN OF ILLNESS BY TYPE OF SYMPTOM



N=752

TYPE OF ILLNESS
BY SESPAS REGION

(PERCENT OF ILL CHILDREN)

REGION	0 N=250	1 N=62	2 N=66	3 N=56	4 N=164	5 N=56	6 N=36	7 N=5[illegible]	TOTAL N=747
RESPIRATORY	37.3	37.1	45.6	33.9	47.0	33.9	62.2	29.8	N=303 40.3%
FEVER	.4	1.6		1.8	4.9	1.8			N=12 1.6%
DIARRHEA	4.8	8.1	5.9	17.9	9.1	1.8	2.7	5.3	N=51 6.8%
SKIN OR EYES	6.0	17.7	4.4	3.6	6.1	16.1	5.4	7.0	N=56 7.4%
OTHER ILLNESS	2.4	6.5	1.5	1.8	.6	5.4			N=16 2.1%
RESP + FEVER	9.9	21.0	22.1	19.6	22.0	19.6	10.8	31.6	N=133 17.7%
RESP + DIARRHEA	6.0		4.4	5.4	2.4	10.7	2.7	3.5	N=34 4.5%
RESP + SKIN/EYES	6.3	1.6	1.5		1.8		5.4	1.8	N=24 3.2%
RESP + FEV + DIA	11.1	3.2	1.5		.6		5.4	7.0	N=38 5.1%
FEVER + DIA OR FEVER + SKIN/EYES	2.4	3.2	4.4	3.6	1.8	1.8		7.0	N=21 2.8%
ONLY OTHER ILLNESS	13.5		8.8	12.5	3.7	8.9	5.4	7.0	N=64 8.5%

p=0.0000

TABLE 7.12.07

TYPE OF SPECIFIC ILLNESS BY STRATA

(Percent of All Children)
N=1165; p=0.000

	1 N=329	2 N=316	3 N=42	4 N=166	5 N=311	TOTAL N=1165
Respiratory	37.3	34.5	44.5	42.3	46.0	N=292 39.6%
Fever	.4	3.4	1.5	1.4	2.0	N=12 1.6%
Diarrhea	4.8	9.6	5.1	4.2	12.0	N=51 6.9%
Skin or Eyes	6.0	9.0	8.0	9.9	6.0	N=55 7.5%
Other	2.4	1.1		9.9	1.0	N=16 2.2%
Resp. + Fever	9.9	23.2	22.6	22.5	18.0	N=131 17.8%
Resp. + Diarrhea	6.0	5.1	4.4	2.8	2.0	N=34 4.6%
Resp. + Skin/Eye	6.3	2.8	2.2			N=24 3.3%
Resp.+ Fever+Dia	11.1	1.7	2.9	1.4	2.0	N=38 5.2%
Fev + Skin or Fev + Dia	2.4	4.5	2.9	1.4	2.0	N=21 2.8%
Other Combination	13.5	5.1	5.8	4.2	9.0	N=63 8.5%

TABLE 7.12.08

TYPE OF SPECIFIC ILLNESS
BY INCOME QUARTILE
(Percent of Ill Children)
N=249; NS

	1	2	3	4	TOTAL
Respiratory	35.4	39.0	43.3	46.8	N=249 40.6%
Fever	2.3	2.5	.6	.9	N=10 1.6%
Diarrhea	6.9	6.9	7.6	2.8	N=39 6.4%
Skin or Eyes	6.9	1.9	12.3	5.5	N=42 6.8%
Other	3.4	2.5	1.2	1.8	N=14 2.3%
Resp. + Fever	21.7	16.4	14.6	21.1	N=112 18.2%
Resp. + Diarrhea	3.4	5.7	2.9	6.4	N=27 4.4%
Resp. + Skin/Eye	2.3	4.4	4.7	1.8	N=21 3.4%
Resp.+ Fever+Dia	5.1	8.2	2.3	3.7	N=30 4.9%
Fev + Skin or Fev + Dia	2.3	3.1	2.9	1.8	N=16 2.6%
Other Combination	10.3	9.4	7.6	7.3	N=54 8.8%

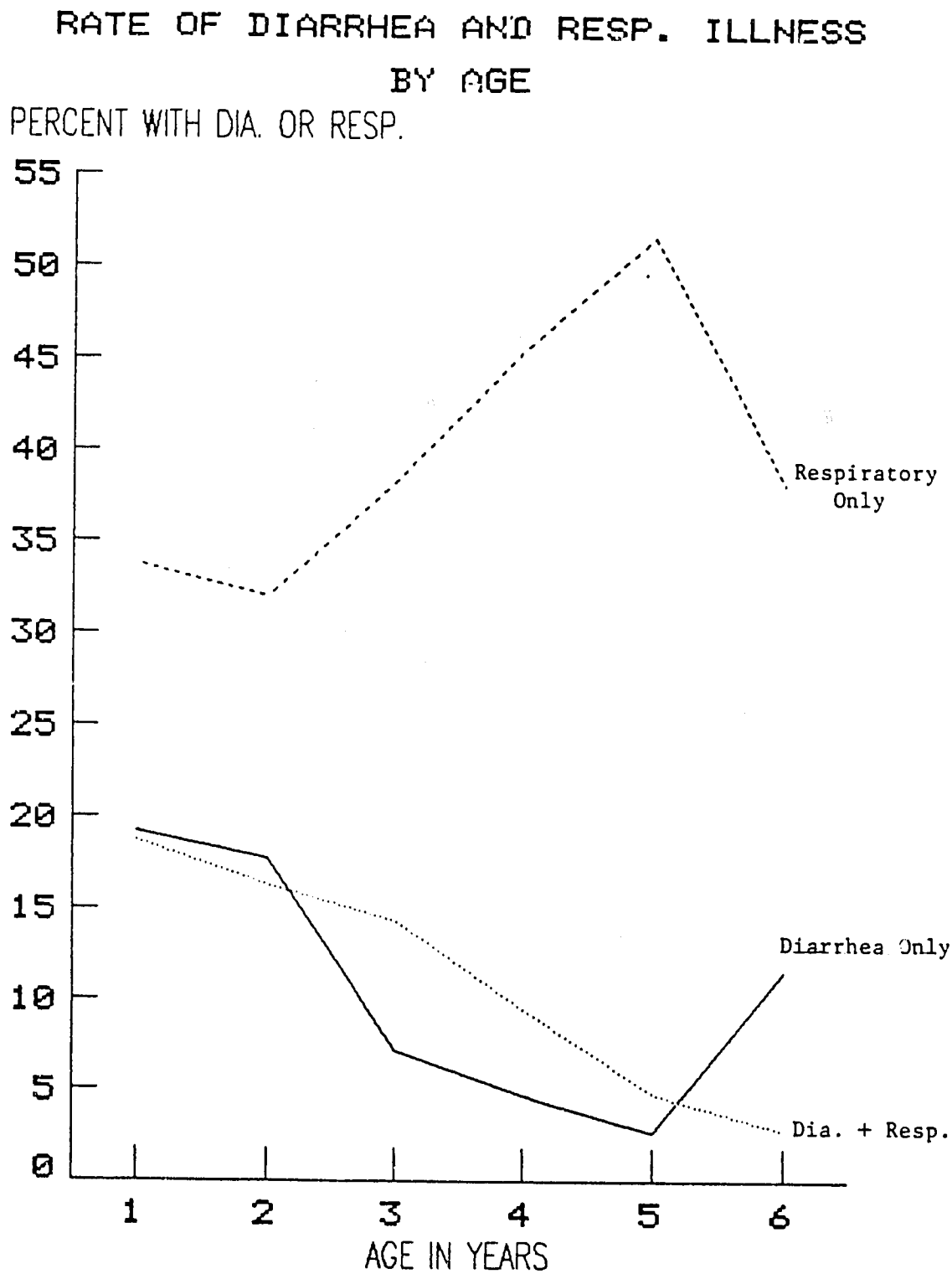
TABLE 7.12.09

TYPE OF SPECIFIC ILLNESS
BY AGE

(Percent of All Children)
N=690, p=0.000

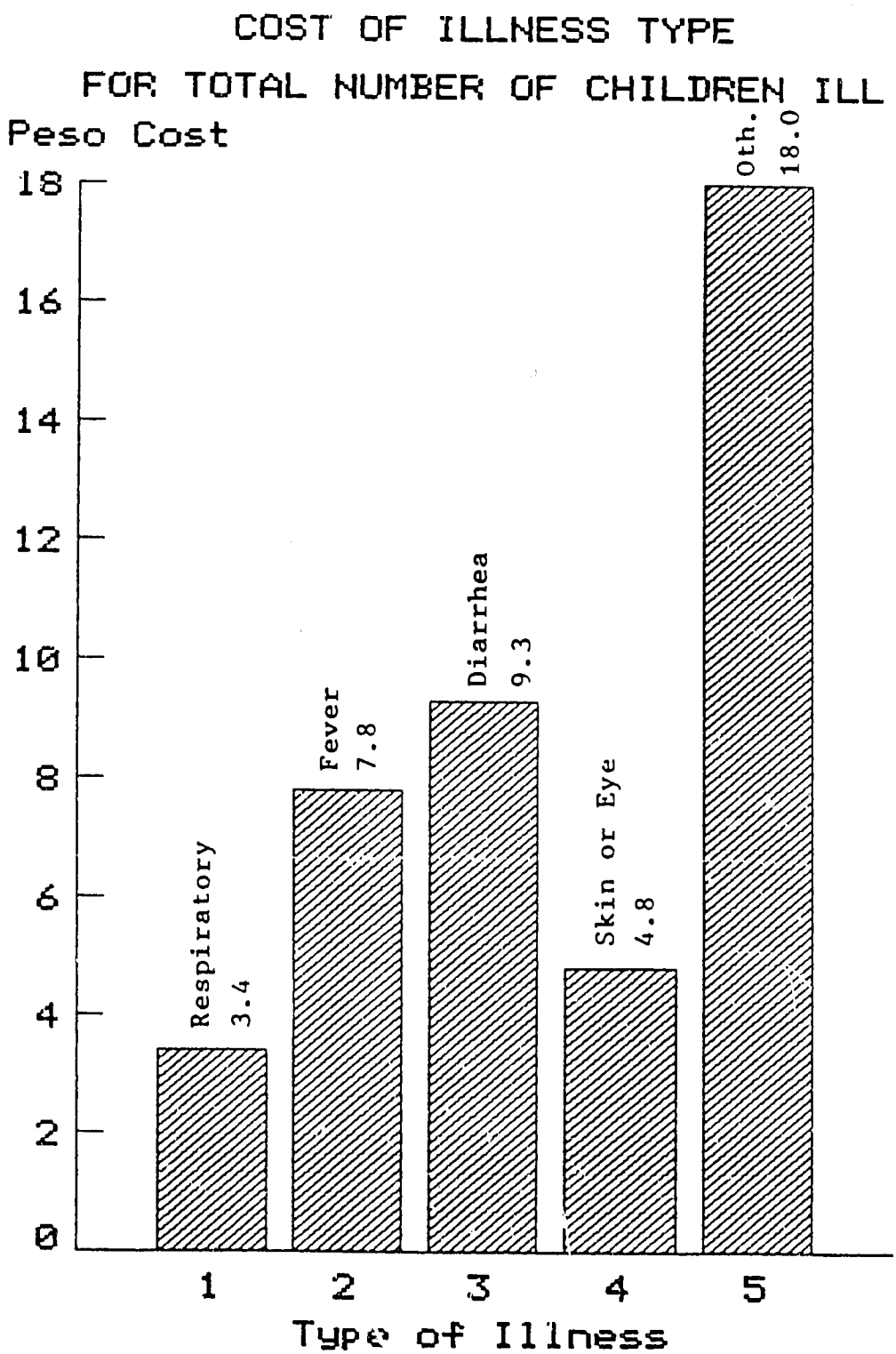
	0-11 M N=113	12-23M N=147	24-35M N=116	36-47M N=103	48-59M N=118	>59M N=94	TOTAL N=690
Respiratory	33.8	32.0	38.2	45.4	51.5	38.1	N=273 39.5%
Fever	.9	2.7	1.3	1.0	1.7	2.3	N=12 1.7%
Diarrhea	12.3	11.6	5.0	3.9	2.3	9.4	N=52 7.5%
Skin or Eyes	5.1	6.6	6.1	7.2	8.8	10.7	N=51 7.3%
Other	.9	1.8	2.7	3.2	1.8	5.6	N=18 2.5%
Resp. + Fever	16.2	14.4	17.7	16.9	18.6	18.4	N=117 16.9%
Resp. + Diarrhea	6.5	4.2	6.[illegible]	3.9	3.0	2.1	N=31 4.4%
Resp. + Skin/Eye	3.0	2.9	5.2	2.0	4.3	1.1	N=22 3.1%
Resp.+ Fev + Dia	9.6	9.3	5.4	3.9	1.0	.2	N=36 5.2%
Fev + Skin or Fev + Dia	4.4	5.4	1.7	1.2	1.7	1.1	N=19 2.8%
Other Combination	7.3	9.1	10.2	11.4	5.4	11.2	N=62 9.0%

FIGURE 7.12.07



N=402
p=0.01

FIGURE 7.12.08



N=665
p=0.000

7.12.03 Use of Health Assistance

A variety of types of health assistance during morbidity episodes was noted during pretesting; those most frequently mentioned were included explicitly in the questionnaire. Tables 7.12.10 - 7.12.13 illustrate different consultant use by region, stratum, income quartile, and age. The most obvious finding was that approximately two-thirds of all illness episodes went untreated by outside help, whether that assistance were of technical or traditional nature. This figure was highest for Stratum 4 (cane and livestock rural regions). Eighty percent of children who were ill had caretakers who did not seek any sort of outside assistance for the illness. Referring to Table 7.12.07, it can be seen that a large proportion of these children suffered from both respiratory and febrile symptoms, indicating a more serious infection than merely a simple runny nose.

Similar allusions to income constraint can be seen by viewing type of assistance sought by income quartile. In this case, nearly three-quarters of children who were ill used no outside service in the lowest quartile, while less than two-thirds of those in the highest income quartile exhibited this behavior. Those of lower income seemed to substitute family advice for technical consult, as this figure was highest for the lowest income quartile and lowest in quartile four. This is not surprising: family consultations frequently are free of charge and the voice of experience is often heeded. Nevertheless, nearly 65 percent of those of lowest income were ill compared with only 51 percent of those of highest income (Figure 7.12.03). Moreover, children from poor homes had a higher incidence of every illness except respiratory (Table 7.12.04). If the optimal health care to be given was exemplified at the highest income quartile, it is clear that the economically disadvantaged are unable to afford this important service.

Type of assistance was then categorized as technical or traditional remedies. Technical services included clinic with doctor, subcentro, hospital, private doctor, pharmacy, and church with consultory. Traditional remedies included family consultation, midwife, or folk healer*. Table 7.12.13 and Figure 7.12.09 show regional breakdown of the percentage of children seeking consultations in these categories.

The majority of families seeking assistance for illness chose that of a more technical nature (25.1%); this figure was highest in the East (Region 5: 35.7%) and lowest in the Northwest (Region 7: 8.8%). Interestingly, 13.5% of those who sought outside assistance in the capital, where technical services were most readily available, chose folk remedies rather than professional technical advice. Tables 7.12.14 - 7.12.16 present this service classification by stratum, income quartile, and gender.

Another way of viewing these data was to combine technical assistance and cost. A new variable ("Intensive Care") was thus calculated grouping those seeking no assistance with those paying no money for treatment, those using folk remedies with those paying a small amount (a few cents to five pesos), and those using technical assistance and paying more than five pesos. This new variable (with three levels, zero, low, and high) was then examined by income quartile (Table 7.12.17). Not surprisingly, more children from the quartile 1 fell into the category of "zero intensity", while those

using most intensive services most frequently fell into the quartile 4 (high income). These differences are graphically illustrated in Figure 7.12.10.

7.12.04 Use of Technical Services for Specific Illnesses

Tables 7.12.18 and 7.12.19 break technical and intensive assistance into general illness symptoms. These breakdowns follow the graphed values for total cost of illness group (Figure 7.12.08). As a whole, level of intervention seemed appropriate for illness type. Eighty percent of those with respiratory sought no health services, while nearly half of those with diarrheal involvement sought either low or high technology. The "intensive care" variable (Table 7.12.20) showed similar findings, which indicated appropriate intervention as a general trend during illness.

* Folk healers included curiosos, curanderos, or brujos (witches). Approximately one percent of the total sample specifically reported using witchcraft to treat illness.

TABLE 7.12.10

TYPE OF HEALTH SERVICES
BY SESPAS REGION

(Percent of ill children
who used services)

REGION	0 N=250	1 N=62	2 N=66	3 N=56	4 N=164	5 N=56	6 N=36	7 N=57	TOTAL N=747
No Health Service	N=164 65.6%	N=44 71.0%	N=43 65.2%	N=29 51.8%	N=07 65.2%	N=38 67.9%	N=27 75.0%	N=49 86.0%	N=501 67.1%
Clinic w/ Doctor	1.6%	6.5%			16.5%	5.4%	5.6%	8.8%	6.0%
Subcentro	3.6	1.6	1.5	3.6	1.8				2.1%
Hospital	4.4	11.3	1.5		11.0	7.1	2.8		5.6%
Private Doctor	5.2	4.8	22.7	19.6	1.8	19.6	5.6		7.8%
Pharmacy	2.8	1.6		5.4	1.8				1.9%
Family	11.6	1.6	6.1	10.7	1.8		5.6	5.3	6.4%
Church	2.0	1.6		1.8					.9%
Midwife							5.6		.3%
Folk Healer	.8		1.5	5.4					.8%
Other	2.4		1.5	1.8					1.1%

TABLE 7.12.11

TYPE OF HEALTH SERVICES USED
BY STRATA
(Percent of Children Ill
That Used Service)
N=685; p=0.000

	1 N=252	2 N=176	3 N=26	4 N=81	5 N=151	TOTAL N=685
Used No Service	65.6	61.1	68.6	80.3	67.7	66.8
Clinic with Doctor	1.6	1.7	19.0	4.2	7.1	3.8
Subcentro	3.6	1.7		2.8	2.0	2.5
Hospital	4.4	10.9	5.8	5.6		5.3
Private Doctor	5.2	18.9		4.2	9.1	9.3
Pharmacy	2.8	.6	2.2	1.4	2.0	1.9
Family	11.6	2.3	4.4	1.4	7.1	6.7
Church	2.0	1.1				1.0
Midwife		1.1				.3
Folk Healer	.8				4.0	1.2
Other	2.4	.6			1.0	1.3

TABLE 7.12.12

TYPE OF HEALTH SERVICE USED
BY INCOME QUARTILE

(Percent of Children Ill
Who Used Service)
N=558; p=0.009

	1 N=150	2 N=150	3 N=155	4 N=103	TOTAL N=558
Used No Service	73.4	70.6	68.1	63.1	69.3
Clinic with Doctor	3.2	7.2	3.9	1.3	4.1
Subcentro	3.2	1.3	3.2	2.9	2.7
Hospital	3.6	5.6	6.4	1.9	4.6
Private Doctor	4.0	5.1	8.0	20.4	8.5
Pharmacy	3.2	2.4	.9		1.8
Family	7.4	6.1	5.2	3.9	5.8
Church	1.3		1.3	1.9	1.1
Midwife		.7		1.0	.4
Folk Healer		1.0	1.3	1.5	.9
Other	.7		1.6	1.9	1.0

TABLE 7.12.13

TYPE OF HEALTH SERVICES USED
BY GENDER
(Percent of Children Ill
That Used Service)
N=685; NS

	MALE N=3[illegible]7	FEMALE N=311	TOTAL N=687
Used No Service	63.6	70.7	66.8
Clinic with Doctor	4.1	3.5	3.8
Subcentro	2.4	2.6	2.5
Hospital	5.9	4.6	5.3
Private Doctor	10.2	8.0	9.2
Pharmacy	1.3	2.5	1.9
Family	7.4	6.0	6.7
Church	1.3	.6	1.0
Midwife	.5		.3
Folk Healer	1.9	.3	1.2
Other	1.3	1.1	1.2

TABLE 7.12.14

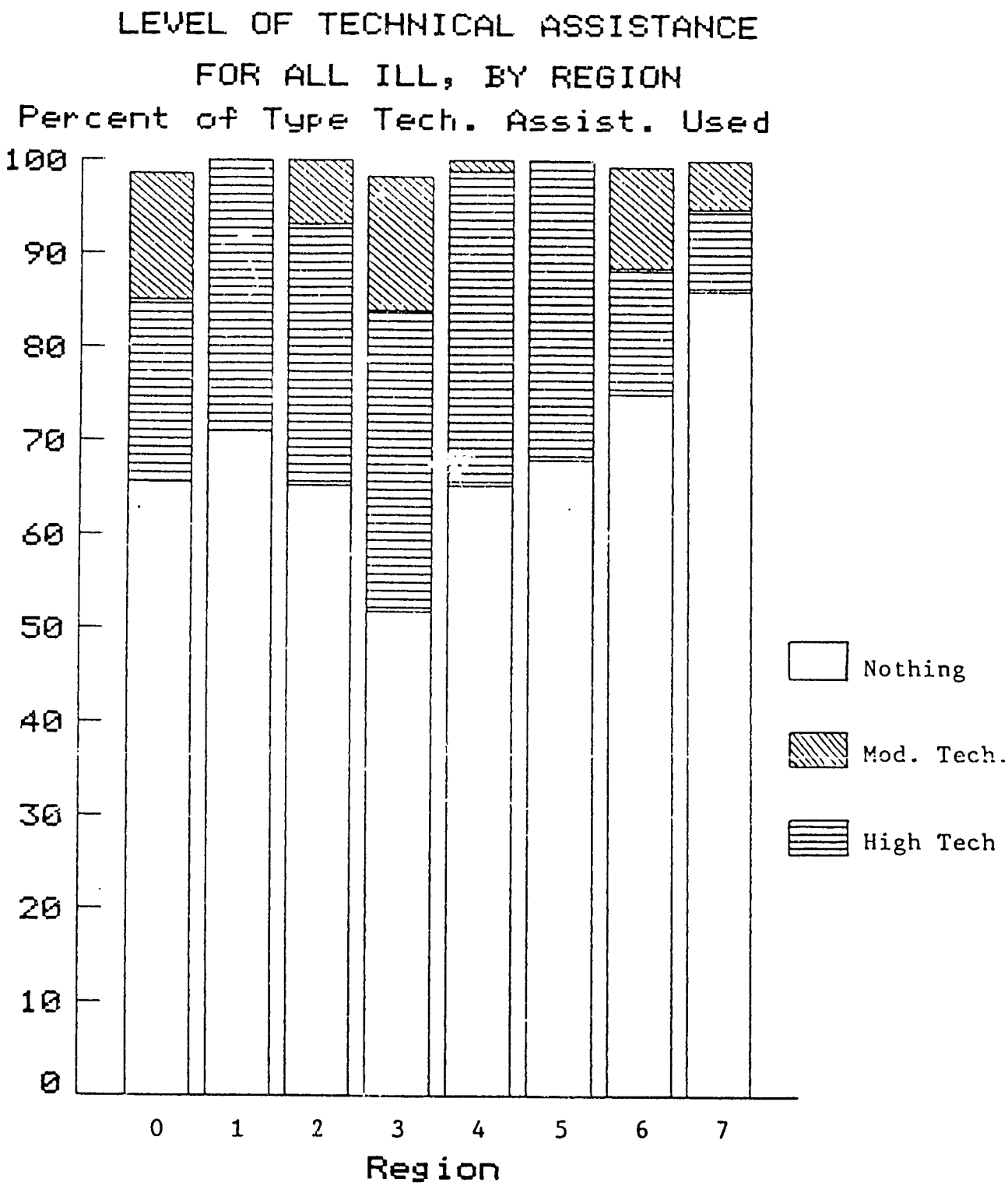
TECHNICAL LEVEL OF HEALTH SERVICES
BY SESPAS REGION

(Percent of ill children
who used services)

REGION	0 N=250	1 N=62	2 N=66	3 N=56	4 N=164	5 N=56	6 N=36	7 N=57	TOTAL N=747
No Health Service	N=164 65.6%	N=44 71.0%	N=43 65.2%	N=29 51.8%	N=107 65.2%	N=38 67.9%	N=27 75.0%	N=49 86.0%	N=501 67.1%
High Technology	19.4	29.0	27.9	32.1	33.5	35.7	13.5	8.8	25.1%
Low Technology	13.5	1.6	7.4	14.3	1.8		10.8	7.0	7.8%

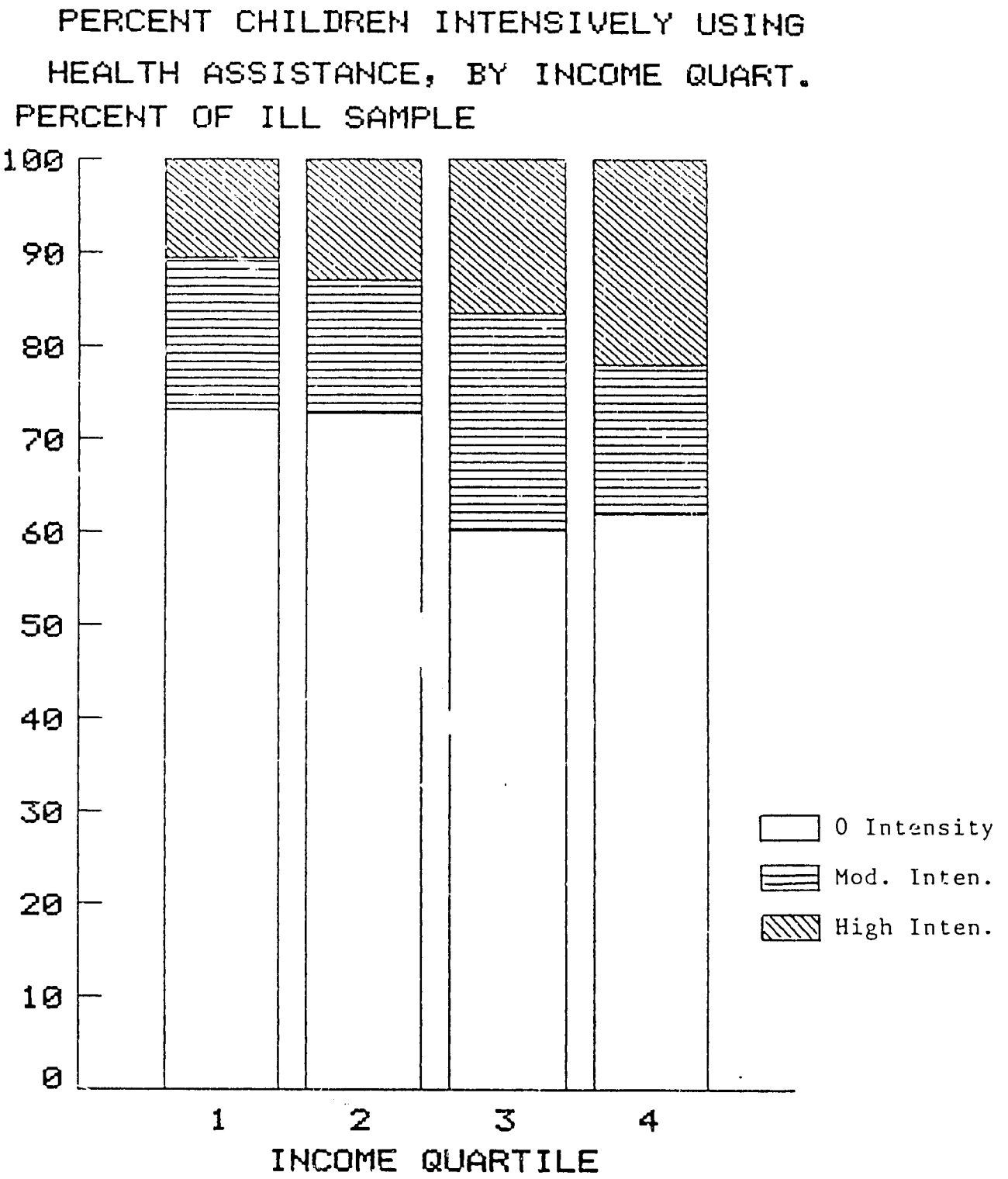
p=0.0000

FIGURE 7.12.09



N=752
p=0.0001

FIGURE 7.12.10



N=561
p=0.03

TABLE 7.12.15

LEVEL OF TECHNICAL ASSISTANCE USED
BY STRATUM

(Percent Children Ill
That Used Service)
(N=690; p=0.000)

	1 N=254	2 N=178	3 N=26	4 N=81	5 N=152	TOTAL N=690
No Health Serv.	67.1	59.3	67.9	78.9	69.0	66.9
Low Technology	19.4	37.3	27.0	19.7	21.0	24.7
High Technology	13.5	3.4	5.1	1.4	10.0	8.4

TABLE 7.12.16

LEVEL OF TECHNICAL ASSISTANCE USED
BY INCOME QUARTILE

(Percent of Children Ill
That Used Service)
N=558; NS

	1 N=150	2 N=150	3 N=155	4 N=103	TOTAL N=558
No Health Serv.	73.6	68.6	69.1	65.1	69.5
Low Technology	17.6	23.0	25.0	30.1	23.4
High Technology	8.8	8.4	5.9	4.9	7.1

TABLE 7.12.17

LEVEL OF TECHNICAL ASSISTANCE USED
BY GENDER

(Percent Children Ill
That Used Service)
(N=687; p=0.09)

	MALE N=377	FEMALE N=311	TOTAL N=687
No Health Serv.	64.1	70.4	67.0
Low Technology	25.8	23.3	24.7
High Technology	10.2	6.2	8.4

7.12.05 Effect of Morbidity on Nutritional Status

Figure 7.12.11 illustrates WAZ by specific illness type. This variable was selected because it is the most sensitive to short-term changes caused by morbidity. Not surprisingly, children with diarrheal involvement exhibited the lowest WAZ, while those with respiratory involvement, even if in combination with fever, exhibited higher values. This finding is consistent with the vast literature on diarrheal illness, indicating that it can pose the greatest hazard to young child health and nutritional status.

Figure 7.12.12 illustrates differences between distinct categories of malnutrition (using Gomez classification) and incidence/duration of diarrheal illness. (Malnutrition grades two and three were grouped together because too few children were in third degree malnutrition to make valid statistical inferences.) Here it can be seen that children who were between 90-100% weight-for-age (WAZ) and "normal" had significantly fewer diarrheal episodes than their more malnourished counterparts, and that as WAZ fell, both incidence and duration of diarrhea rose. This is not a surprising finding; however, the nature of this data does not allow discerning whether the ill child's weight was low before diarrheal episode or if the illness caused weight to fall.

7.12.06 Effect of Breastfeeding

Figure 7.12.13 illustrates the difference betweem breastfed and non-breastfed children and illness incident. Breaking these groups into age by years, it can be seen that at younger ages, those who were breastfed had significantly lower incidences of illness: 57.6 percent vs. 78.9 percent (breastfed vs. non-breastfed, respectively) were ill at less than one year, while 66.6 percent vs. 75.5 percent were ill between one to two years. However, at the third year, those who were breastfed had significantly more illness than those who were not. This is believed to be the case because of a strong income effect: those who breastfed for longer periods of time were of lower income than those who weaned earlier. Nevertheless, with children losing growth velocity most rapidly at less than one year and with diarrheal illness being one of the chief causes of morbidity in this age group, the significant trend toward less illness in the group that was breastfed (which included both solely breastfeeding and combination feeding) is an important indication of possible intervention efforts that could be made in this population.

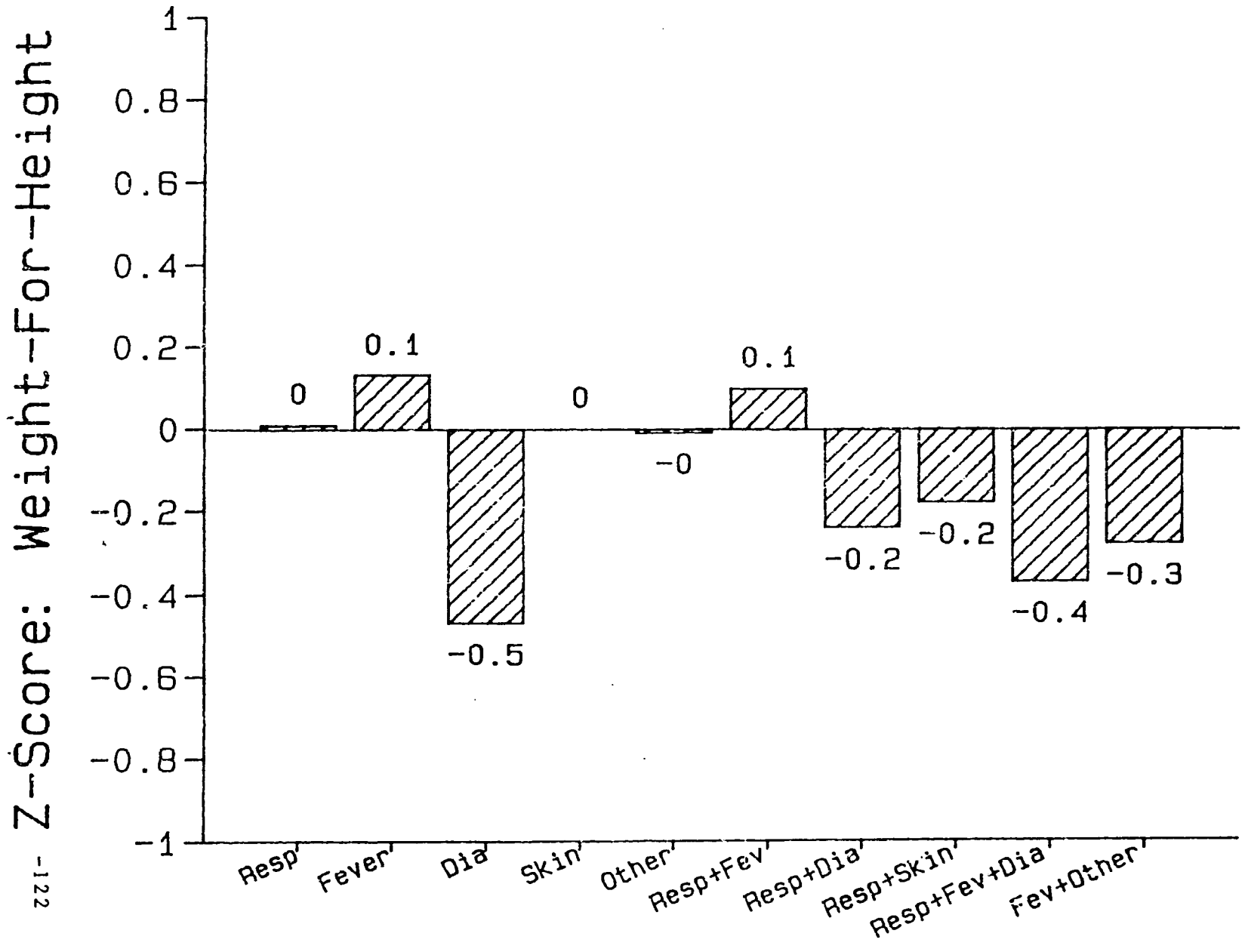
7.12.07 Differences Between Gender

For all illness groupings, males were more ill than females but not significantly so (Figure 7.12.14). Slightly more funds and more technical consultants were sought for males as well (ref. Tables 7.12.13 and 7.12.16); this could well be appropriate caregiving practices. However, it could also reflect that males were perceived as being more ill than females, and that male illness was taken more seriously due to the higher cultural value placed on males. Perhaps some caretakers were more apt to notice a diarrheal episode or cough

FIGURE 7.12.11

COMPARISON BETWEEN WEIGHT-FOR-HEIGHT

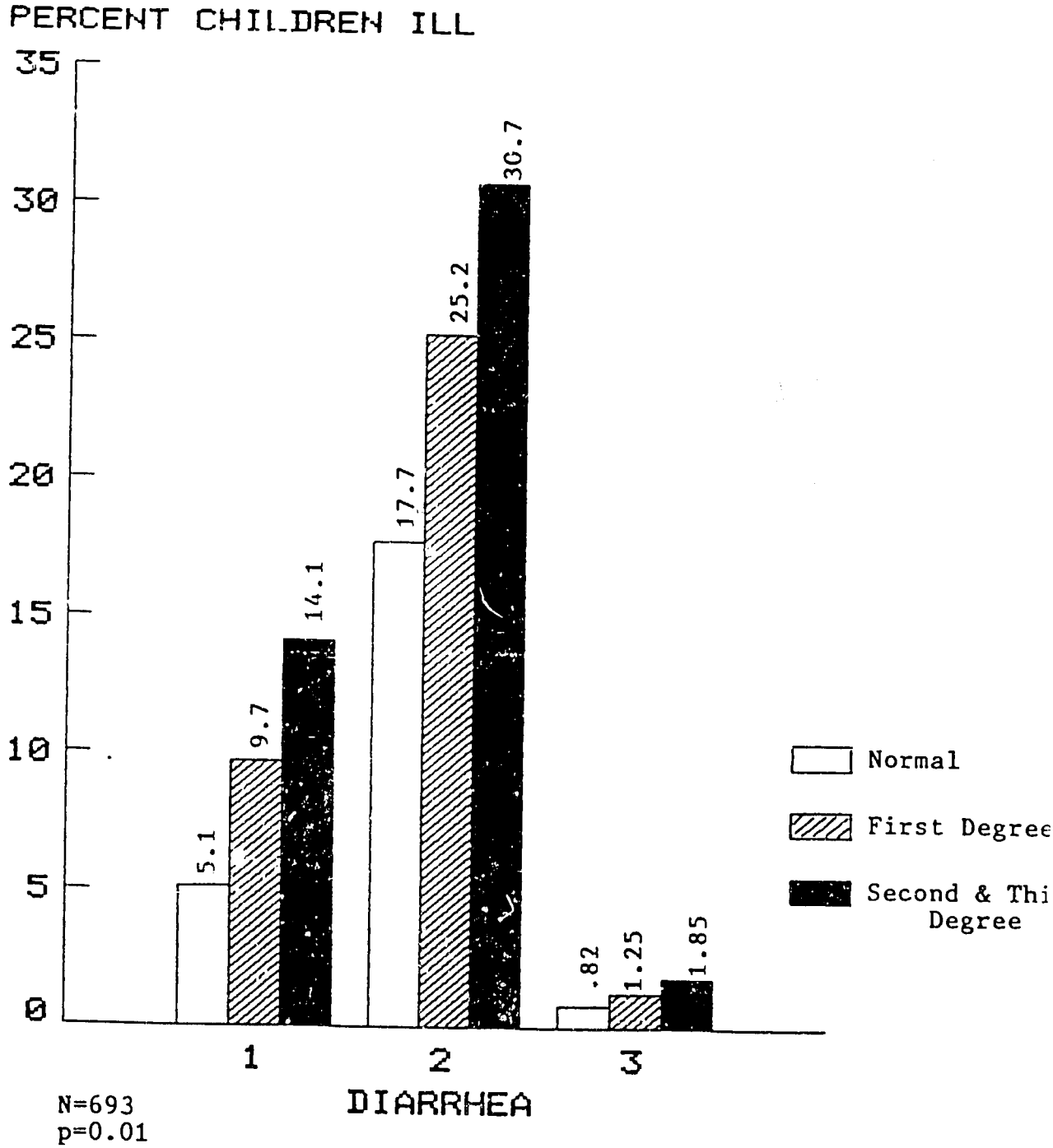
Between Illness Types



N=75

FIGURE 7.12.12

RATE OF DIARRHEA BY DEGREE OF MALNUTRITION



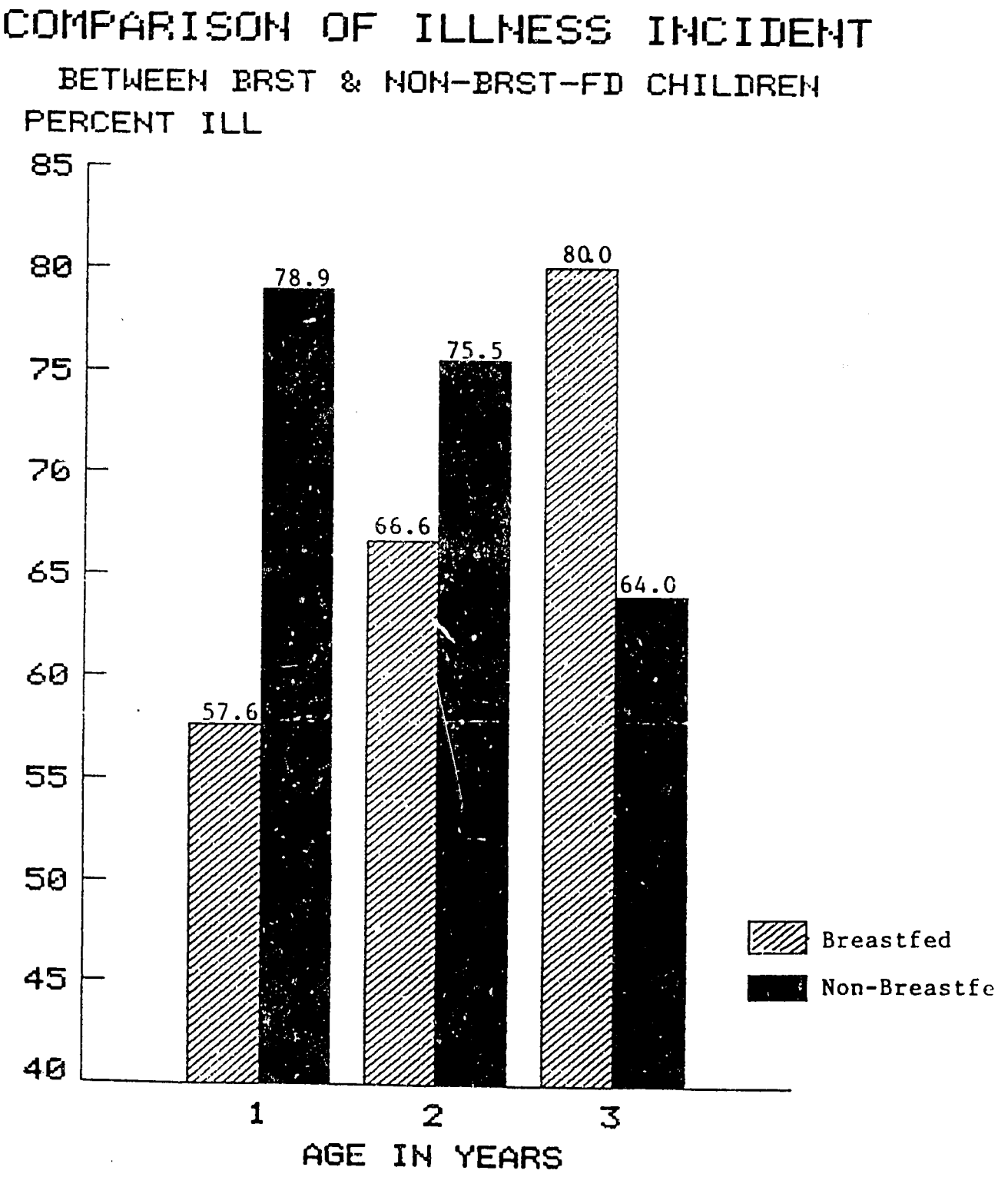
N=693
p=0.01

1=Diarrhea Only

2=Any Diarrhea

3=Diarrhea Duration in Days

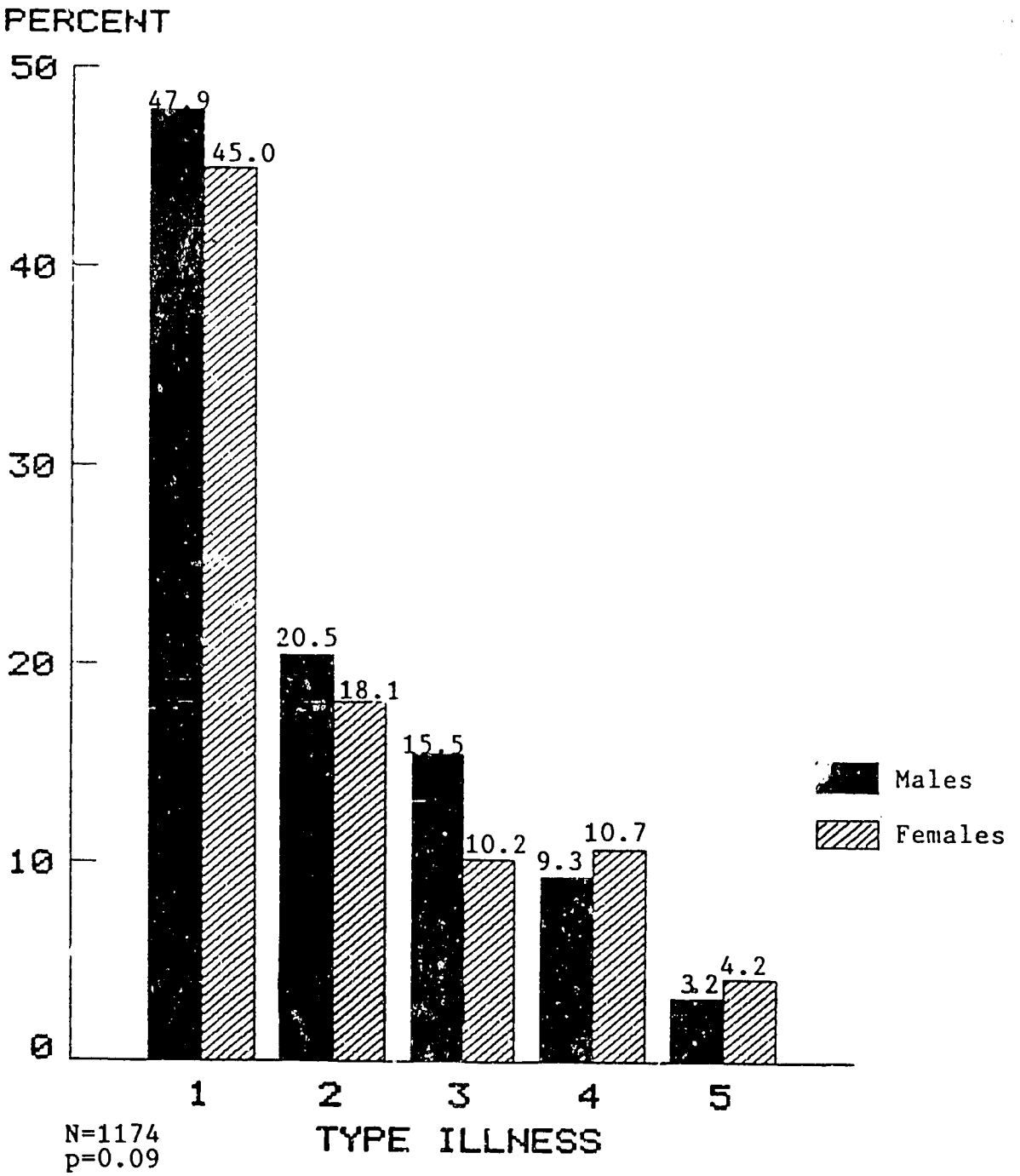
FIGURE 7.12.13



N=563
p=0.006

FIGURE 7.12.14

RATE OF SPECIFIC ILLNESS BETWEEN SEXES



N=1174
p=0.09

1=Respiratory
2=Fever
3=Diarrhea
4=Skin or Eye
5=Other Illness

TABLE 7.12.18

LEVEL OF INTENSITY (COST PLUS ASSISTANCE)
BY INCOME QUARTILE

(Percent of Children Ill
That Used Service)
N=561; p=0.03

	1 N=150	2 N=150	3 N=155	4 N=103	TOTAL N=558
No Intensity	73.1	72.7	60.1	61.9	67.3
Low Intensity	16.3	14.3	23.4	16.0	17.7
High Intensity	10.7	13.1	16.5	22.1	15.0

TABLE 12.19

LEVEL OF TECHNICAL ASSISTANCE USED
BY ILLNESS TYPE

(Percent of Children Ill
That Used Service)
N=693; p=0.000

	RESP N=276	FEVER N=130	DIAR. N=131	SKIN N=113	OTHER N=43	TOTAL N=693
No Health Serv.	80.7	62.4	54.9	59.3	49.1	67.0
Low Technology	13.7	32.4	33.5	28.0	35.5	24.7
High Technology	5.6	5.2	11.5	12.7	15.3	8.4

TABLE 7.12.20

LEVEL OF INTENSITY (COST PLUS ASSISTANCE)
BY ILLNESS TYPE

(Percent of Children 111
That Used Service)
N=693; p=0.001

	RESP N=276	FEVER N=130	DIAR. N=131	SKIN N=113	OTHER N=43	TOTAL N=693
No Intensity	76.1	56.5	56.0	66.4	61.4	66.1
Low Intensity	16.1	22.0	21.3	14.9	12.9	17.8
High Intensity	7.8	21.5	22.7	18.7	25.7	16.1

with a male than a female child. Again the limitation of recall data is such that these differences can never be ascertained.

7.13 PROGRAM USE AND IMPACT

As stated in the preliminary report, program use was well targeted toward the malnourished. Those who used any sort of food supplement programs had significantly lower HAZ, WAZ, and WHZ than those not using programs (Table 7.13.1).

Although approximately 20 percent of all children had used some sort of food supplement program during the past six months, specific programs which had been used were exceedingly diverse and contained few persons within each type. This, coupled with the fact that they survey was taken at one point in time and not of a longitudinal nature, deemed in-depth evaluation of program impact impossible.

Table 7.13.2 illustrates why analysis is so difficult for these programs. As can be seen, not only are there few participants in many of these programs, but the range of frequency of donation and average donation varies greatly. In other words, what agencies may believe is the standard for program participation is not the uniform practice at the micro level. This problem was encountered repeatedly during data collection. Program recipients usually did not know the agency or governmental source of the food received, they only knew where and when it could be obtained. The field workers traced the person responsible for food distribution and asked details about food source from her. Frequently she did not know the food source either. In addition, programs were poorly publicized. Even if a program were in place in a community, many of those eligible had not heard of its existence.

This being the case, a few effects could be noted in the data. One interesting trend was the number of food programs that were used. Children who used more than one program were significantly more stunted than those using only one program, but were also chubbier (Table 7.13.3). Examining income and home consumption for children who had used more than one program revealed that these children tended to have less income in the home but more calories and protein available (Table 7.13.4). Although these trends were not significant, they may indicate that some sort of program impact occurred when a greater ration size (participation in two programs rather than one) is received.

A further interesting effect was seen with those who had recently received PPL cheese during the time of the Tufts Consumption Study (Table 7.13.5). These children were significantly heavier than those who had been on the PNA program and had not received cheese. These results are extremely confounded by region and other intervening factors. However, they may indicate an income effect as well: most families receiving these cheese rations reported that they immediately sold them. The cheese thus provided an additional income increment rather than directly supplementing the diet.

Dr. Rogers' finding that those of high income receive many of the program participation benefits is replicated in this data (1). As shown in Figure 7.13.1, nearly 40 percent of all program participation is by those of the upper half of income levels. Nearly 13 percent of

those participating in programs are from the upper income quartile. Clearly, programs are not accurately targeted to the low income.

Major food programs by SESPAS regional breakdown are shown in Table 7.13.6. Children of male-headed households were more likely to participate than those of female-headed households except in the highest income quartile, where 31 percent of children from households headed by women vs. nine percent from male headed households received benefits from some type of food program.

7.14 COMMUNITY AVAILABILITY AND USE OF SERVICES

Table 7.14.1 shows the availability of health services at the community level. Each cell represents the percentage of children covered by this service within the SESPAS region surveyed. As can be seen, the Capital (Region 0) seems fairly well covered by all services represented. This contrasts sharply with more sparsely populated regions (e.g. the Central West and the East, or Regions 6 and 5), where a much smaller percentage of children were covered by technical services. Counting these services by technical nature yielded the following table (7.14.2). At the child level, each technical type of service available was summed if it were present, resulting in a count variable with values from zero to seven (zero signifying that no technical services were available, seven signifying that seven technical services were available). As shown, no children in the capital had zero technical services available to them, whereas over 40 percent of children in the Central West (Region 6) lacked any kind of technical health service nearby. Similarly, only children in the capital had as many as seven technical services nearby.

Examination was then made as to actual use of these services within the past six months (Table 7.14.3). As shown, nearly 85 percent of the sample had used the SESPAS health promotor; this indicates that these children were vaccinated, as a national campaign began during data collection. Two-thirds of the sample used pharmacies, and one-third used hospitals. It is interesting to note that nearly one-fifth of the children had been taken to a folk healer; in most cases, caretakers claimed that the curer was indeed a witch.

Table 7.14.4 shows the availability of subsidized stores at the regional level. Again, the East falls short of the remainder of the country, contrasting sharple to high availability in the South and Central West.

Table 7.13.1
COMPARISON OF ANTHROPOMETRICS
BETWEEN CHILDREN USING PROGRAMS AND
CHILDREN NOT USING PROGRAMS
N=1166

	HAZ	WAZ	WHZ
No Participation	-0.97	-0.61	0.01
Participation	-1.36	-0.96	-0.12
SIGNIFICANCE	p=0.000	p=0.000	p=0.04

TABLE 7.13.2
LENGTH OF DURATION OF FOODS FROM SUPPLEMENT PROGRAMS AND FREQUENCY OF DONATION

PROGRAM	NUMBER CHILDREN	DURATION (Days)	FREQUENCY OF DONATION	
Local Clinic	118	Average: 3.5 Range: 0-34 59% = 0 Days	N= 5 N=59 N=49	Weekly Bimonthly Monthly
SESPAS	39	Average: 3.2 Range: 0-17 25% = 0 Days	N= 2 N= 1 N=30	Daily Bimonthly Monthly
Preschool Program	32	Average: 7.7 Range: 0-17	N=33 N= 2	Daily Weekly
INESPRE	71	Average: 5.2 Range: 0-13 16% = 0 Days	N=71	Monthly
Liquid Milk	39	Average: 0 100% = 0 Days	N=38 N= 1	Daily Monthly

TABLE 7.13.3.

COMPARISION OF ANTROPOMETRIC VALUES
BETWEEN CHILDREN USING MORE THAN ONE PROGRAM
AND ALL OTHER CHILDREN
Population: All Study Children
N=1230

	COUNT	HAZ	WAZ	WHZ
Using One Program	158	-1.25	-1.00	-0.24
Using Two Program	22	-1.43	-0.90	-0.12
All Other Children	1050	-0.89	-0.62	-0.01
SIGNIFICANCE		p=0.001	p=0.000	p=0.02

TABLE 7.13.4

COMPARISON BETWEEN USE OF
MORE THAN ONE FOOD PROGRAM
N=970

	COUNT	In-Kind Income	Earned Income	Kcals/ Ad. Eq.	Prot/ Ad. Eq.
All Other Children	954	479.6	375.7	2486	57.6
Used More than One	15	451.8	297.6	2597	63.6
SIGNIFICANCE		(NS)	(NS)	(NS)	(NS)

TABLE 7.13.5

COMPARISON BETWEEN CHILDREN RECEIVING CHEESE
AND NOT RECEIVING CHEESE FROM PPL PROGRAM
N=27

	COUNT	HAZ	WAZ	WHZ
Did Not Receive Cheese	15	-1.59	-1.19	-0.24
Received Cheese	12	-1.00	-0.49	0.07
SIGNIFICANCE		(NS)	p=0.01	p=0.07

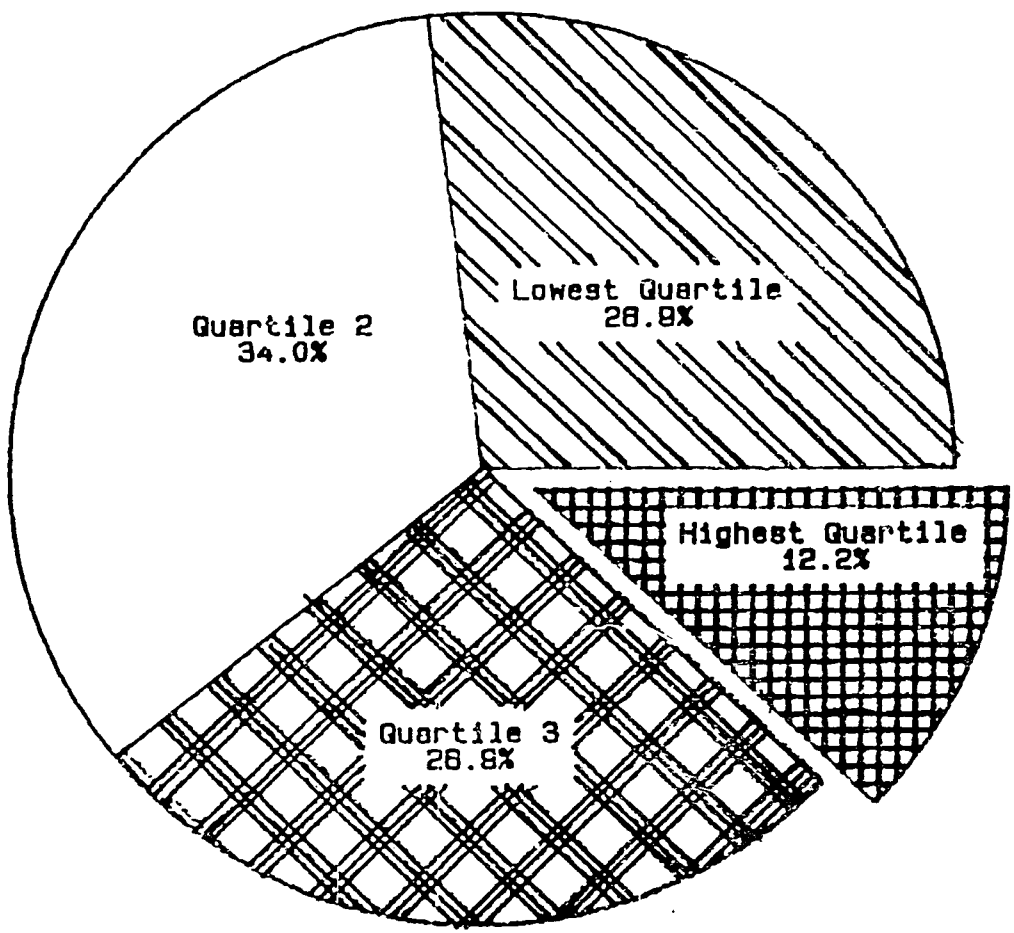
TABLE 7.13.6

PERCENTAGE OF CHILDREN USING FOOD SUPPLEMENT PROGRAMS
BY SESPAS REGION

REGION	0 N=327	1 N=117	2 N=143	3 N=88	4 N=287	5 N=106	6 N=50	7 N=95	TOTAL N=1215
CEA		.9				14.8			1.4%
CONANI	3.4				.7				1.1
CLINICA LOCAL	.3				1.0				0.3
PUESTO DE SESPAS		1.7		1.1	8.3	9.3			3.0
IAD									
CENTRO DE RECUP.	1.8				1.0				0.7
PRESCHOOL PROGRAM					19.1		21.3		5.8
FOOD FOR WORK					0.3				0.1
ORPHANAGES						1.9			0.2
PROG. MUNDIAL DE ALIMENTOS									
INESPRE	.9	1.7			17.4		17.5	2.2	5.7
MILK FROM SALUD PUBLICA					12.5		2.5		3.1

FIGURE 7.13.1

PARTICIPATION IN FOOD PROGRAMS BY INCOME QUARTILE



n=0 000,

TABLE 7.14.1

COMMUNITY SERVICES AVAILABLE
BY SESPAS REGION

(PERCENT OF CHILDREN)

REGION	0 N=327	I N=117	II N=143	III N=88	IV N=287	V N=108	VI N=50	VII N=95	TOTAL N=1215
LOCAL CLINIC WITH DOCTOR	20.5	17.1	25.2	19.3	42.5	23.1		82.1	30.0%
SUBCENTRO DE SALUD	14.1		14.0					17.9	6.8%
HOSPITAL	16.2	6.8	14.0	55.7	18.1	13.0	28.0		17.3%
PRIVATE DOCTOR (W/O CLINIC)	63.0	21.4	39.2		10.1	8.3	16.0	34.7	30.1%
PHARMACY	97.2	19.7	64.3	42.0	28.2	38.9	28.0	34.7	52.7%
CHURCH WITH CONSULTORY	48.0	9.4		9.1			26.0		15.6%
MIDWIFE	20.2	69.2	14.0	19.3	79.8	8.3		42.1	38.0%
FOLK HEALERS	76.8	42.7	60.1	62.5	87.5	17.6	100.0	83.2	69.2%
PROMOTOR OF SALUD PUBLICA	62.1	46.2	70.6	100.0	93.7	44.4	88.0	100.0	74.2%
PROMOTOR OF CARITAS	20.5	17.1	25.2	19.3	42.5	23.1		82.1	30.0%
CONANI	44.0	6.8	5.6		11.8	7.4			16.6%
PRIVATE CLINIC	49.5	3.4	28.0	55.7	8.0	39.8	16.0	17.9	28.5%

TABLE 7.14.2

PERCENT OF CHILDREN WITH ACCESS TO
TECHNICAL HEALTH SERVICES
BY SESPAS REGION

N=1251; p=0.0000

NUMBER SERV AVAILABLE	0 N=327	I N=117	II N=143	III N=88	IV N=289	V N=108	VI N=84	VII N=95	TOTAL N=1251
0		27.4	4.2		6.9		40.5		7.4%
1	17.1	26.5	25.2	20.5	30.8	42.6	27.4		23.9%
2	3.7	34.2	31.5	4.5	22.5	44.4	22.6	65.3	23.6%
3	4.3	12.0	5.6	47.7	31.8	5.6			14.1%
4	31.2		14.0	27.3				16.8	12.9%
5	24.8		5.6		8.0	7.4	9.5	17.9	11.6%
6	4.0		14.0						2.6%
7	3.9								3.9%

TABLE 7.14.3
HEALTH SERVICES USED
BY SESPAS REGION

(PERCENT OF CHILDREN)

REGION	0 N=327	I N=117	II N=143	III N=86	IV N=287	V N=108	VI N=50	VII N=95	TOTAL N=1215
LOCAL CLINIC	3.7	16.4	2.1	16.3	28.3	9.3	11.3	48.4	15.6%
SUBCENTRO DE SALUD	12.3	2.6	2.8	36.0	5.6	8.3	10.0	8.6	9.6%
HOSPITAL	25.8	44.8	32.2	24.4	44.4	32.4	35.0	21.5	33.4%
PRIVATE DOCTOR	12.9	4.3	28.7	11.6	4.2	9.3	2.5	10.8	10.7%
PHARMACY	68.3	60.3	79.7	31.4	66.1	63.9	43.8	73.1	64.2%
CHURCH	8.6	.9	1.4	3.5		2.8			3.0%
MIDWIFE		1.7		9.3	3.4	1.9	11.3	2.2	4.0%
FOLK HEALER	14.6	7.6	14.7	37.2	24.1	10.2	27.5	5.4	17.5%
PROMOTOR OF SESPAS	84.7	78.4	93.7	93.0	83.2	70.4	91.3	92.5	85.1%
PRIVATE CLINIC	29.2	16.4	35.7	46.8	26.2	34.3	22.5	9.7	28.0%

TABLE 7.14.4

VENTA POPULAR AVAILABILITY
BY SESPAS REGION

(PERCENT OF CHILDREN)

Number of Children: 1101; p=0.0000

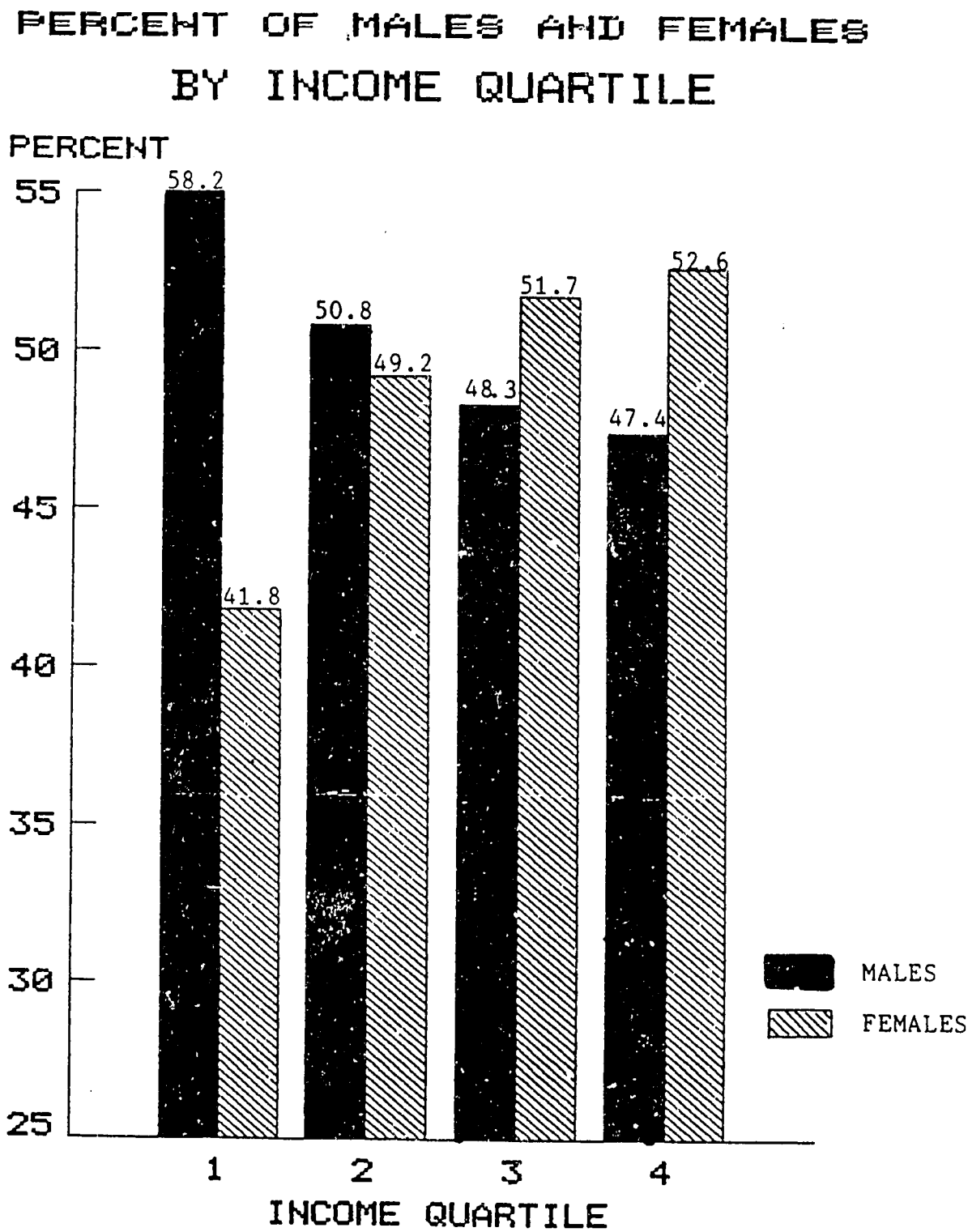
REGION	0	1	2	3	4	5	6	7	TOTAL
Avail.	N=70	N=55	N=105	N=29	N=248	N=7	N=82	N=87	N=683
	25.0	52.3	81.4	37.7	91.5	7.3	97.6	98.9	62.0%
Not Avail.	210	50	24	48	23	89	2	1	N=418
	78.6	88.6	44.2	62.3	68.2	95.8	65.5	39.8	69.5%

7.15 SEX BIAS

Breaking sex ratio* into quartiles demonstrated a highly significant difference between males (nearly 60%) and females (40%) in the lowest quartile (Figure 9). This striking difference warranted further investigation. Sex ratio was calculated for low and high income sectors by age; the greatest disparity seemed to be among the low-income at early ages (less than three years). This difference was found in both income quartiles and deciles. Because sex ratio started out fairly normally and did not become inordinately high until after three months of age, active infanticide was not suspected. However, neglect combined with the "downward spiral of malnutrition" in these lowest income groups could well be the cause of such a disproportionate number of males in these populations.

*Number of males divided by number of females, multiplied by 100. The sex ratio at birth is normally 104 to 105, then slowly falls throughout life. During pre-adolescence it is usually 100.

FIGURE 7.15.1



N=1251
p=0.00

8.0 DISCUSSION

Many persons currently working with health and nutrition in the Dominican Republic have expressed interest and concern in the widespread application of these findings. Specifically, they wonder whether results from this survey can be applied with confidence at a national level. Concerns seem to center around two issues: (1) sample selection and (2) use of NCHS standards rather than the traditional SESPAS breakdowns.

Pages 9 and 10 of this report address the first issue. The sample population was originally gathered to reflect demographic and economic trends at a national level; regional breakdowns were not included in the original focus of the study. Again, the reader is referred to Table 6, where differences between population percent within region and sample percent within region are noted. A representative sample may not have been gathered from these regions, as regional breakdown was not a criteria for this sample selection. In addition, small numbers within regions may indicate that the children sampled did not adequately reflect true nutritional status of the entire population. Thus, Regions I, II, III and VI may be viewed with caution and not as absolute values which truely represent these regions. Conversely, Regions 0, IV, and VII are more accurate pictures of reality in these areas.

The second issue may be best addressed by Figure 8.0. Here it can be seen that Dominican standards traditionally used by SESPAS do not vary greatly from NCHS breakdowns into Gomez classifications. In fact, variation is only about five percent between first-degree malnutrition cut-off points. Second-degree and third-degree malnutrition ranges are nearly identical.

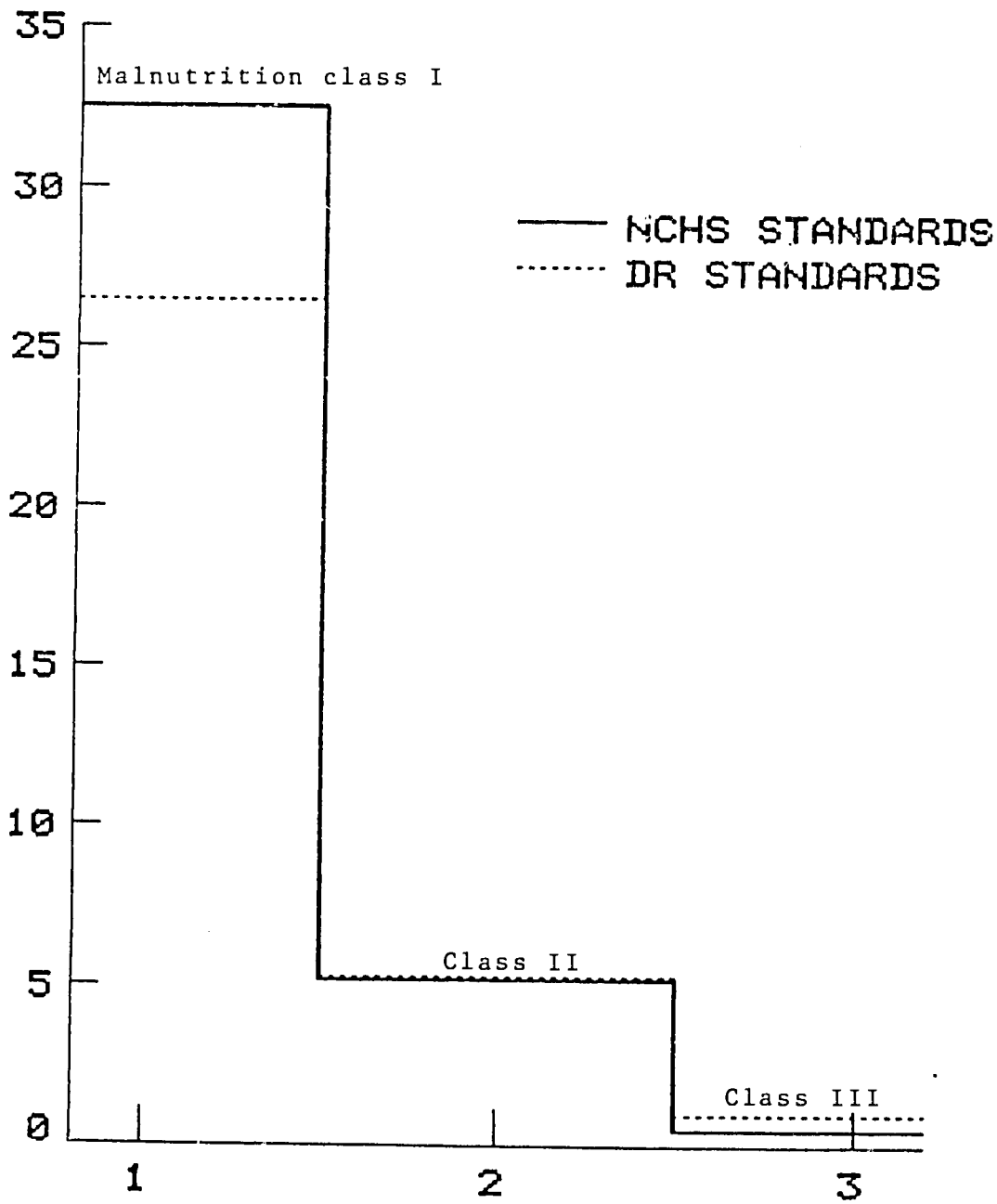
Given this information and the high degree of accuracy involved in anthropometrics and other variables, as well as timeliness (data collection began less than a year from the time that this report was compiled), total country values can be used to update existing data. With the qualifications noted, regional breakdowns can be interpreted as valid, especially in Regions 0 and IV (the capital and Southwest).

An important means of interpreting these results is by means of the underlying meanings of height-for-age and weight-for-height. Height, a measure of long-term nutritional status, yields different information than weight-for-height, a reflection of immediate nutriture. Weight-for-age is confounded by both absolute stature and proportion of body fat and lean body mass, and yielding less specific information than the other two measurements in this context. Hence, while the Central West (Region 6) fared relatively well for HAZ, their WHZ was lower than many other regions in the sample. This may indicate that a trend toward more acute malnutrition was present in this region: perhaps a seasonal variation was present or sudden price shift of a major caloric source had recently occurred.

The major trend present in all data was that of income. This was among one of the strongest influences across regions, strata, age, and other breakdowns, underscoring the importance in addressing

Figure 8.0

COMPARISON OF EXTENT OF MALNUTRITION:
NCHS VS. DR STANDARDS



malnutrition through total economic development of the country rather than by isolated symptoms of the problem.

Dietary intake values were higher than those reported in previous literature (6). This may be due to increased calories and protein available at present; it may also be due to a greater degree of accuracy in measurement methodology (a week's worth of recall information based on volumetric measurements). These figures seem realistic for the population at large.

Because protein and calories were the basic nutrients sampled, micronutrients (e.g. vitamins and minerals) were not included in the analysis. A survey of this type cannot accurately measure micronutrient content, although food frequencies can alude to dietary deficiencies. The common finding in the country that iron-deficiency anemia is widespread was noted in lower income groups, who had compromised intake of iron-rich foods in lieu of increased calories from cheaper sources. Likewise, calcium deficiency may be of concern in this population as few milk products were used as income fell. Other nutrient deficiencies were not noted, and the only sign of a nutritional deficiency disease during both pretest and data collection was an adult Haitian woman with goiter.

In pinpointing the main causes of malnutrition in the under-six-year population, it is evident that the main problem lies within the first year of life. Birthweights are, on the whole, fairly high. Breastfeeding is present in the majority of the population, and for more than six months for many mother-child pairs. Yet growth fails precipitously within the first year, particularly during the first six months of life. The reason for this rapid decline may well be early introduction of bottlefeeding combined with poor hygiene practices, leading to more diarrhea and nutritional insult. In addition, late introduction of solids and poor nutrient content of those offered may well have resulted in the steep decline of all three anthropometric variables that was noted.

Perhaps the most startling finding was the strong impact of women's income on nutrition, coupled with female-headed households and improved nutritional status. Previously, children from households headed by women have fared more poorly than those headed by men. These data, approaching significance in the lowest income quartile, uncover trends which could lead to exciting development possibilities.

Finally, one area explored in this data which has not been noted in previous literature is that of sex bias. A strong trend toward male preference was noted in several data breakdowns. It is believed that this sex bias is reflected to more or less an extent throughout the entire population, but that its emphasis at the lowest income groupings leads to measurable impact on tested variables.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Taken as a whole, the Dominican preschool population does not fare badly. Slightly stunted but with adequate body stores, they are generally not in danger of acute malnutrition. The majority of the populance has access to adequate calories and protein, although those of lowest income seem to be facing a real crisis in terms of absolute food quantity. Nontheless, birthweights are within normal range for most persons, and only 10 to 11 percent of all births are less than 2500 grams.

Yet regional disparities are also endemic. Nearly one-fourth of all births in the public hospital in La Romana were of low-birthweight status. The Southwest (Region IV) also contains pointed indicators of undernutrition, with low anthropometric values, few calories and protein available, and low income status. In fact, two-thirds of the lowest income quartile were comprised of those from the Frontier stratum.

In light of these findings, the following recommendations can be given:

1. TARGETING

The most obvious targeting which must occur is that to low-income groups. Nearly 40 percent of all food program participants were from the upper half of the income distribution. Because a great deal of regional and income disparity exists, care must be exercised when targeting occurs in order to insure against leakage.

Targeting by region is difficult to access by this report. Certainly, the Southwest is the most in need of stringent attention. Other regions which could benefit from targeted interventions are the East (Region 5) and West (Region 6), Although this latter does not show the trend toward malnutrition that the Southwest demonstrates, nontheless low caloric and protein availability and general low income status of the population render it a candidate for special focus.

2. WOMEN'S INCOME

Another finding that bears merit is the relationship between women's income and improved nutritional status of their children. Income-generating activities could thus be encouraged and/or build into long-range policies. Such enterprises as handicraft industries may provide viable opportunities for income and would not necessitate the woman leaving the home. Even if the activity required her absence, social support networks are such in this culture that adequate child care may be obtained from nearly any close relation, with the exception of young siblings and elderly grandparents.

3. BREASTFEEDING

A national campaign was been undertaken to address this issue. Perhaps its effect has resulted in the large proportion of breastfeeding mothers, and a mean weaning age of approximately eight months. However, while most mothers firmly believe that breastmilk is the best food for a newborn, few feel that they can adequately

sustain lactation for more than a few weeks without jeopardizing their child's health. In other words, the cultural belief that breastmilk alone is insufficient for growth after the first few weeks of life is quite strong. This leads to early introduction of bottlefeeding, which has well-known risks associated.

The belief that bottlefeeding is essential for a newborn infant must be addressed. Education postponing the introduction of bottlefeeding would be one realistic approach. In addition, education regarding improved bottle hygiene and feeding practices would be useful. In all the time the PI spent in homes of young children, she never noted a bottle of prepared formula that was refrigerated. Prepared bottles ready for feeding were in some cases left on floors or windowsills, within easy access but also incubating bacteria.

Breastfeeding practices must be encouraged and promoted in order that they continue so strongly in this society.

4. WEANING AGE AND FOODS

Introduction of solid foods is quite late in this culture. Nutrition education programs could address earlier solid feedings (4 months) as well as increased nutrient density (addition of small amounts of oil to feeds, animal protein if available). Bulky carbohydrate foods traditionally given (e.g. yuca and platain) are not optimal foods; these could be substituted for thicker wheat-based gruels with added oil.

5. FEEDING METHODS

Again, nutrition education programs could focus on ways to feed infants and small children. Rather than allowing them to eat their meal unassisted (and usually ambulatory), mothers could be encouraged to actively feed children, holding them in their arms or restraining them in some way and not allowing them to solely self-feed during the toddler age.

6. HEALTH CARE

Health care could focus on the younger child at higher risk for morbidity and diarrhea, rather than all ages. Technical rather than traditional healers could be promoted; health promotors could provide an intermediary point between high technological care and traditioinal medicine. Promotors could be utilized more fully, better equipped with scales and measuring devices, with higher training and job seniority.

7. SEX BIAS

Unfortunately, sex bias is likely to remain part of the cultural bias until the society becomes more equal for women as a whole. In the meantime, health workers should be allerted to the risk to female infants and children, particularly in the lowest income groups.

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APPENDIX 1

QUESTIONNARIE
FOR
TUFTS NUTRITION SURVEY

STRATO☐ PROVINCIA☐☐ MUNICIPIO☐☐ ENCUESTADORA_____

Fecha (Día) ___ (Mes)___(Año)___

CONGLOMERADO☐☐ SITIO_____

EL NIVEL COMUNITARIO

1. ¿Cuáles de los siguientes están en su comunidad?
   (ENCUESTADORA: Si no hay, déjalo en blanco)

☐ (01) Clinica local con medico
☐ (02) Clinica local sin medico
☐ (03) Subcentro de salud
☐ (04) Hospital
☐ (05) Medico privado (no en una clinica)
☐ (06) Farmacia
☐ (07) Iglesia con consultoria
☐ (08) Comadrona o partera
☐ (09) Curanderos, curiosos, o brujos
☐ (10) Promotor de Salud Publica
☐ (11) Promotor del programa de nutrición de Caritas
☐ (12) Promotor del programa de nutrición de Servicio Social de la Iglesia Dominicana
☐ (13) CONANI
☐ (14) Clinica privada
☐ (15) Otra _____

2. ¿Cuáles de los siguientes programas de alimentos han estado sirviendo a su comunidad en los últimos 6 meses?
   (ENCUESTADORA: Si no hay, déjalo en blanco)

Alimentos de CARE, a traves de:

☐ (01) CEA
☐ (02) CONANI
☐ (03) Clinica local
☐ (04) Puesto de SESPAS
☐ (05) IAD
☐ (06) Centro de Recuperación Nutricional
☐ (07) Hospital o Guarderías
☐ (08) Programa de Alimentos Pre-Escolar

Otros Programas:

☐ (09) Caritas: Alimentos por trabajo
☐ (10) Caritas: Escuela/Orfanatas: Niños 0-14 años
☐ (11) El Programa Mundial de Alimentos
☐ (12) Otra_____
(esoecufuque)

ENCUESTA DE NUTRICION DE TUFTS UNIVERSITY/USAID

SITIO: _____ FECHA (Día)___(Mes)___(Año)___ ENCUESTADORA _____

ESTRUCTURA Y CARACTERISTICAS DEMOGRAFICAS DEL HOGAR

Tamaño de Personas [ ][ ] CODIGO DE LA FAMILIA [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

No.	NOMBRE 1	Cód. de la Mad. 2	P. CODIGO 3	SEXO 4	EDAD AÑOS 5	¿Nuevo a la Encuesta? 6	¿Miembro de la familia?
01							
2							
3							
04							
5							
06							
07							
8							
0							
9							
11							
12							
13							
14							
15							
15							

NOTA:

Miembros de la casa incluye todas las personas que viven en la casa y comen de sus provisiones. Se incluye todas las personas que han pasado por lo menos 6 de los últimos 12 meses en la casa, aún cuando no estén actualmente presente. No se incluyen personas que hayan ido en forma permanente.

Parentesco
CODIGO:
01. Jefe
02. Esposa
03. Hijo/a
04. Padre/Madre
05. Hermano/a
06. Suegro/a
07. Yerno/a
08. Nieto/a
09. Otro familiar
10. Ninguna relacion

Código de la Madre: Miembro número de su madre (88=si la madre no vive en la casa)

CODIGO:
1. Masculino
2. Femenino, no encinta ni lactando
3. Femenino, encinta o lactando.

Si tiene menos de un (1) año, llena con "000"

CODIGO:
1=Sí
2=No
(Ver si figura en la foto cópia)

CODIGO:
1=Sí
2=No
(duerme y come con la famili

INFORMACION DE LA PERSONA QUE CUIDA A LOS NIÑOS LA MAYORI[illegible] [illegible] DE LA MADRE

1. Código de la Madre: Miembro número (página 1) [illegible] vive con l[illegible]

2. Código de la Madre: ¿Nueva a la encuesta o no?
3. Código de la Madre: ¿Miembro de la familia o no?

1=Sí
2=No
3=No vive con l[illegible]

4. ENCUESTADORA: ¿La madre contestó las preguntas? [illegible]=Sí [illegible]=No

5. ¿Cuántas veces la madre del niño ha estado embarazada? 99=No sabe

¿Cuántos niños viven? 99=No sabe

¿Cuántos abortos? 99=No sabe

¿Cuántos muertos? 99=No sabe

¿Cuántos nacidos muertos? 99=No sabe

6. ¿La madre está usando ahora algún método de planificación familiar? 1=Sí 9=No sabe 2=No

7. ¿Trabaja la madre fuera de la casa? [illegible]=Sí [illegible]=No

8. La mayoría del tiempo, ¿quién cuida a los niños menores de 6 años que están en la casa actualmente? 9=No sabe

(1) Madre
(2) Abuela de los niños
(3) Tía de los niños
(4) Hermana de los niños que tiene 10 AÑOS O MAS
(5) Hermana o hermano de los niños que tiene MENOS de 10 años
(6) Servicio
(7) Otra _____ (especifique)

9. ¿Cuántos años tiene aprobado en la escuela la persona que tiene la gran responsibilidad de cuidar a los niños? 99=No sabe

10. ¿Cuáles de los siguientes asistencias está usando actualmente para los niños menores de 6 años? (Marca "X" en cada uno que usó durante los últimos 6 meses.)

- (01) Clínica local con médico
- (02) Clínica local sin médico
- (03) Subcentro de salud
- (04) Hospital
- (05) Médico privado (sin clínica)
- (06) Farmacia
- (07) Iglesia con consultoria
- (08) Comadrona o partera
- (09) Curanderos, curiosos, brujo
- (10) Promotor de salud publica
- (11) Promotor de Caritas
- (12) Promotor de nutrición de la Iglesia Dominicana
- (13) CONANI
- (14) Clínica privada
- (15) Otra _____ (especific.)

INFORMACION DE LA PERSONA QUE CUIDA A LOS NIÑOS LA MAYORIA DEL TIEMPO Y/O DE LA MADRE

1. Código de la Madre: Miembro número (página 1) ☐☐ 88=No vive con la

2. Código de la Madre: ¿Nueva a la encuesta o no? ☐ 1=Sí 2=No
3. Código de la Madre: ¿Miembro de la familia o no? ☐ 8=No vive con la

4. ENCUESTADORA: ¿La madre contestó las preguntas? ☐ 1=Sí 2=No

5. ¿Cuántas veces la madre del niño ha estado embarazada? ☐☐ 99=No sabe

¿Cuántos niños viven? ☐☐ 99=No sabe

¿Cuántos abortos? ☐☐ 99=No sabe

¿Cuántos muertos? ☐☐ 99=No sabe

¿Cuántos nacidos muertos? ☐☐ 99=No sabe

6. ¿La madre está usando ahora algún método de planificación familiar? ☐ 1=Sí 2=No 9=No sabe

7. ¿Trabaja la madre fuera de la casa? ☐ 1=Sí 2=No

8. La mayoría del tiempo, ¿quién cuida a los niños menores de 6 años que están en la casa actualmente? ☐ 9=No sabe

(1) Madre
(2) Abuela de los niños
(3) Tía de los niños
(4) Hermana de los niños que tiene 10 AÑOS O MAS
(5) Hermana o hermano de los niños que tiene MENOS de 10 años
(6) Servicio
(7) Otra _____ (especifique)

9. ¿Cuántos años tiene aprobado en la escuela la persona que tiene la gran responsibilidad de cuidar a los niños? ☐☐ 99=No sabe

10. ¿Cuáles de los siguientes asistencias está usando actualmente para los niños menores de 6 años? (Marca "X" en cada uno que usó durante los últimos 6 meses.)

☐ (01) Clínica local con médico
☐ (02) Clínica local sin médico
☐ (03) Subcentro de salud
☐ (04) Hospital
☐ (05) Médico privado (sin clínica)
☐ (06) Farmacia
☐ (07) Iglesia con consultoria
☐ (08) Comadrona o partera
☐ (09) Curanderos, curiosos, brujo
☐ (10) Promotor de salud publica
☐ (11) Promotor de Caritas
☐ (12) Promotor de nutrición de la Iglesia Dominicana
☐ (13) CONANI
☐ (14) Clínica privada
☐ (15) Otra _____ (especific.)

INFORMACION DEL NIÑO

NOMBRE: _____

1. Código completo: Miembro número (página 1)
Número del embarazo
Código de la madre (página 2)

(="Código Breve")
99=No sabe

¿El niño está nuevo a la encuesta? ¿El es miembro de fam? 1=Sí, 2=

2. Fecha de Nacimiento

(día) (mes) (año) 9999=No sabe

3. Edad (si no sabe la fecha de nacimiento)

años meses

4. ¿El niño vive con su madre?

1=Sí
2=No
8=Madre falleció
9=No sabe

5. ¿Cuánto pesó su hijo al nacer?

(lib.)(on.) Libras (9999=No sabe)

Kilos (9999=No sabe)

6. Cuántos días tenía su hijo cuando lo pesaron?

99=No sabe

7. ¿La madre dió el seno a este niño?
(Si contesta "No," pase a Pregunta 9)

1=Sí
2=No
9=No sabe

8. ¿A que edad se le quitó el seno?

año mes sem. días 777777=Todavía da el seno

9. ¿Dió el biberon a este niño?
(Si contesta "No," va a la proxima página)

1=Sí
2=No
9=No sabe

10. Si dió el biberon, ¿a que edad empezó a darlo al niño?

año mes sem. días

11. ¿A que edad terminó de darlo al niño?

año mes sem. días 777777=Todavía da el bib.

12. ¿Cuáles cosas contiene/contenía el biberon?

- (01) Refrescos, té, agua de azúcar
- (02) Jugo
- (03) Leche en polvo (seco), cantina
- (04) Leche INESPRE
- (05) Leche para bebés (Similac, et
- (06) Cerelac, etc.
- (07) Arroz, maizena, con leche
- (08) Arroz, maizena, sin leche
- (09) Compotas, sopa
- (10) Leche de vaca o chivo
- (11) Otra _____ (especifique)
- (99) No sabe

INFORMACION DEL NIÑO NOMBRE: _____

1. Código completo: Miembro número (página 1) Número del embarazo Código de la madre (página 2) ¿El niño está nuevo a la encuesta? ¿El es miembro de fam?	(="Código Breve") 99=No sabe 1=Sí, 2=No
2. Fecha de Nacimiento	999999=No sabe (día) (mes) (año)
3. Edad (si no sabe la fecha de nacimiento)	años meses
4. ¿El niño vive con su madre?	1=Sí 2=No 8=Madre murió 9=No sabe
5. ¿Cuánto pesó su hijo al nacer?	Libras (9999=No sabe) (lib.)(on.) Kilos (99=No sabe)
6. Cuántos días tenía su hijo cuando lo pesaron?	99=No sabe
7. ¿La madre dió el seno a este niño? (Si contesta "No," pase a Pregunta 9)	1=Sí 2=No 9=No sabe
8. ¿A que edad se le quitó el seno?	7777777=Todav año mes sem. días da el seno
9. ¿Dió el biberon a este niño? (Si contesta "No," va a la proxima página)	1=Sí 2=No 9=No sabe
10. Si dió el biberon, ¿a que edad empezó a darlo al niño?	año mes sem. días
11. ¿A que edad terminó de darlo al niño?	7777777=Todav año mes sem. días da el bib.
12. ¿Cuáles cosas contiene/contenía el biberon?	(01)Refrescos, té, agua de azúca (02) Jugo (03)Leche en polvo(Nido), cantir (04)Leche INESFRE (05)Leche para bebes (Similac, e (06)Cerelac, etc. (07)Arroz, maizena, con leche (08)Arroz, maizena, sin leche (09) Compotas, sopa (10)Leche de vaca o chivo (11)Otra _____ (especifique) (99)No sabe

MORBILIDAD

Código breve del niño ☐☐ Nombre _____

¿Estaba enfermo el niño durante los últimos 15 días? ☐ 1=Sí, 2=No

	1	2	3	4	5	Duración	¿T?	(1)	(2)	Costo
Episodio 1						Días		Consulta		Costo
Episodio 2						Días		Consulta		Costo
Episodio 3						Días		Consulta		Costo
Episodio 4						Días		Consulta		Costo

Código breve del niño ☐☐ Nombre _____

¿Estaba enfermo el niño durante los últimos 15 días? ☐ 1=Sí, 2=No

	1	2	3	4	5	Duración	¿T?	(1)	(2)	Costo
Episodio 1						Días		Consulta		Costo
Episodio 2						Días		Consulta		Costo
Episodio 3						Días		Consulta		Costo
Episodio 4						Días		Consulta		Costo

Código breve del niño ☐☐ Nombre _____

¿Estaba enfermo el niño durante los últimos 15 días? ☐ 1=Sí, 2=No

	1	2	3	4	5	Duración	¿T?	(1)	(2)	Costo
Episodio 1						Días		Consulta		Costo
Episodio 2						Días		Consulta		Costo
Episodio 3						Días		Consulta		Costo
Episodio 4						Días		Consulta		Costo

Código breve del niño ☐☐ Nombre _____

¿Estaba enfermo el niño durante los últimos 15 días? ☐ 1=Sí, 2=No

	1	2	3	4	5	Duración	¿T?	(1)	(2)	Costo
Episodio 1						Días		Consulta		Costo
Episodio 2						Días		Consulta		Costo
Episodio 3						Días		Consulta		Costo
Episodio 4						Días		Consulta		Costo

Códigos para Episodios:

1=Respiratorio
2=Fiebre
3=Diarrea, vomito
4=Infección del piel o ojos
5=Otra _____ (especifique)

¿T?
¿Todavía tiene la enfermedad?

1=Sí
2=No

Códigos para Consultas:

01=Clinica local con medico
02=Clinica local sin medico
03=Subcentro de salud
04=Hospital
05=Medico privado
06=Farmacia
07=Miembro de familia, amiga, vecina
08=Iglesia con consultoria
09=Comadrona o partera
10=Curanderos, curiosos, brujos
11=Promotor de salud publica
12=Promotor del programa de nutrición Caritas
13=Promotor del programa de nutrición Servicio de la Iglesia Dominicana

APPENDIX 2

EXAMINATION OF DOMINICAN BIRTHWEIGHT DATA: Results, Conclusions, and Recommendations

EXAMINATION OF DOMINICAN BIRTHWEIGHT DATA:
Results, Conclusions, and Recommendations

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SUMMARY

A survey of ten maternity facilities (8 hospitals; 2 clinics) was conducted in the Dominican Republic. Of these facilities, all represented lower-income groups with the exception of the two clinics in Santo Domingo, which represented women of higher SES. Birthweights, date of birth, and gender were copied from hospital records for years 1982-1986; 120 (10 per month) were taken from each year for a total of 600 per facility and 6000 per total sample. Data were analyzed for differences between region, facility, birth year, season, and gender.

Mean birthweight was 3198.3 + 534.6 grams for the entire country. An average of 10.4 percent of all infants were born LBW (<2500 grams); 0.6 percent of the total sample were VLBW (<1500 grams). Striking differences were noted between facility: highest average birthweight was 3281.2 grams while lowest average birthweight was 2950.5 grams. Similarly, one facility noted less than 6 percent of all births as LBW status while another noted nearly 24 percent.

Many of the facilities showed birthweights "peaking" in 1983; birthweights have generally declined after that year. A higher-than-normal sex ratio was also evident in two facilities, suggesting subtle sex bias in the culture.

INTRODUCTION AND RATIONALE OF PROJECT

This survey of birthweights in the Dominican Republic is a result of the Tufts Nutrition Survey (1986-1987). In that study, the author collected anthropometric and health status data from 1251 Dominican infants and preschoolers throughout the entire country. These children represented those family members six years of age and under from 1400 randomly-selected households. For a full account of this major health and nutrition survey, the reader is referred to the author's preliminary (March, 1987) and final (September, 1987) reports to USAID, Santo Domingo.

During the data collection of the Tufts Nutrition Survey, birthweights (per recall of primary caretaker) of approximately 85 percent of study subjects ranged from 456.6 grams to 6350.4 grams, and averaged 3358.7 grams*. The problem of low-birthweight infants therefore seemed less severe than other nutrition-related issues (e.g. lack of prolonged breastfeeding, early introduction of bottlefeeding, and general weaning ages and feeding practices). However, many physicians and health care professionals expressed concern with what they considered to be an increasing rate of low birthweights. Realizing that the Tufts Nutrition Survey was biased in the respect that it measured only infants and children who had survived the trauma of birth and the first few days of life and thus could have been of higher birthweight, the PI, in conjunction with Anne Weeks of USAID, decided that a survey

of Dominican hospitals/clinics throughout the country would reveal:

1. The average birthweight in the Dominican Republic over the past five years, and the extent to which low birthweights are a problem of major proportions in that country;

2. Change in birthweights over time;

3. A comparison of the data from the Tufts Nutrition Survey with the present data set to determine if the former data is representative of birthweights throughout the country; and

4. Whether seasonal variations in birthweight were present.

* Birthweight figures of the remaining 15 percent of the sample were not available; birthweights of approximately 13 percent of children were either not remembered by caretakers or not taken within the first few months of birth. The remaining 2 percent of weights were taken after the first day of birth, thus not reflecting true birthweight.

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METHODS

Ten facilities throughout the Dominican Republic were chosen by geographic location. Four facilities (2 hospitals and 2 clinics) were selected in Santo Domingo; two (rather than one) hospitals were chosen because of the large population concentration in that district. The two clinics were chosen to contrast higher-income and lower-income groups: wealthier women tend to utilize clinics more frequently than public hospitals. In this way, birthweight differences as a result of income status could be indirectly measured. The remainder of the facilities throughout the country were chosen to reflect similar economic status, and were all hospitals with the exception of Dajabon. In this region, 600 birthweights from sample years and months were unavailable. Hence, 326 weights were taken from the main maternity clinic in Partido and the remaining 274 weights were from the main maternity hospital in Dajabon. These two sub-sample sets are believed to be similar in socioeconomic status, and thus comparable under the constraints of the present study.

The hospitals selected were:

1. Santo Domingo: Hospital Maternidad
2. Santo Domingo: Hospital Gaspar Hernandez
3. Santo Domingo: Clinica Abreu
4. Santo Domingo: Clinica Abel Gonzales
5. La Romana: Hospital Dr. Francisco Ant. Gonzalvo
6. La Vega: Hospital Dr. Luis Morillo King
7. Dajabon: Hospital Romon Matias; Partido: Clinica Rural
8. Neyba: Hospital Los Bartolome
9. Higuey: Ntra. Sra. de la Altagracia
10. Elias Pina: Hosp. Rosa Duarte

Letters requesting cooperation from each hospital and clinic director were obtained from the Secretary of Health (SESPAS). Many directors were personally contacted by the PI, who explained the rationale, importance, and need of the survey. Several similar letters from Dr. Didiez, Director of Nutrition at SESPAS, were also delivered.

The PI and Anne Weeks directed one of the most competant field workers from the Tufts Nutrition Survey to obtain the needed data from each facility. A total of 6000 birthweights (600 from each facility) were collected during the months of March to July, 1987. The 600 data points per facility represented 120 cases per year (10 per month) for 1982 through 1986. Cases were selected at random from available files for all live births, regardless of subsequent health outcome. The encuestadora noted date of birth, gender, and recorded birthweight of each subject.

In addition, scales used to weigh neonates in each facility were checked at both low- and mid-range by the encuestadora, who carried standard hand-held weights with her and weighed them first alone then together in each facility. The encuestadora knew that each scale was being tested for accuracy and did not know the true values of the weights she carried. In this way, measurement error due to faulty scales of both lower and mid-point weight range was noted.

not for 82 thru 86!

Birthweights were noted and entered into the computer system as recorded by the facility; this was always in pounds and ounces. Weights were then converted to grams for more accurate and internationally applicable analysis.

Statistical analyses were conducted using SPSSX, Version 2.1 (Statistical Package for the Social Sciences) on the Digital VAX2 mainframe computer system at Tufts University. Values for the entire country were weighted by population (1) to reflect a more accurate portrayal of true total country measurements. Regional and inter-facility differences were tested using oneway Analysis-of-Variance (ONEWAY) and crosstabs.

RESULTS

1. AVERAGE BIRTHWEIGHT

The average birthweight for the entire country was 3198.3 + 534.6 grams (about 7 pounds), approximating the 40th to 50th percentile of NCHS Standards (2).

2. BIRTHWEIGHT BY REGION AND FACILITY

A highly significant difference (ONEWAY, p=0.000) was noted in contrasting birthweights from different regions of the country. This strong significance was also reflected in comparing birthweights from each of the 10 surveyed facilities (ONEWAY, p=0.000). As can be seen in Table 1. the lowest birthweights for the five-year period occurred in Elias Pina while the highest were found in the capital's Clinica Abreu ($\bar{x}$=2950.5 grams vs 3281.2 grams, respectively).

Figure 1 depicts average birthweight for all surveyed regions; Figure 2 breaks down Region 1 (Santo Domingo) into its four component facilities.

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3. BIRTHWEIGHT BY BIRTH YEAR

Figure 3 illustrates the average birthweight by birthyear of the population as a whole contrasted to birthweights from the facilities with lowest and highest mean values (Elias Pina and Clinica Abreu, respectively). As can be seen, birthweights as a whole were highest in 1983 then steadily declined in subsequent years. This difference in birth years was highly significant (ONEWAY; p=0.000); on average, infants born in 1983 weighed approximately 70 grams more than those born in other years combined.

Birthweights were then grouped into two years (1982-1983 as the first group; 1984-1986 as the second). ONEWAY revealed a significant difference between these groups (p=0.000); infants were an average of 70 grams heavier at birth in the first group than in the second. In individual facilities, this significant trend was noted in three facilities only:

FACILITY	GROUP 1	GROUP 2	PROBABILITY
Clinica Abel Gonzalez	3325.0 g	3232.0 g	0.045
Elias Pina	2897.4 g	2985.9 g	0.031
Higuey	3179.0 g	3077.0 g	0.019

The "peak" in birthweight in 1983 may well have been responsible for this finding. Examining each facility individually revealed that this trend in highest birthweight in 1983 was strongly prevalent in the capital but less so in other regions. For example, 1985 birthweights in Neyba and La Vega were slightly (but not significantly) higher than those in 1983. Birthweights in La Romana were at their second-highest in 1983 and peaked in 1984; in Elias Pina, birthweights were at their lowest in 1983 and peaked in 1985. This contrasts with Santo Domingo, where three of the four facilities "peaked" in 1983. Only Clinica Abel Gonzalez noted a gradual downward trend in birthweights during study years (3367.1 grams in 1982 vs. 3244.2 grams in 1986). Table 2 defines the breakdown of birthweight by birth year for all surveyed facilities. Figure 4 dilineates these differences over time for facilities in the capital; Figure 5 illustrates these differences for remaining regions.

4. LOW BIRTHWEIGHT INFANTS

A. General Trends and Regional Differences

The percentage of low birthweight infants (LBW; those whose birthweight is less than 2500 grams or approximately 3.5 pounds) was 10.4 percent for the entire population. However, this figure varied dramatically by region and facility (CROSSTABS; p=0.000 for both differences). Not surprisingly, the greatest percentage of LBWs was found in La Romana (23.8 percent) followed by Elias Pina (20.7 percent); the least were found in Clinica Abreu (5.7 percent). Table 3 delineates values for both region and facility. Figure 6 depicts these differences by facility; Figure 7 illustrates breakdown of Santo Domingo into its four components.

B. Differences over Time

A highly significant difference was found between number of LBW infants and birth year (CROSSTABS; p=0.000). Fewest infants were of LBW in 1983 (6.8 percent); twice as many infants were of this status in 1985 (13.6 percent) (Figure 8). However, closer scrutiny revealed that only two facilities may have been responsible for this difference: no significance was found by impacting percentage of LBW infants with birth year for the remaining eight areas. These two facilities (Clinica Abreu, CROSSTABS, p=0.034;

Gaspar Hernandez CROSSTABS, p=0.015) both had least LBWs during 1983. Yet in the former, more infants less than 2500 grams were born during 1985, and in the latter, more LBW infants were born during 1982:

FACILITY	LOWEST %LBW BORN	LOW YEAR	HIGHEST %LBW BORN	HIGH YEAR
Clinica Abreu	1.7	1983	10.8	1985
Gaspar Hernandez	4.2	1983	15.0	1982

Table 4 depicts the percentage of low birth weight infants born during each year surveyed throughout the entire country.

5. VERY LOW BIRTHWEIGHT INFANTS

A. General Trends and Regional Differences

Less than one percent of all infants born in surveyed facilities could be classified as "very low birth weight" (VLBW; less than 1500 grams or approximately 3.5 pounds). Among these few cases (N=32), no significant difference was noted between regions (CROSSTABS; p=0.213). However, a highly significant difference was noted between facilities (CROSSTABS; p=0.000), indicating that differences existed primarily between facilities within the capital, rather than between regions as a whole. As can be seen in Table 3 and Figures 6 and 7, the greatest percentage of VLBW infants were born in Hospital Maternidad (1.8% of all births), followed by Higuey (1.2% of all births). No VLBW infants were reported at Clinica Abel Gonzalez for the data collected.

B. Differences over Time

Among these few infants, no significance between number of infants born of this status and birth year was noted (CROSSTABS; p=0.237). Figure 8 depicts this lack of difference by a flat curve, with values ranging from 0.2 (1983) to 0.8 percent (1982 and 1985).

Interestingly, the only region and/or facility sampled which exhibited a significant difference between number of VLBW infants and birthyear was in Dajabon. In this case, 2.5 percent of sampled infants born in 1982 were VLBW; no other infants were reported of this status for remaining survey years.

6. HOSPITALS VS. CLINICS

The difference between birthweights for infants born in Santo Domingo clinics versus Santo Domingo hospitals was roughly 150 grams for all five study years combined (3275.2 grams vs. 3130.4 grams). This difference was highly significant (ONEWAY; p=0.000). Those born in clinics weigh approximately one-third of a pound more at birth than those born in hospitals in the capital. This difference represents roughly 5 percent of the average birthweight for the entire country.

7. BIRTHWEIGHT BY MONTH AND SEASON

No significant difference was found either monthly or seasonally in birthweights in this survey; neither was any such trend noted. Average birthweights for all months in all facilities remained fairly constant; only a 60 gram difference was found in cumulative averages between the "high" month (October) and "low" month (July). This difference was not significant (ONEWAY; p=0.649). Hence, any grouping of months would not yield significant results.

8. BIRTHWEIGHT BY GENDER

Not surprisingly, males in the sample weighed more than females by approximately 35 grams; this difference was highly significant (ONEWAY; p=0.011). However, closer examination revealed that this difference was found in only Hospital Maternidad and Dajabon:

FACILITY	MALES	FEMALES	DIFFERENCE	PROBABILITY
Maternidad	3129.5g	3028.5g	101.0g	0.029
Dajabon	3251.0g	3136.7g	114.3g	0.007
Total Sample	3217.2g	3177.5g	39.7g	0.000

9. SEX RATIO

The sex ratio (number males per 100 females; illustrated in Table 3) was 109.5 for the entire country, ranging from a high of 119.2 and 116.4 (Hospital Maternidad and Clinica Abreu, respectively) to a low of 96.0 (La Vega). The remaining facilities fluctuated between normal values.

10. RELIABILITY OF DATA

Information gained from hospital records could well have a margin of error included. Firstly, nearly all birthweights were recorded in quarter-pound intervals; thus, few of the 6000 data points recorded such values as "6 pounds 3 ounces" or "7 pounds 7 ounces". It can only be speculated as to the rounding techniques used when a given neonate's weight did not naturally fall on the values 0, one-fourth, one-half, or three-quarters of a pound.

Secondly, virtually no facility's scales/staff recorded precisely accurate values for test weights (Table 5). One was within one ounce (Dajabon); several others were within three ounces. Yet even these degrees of error can be significant, as they represent approximately 30 to 100 grams, respectively. Four of the facilities (Hospital Maternidad+, Clinica Abel Gonzalez, La Vega, and Elias Pina) reported at least one-half pound additional weight for the final totaled values. If scales were consistently this inaccurate during the five surveyed years, birthweights in these areas may be even more problematic than originally noted.

+ The values reported for Hospital Maternidad are questioned. It is believed in this case, hospital staff "pretended" to weigh the test weights themselves and reported fictitious (and highly inaccurate!) values. This facility should be re-examined for validity.

DISCUSSION

1. To what extent are low birthweights a problem of major concern in the Dominican Republic?

Examining the data as a whole, an average nation-wide birthweight figure of nearly 3200 grams does not cause concern. In fact, birthweights of nearly seven pounds are excellent, and confirm that women are generally sufficiently nourished to successfully sustain the prenatal period. However, discrepancies in specific regions (e.g. Elias Pina and La Romana, where birthweights averaged 2950.5 grams and 2976.2 grams for all five years, respectively) are at issue. In these regions, 20.7 percent and 23.8 percent of infants (respectively) were born at less than 2500 grams for all study years. Similarly, 14.4 percent of infants born to women of lowest income in Santo Domingo (Hospital Maternidad) were also 2500 grams. These data become even more startling when one views the genetic possibilities that exist for Dominicans, namely, those born of higher income with access to adequate services (e.g. Clinica Abreu) where only 5.7 percent of infants for all study years were of LBW status

Examining these figures in a more global context and ranking countries by Infant Mortality Rate (number of deaths in the first year of life by 1000 births) reveals that the DR, with an official LBW percentage of 15 (3) but perhaps a more true rate of 10 to 11 percent, does not appear in too negative a light:

COUNTRY	IMR	%LBW
Sweden	4	6
USA	11	7
Cuba	15	9
Costa Rica	19	9
Jamaica	20	12
Chile	22	9
Venezuela	38	9
Colombia	48	10
Mexico	50	15
Guatemala	65	18
Nicaragua	69	15
DOMINICAN REPUBLIC	70	15
Haiti	123	17

However, when certain regions of the country are contrasted with these figures, results are striking. Some sectors of the population approximate rates in the most developed countries; other regions are worse than the least developed of countries listed.

The difference between the highest birthweights (Clinica Abreu) and the lowest (Elias Pina) are of even more concern when considered on a percentile scale. This difference of approximately 330 grams reflects roughly 10 percent of the average birthweight in the country, a difference which may seem small at first glance but actually

reflects the difference between the 20th and 90th percentiles (NCHS). Thus, children born in Elias Pina are, on the average, born at the 20th percentile, while those born in Clinica Abreu more closely approximate the 90th percentile.

Interestingly, the Cibao (represented by La Vega's hospital) reflected birthweights that were similar to those of the capital (3215.6); this figure is the third highest in the sampled facilities, and 50 to 100 grams higher than Santo Domingo's hospitals.

2. Have birthweights changed over the past five years? And if so, in what direction has the change occurred?

The general trend indicates that birthweights, after reaching a peak in 1983, have been steadily declining. Yet this statement must be qualified as it holds true mainly for three of the four surveyed facilities in the capital. For remaining facilities (with the exception of Higuey), birthweights either have not significantly changed or have actually increased (e.g. Elias Pina). Thus, even though this trend may be present in other regions of the country, it lacked sufficient strength to show statistical significance.

3. Are data from the Tufts Nutrition Survey representative of birthweights throughout the country?

The average birthweight from the Tufts Nutrition Survey was 3354.2 grams, or approximately 150 grams higher than the data reported in the present report. This difference could be due to faulty recollection/reporting of primary caretakers; it could also be a result of the inherent bias previously mentioned which lies in the Tufts Nutrition Survey data (infants and children surveyed in this data set were, in all but one case, in home settings and had survived the trauma of birth and first few days of life; LBW and VLBW infants were thus under-represented in this sample). In the Tufts Nutrition Survey, no significant differences were noted between regions; all areas surveyed yielded average results of over 3200 grams Hence, the Tufts Nutrition Survey most likely represents infants who survived rather than total infants born in the Dominican Republic.

4. Were seasonal variations in birthweight present?

Clearly, no monthly nor seasonal trend in the data was present.

5. Was a sex bias present in the data?

The two high values for sex ratio in Santo Domingo are most probably responsible for the high value of the country as a whole, since most of the remaining facilities approximated normal limits (defined as 105 to 106 [4,5]). Speculation can be made as to the reason for this high value: in these two modern facilities, untrasound testing may be routine for prenatal patients. Thus, women receiving their prenatal care at these facilities may know the gender of their fetus before birth. If the fetus is male, it may be likely that these women (preferring male offspring and providing greater protection and health advantages to males than to females) would deliver their infants in a hospital setting rather than at home. Different hypotheses can be extended, but the fact that only these two facilities throughout the entire sample exhibited a rate quite higher than the global standard is quite striking.

+ Contrasting this difference between gender at birth and that during the first five years of life in the Tufts Nutrition Survey will prove interesting.

CONCLUSIONS AND RECOMMENDATIONS

Viewing the data as a whole, birthweights in themselves are generally not cause for concern throughout the Dominican Republic. Certainly, food supplement programs are not warranted throughout the general population, given the questionable results of such costly and difficult-to-administer endeavors. However, certain areas (most notably La Romana, Elias Pina, and those of very low income in the capital represented by Hospital Maternidad) may well benefit by more concerted attention in health and nutrition. Other areas which were not surveyed but would probably demonstrate similar values as Elias Pina are regions in the Southwest, such as Perdanales. It is recommended that any concerted program which addresses Elias Pina extend to this region as well.

Recent evidence indicates a linear relationship between maternal weight gain and neonatal birthweight except for the very obese (6). Hence, increasing birthweights in these areas would require focusing on means to achieve maternal weight gain, both before and during pregnancy. Such variables as increased income, improved prenatal care, well-targeted food supplement programs, and nutrition education could well be factored into the equation of improved birth outcome. It is important to note that not all women in these problematic areas may need to be targeted; prior prenatal history, income, age, and other pertinent variables should be considered to ultimately

provide a well-targeted strategy.

Considering this data in light of the Tufts Nutrition Survey underscores that weaning practices, rather than low birthweights, are one of the main problems affecting Dominican infants. Birthweights generally range from the 40th to 50th percentile in this population, which is quite favorable. However, after one year of life weight-for-age falls to approximate the 10th percentile. This severe drop in such a short time frame is, in the author's opinion, one of the most severe health and nutrition problems in the country, far out-shadowing pockets of LBW infants in certain areas.

The downward trend of birthweights in certain areas may indicate a similar problem throughout the country. Table 6 notes statistically significant trends in the data from all facilities and conclusions that can be drawn. In this table, the "peak" occurring in 1982-83 was highly significant for nearly half of the facilities surveyed. The question arises as to political and economic conditions in the DR (and specifically Santo Domingo) during this period, and the extent to which these conditions affected the general health of the population. Seen in this light, the 1983 "peak" is interesting to note and may provide useful information when health, nutrition, and food policies are examined for 1982 and 1983. But because the trend is neither universal nor always significant, it must be interpreted with caution.

In conclusion, policy considerations could be given to those of lowest income in Elias Pina, La Romana, and Santo Domingo to hopefully achieve improved birthweights in the 15 to 25 percent of the population that is problematic. Continued monitoring of the population over time is reasonable, given the fluctuation seen in birthweights which may be a result of macro-policies and because birthweights seem to be declining in certain areas. Finally, possible sex biases in the culture need to be explored and addressed, perhaps in relation to a combined health, nutrition, and family planning strategy.

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CUADRA 1: PESO DE NACIMIENTO POR CENTRO SANITARIO Y/O CIUDAD O REGION

CENTRO SANITARIO	PESO DE NACIMIENTO (PROMEDIO)	DESVIACION ESTANDARD	VALOR MINIMO	VALOR MAXIMO
Santo Domingo	3202.8	533.8	793.9	5585.0
SD: Hospital Maternidad	3083.5	562.3	793.9	5585.0
SD: Clinica Abreu	3281.2	493.4	1360.8	5159.8
SD: Gaspar Hernandez	3177.2	494.6	907.2	4989.6
SD: Clinica Abel Gonzales	3269.2	557.8	1701.1	4762.9
La Romana	2976.2	552.9	1134.1	4309.3
La Vega	3215.6	539.5	793.9	4762.9
Dajabon	3195.6	518.7	1020.6	5443.2
Neyba	3179.6	509.8	1360.8	4536.0
Elias Pina	2950.5	492.4	1474.2	4309.3
Higuey	3117.8	523.2	907.2	4989.6
Poblacion Total	3198.3	534.6	793.9	5585.0

CUADRA 2: PESO DE NACIMIENTO (EN GRAMOS) POR AÑO 1982-1986

CENTRO SANITARIO Y/O CIUDAD	1982	1983	1984	1985	1986
SANTO DOMINGO	3219.2	3274.1	3182.2	3157.6	3181.0
SD: Hospital Maternidad	3066.3	3193.4	3034.9	3048.6	3073.6
SD: Clinica Abreu	3297.4	3353.1	3271.4	3248.2	3236.1
SD: Hospital Gasp. Herm.	3146.0	3267.0	3161.0	3142.2	3170.8
SD: Clinica Abel Gonz.	3367.1	3282.8	3260.3	3191.3	3244.2
LA ROMANA	2944.7	3022.2	3037.3	2970.2	2906.9
LA VEGA	3193.2	3222.5	3179.0	3255.6	3227.7
DAJABON	3220.0	3257.8	3122.6	3199.8	3178.1
NEIBA	3090.2	3252.7	3087.4	3261.3	3206.4
ELIAS PINA	2939.9	2854.9	2982.5	3013.7	2961.7
HIGUEY	3111.9	3246.1	3112.9	3100.6	3017.4
POBLACION TOTAL	3212.5	3268.0	3178.4	3156.5	3175.9

CUADRA 3: PORCENTAJE DE LOS NINOS BAJO Y MUY BAJO DE PESO
POR CENTRO SANITARIO Y/O CIUDAD,
Y PORCENTAJE DE VARONES Y HEMBRAS

(Bajo de Peso: <2500 Gramos; Muy Bajo de Peso: <1500 Gramos)

	POB. TOTAL	SANTO DOMINGO (TOTAL)	HOSPITAL MATERNIDAD	CLINICA ABREU	HOSPITAL GASPAR HERNANDEZ	CLINICA ABEL GONZALEZ	LA ROMANA	LA VEGA	BAJABON	NEIBA	ELIAS PINA	HIGUEY
BAJO DE PESO	10.5	0.1	14.4	5.7	9.0	11.8	23.8	7.8	9.7	11.3	20.7	12.7
MUY BAJO DE PESO	0.6	0.6	1.8	0.2	0.3	0.0	0.3	0.7	0.5	0.2	0.2	1.2
VARONES (%)	52.3	52.4	54.4	53.8	50.8	50.5	51.2	49.0	51.6	51.2	50.5	50.8
HEMBRAS (%)	47.7	47.6	45.6	46.2	49.2	49.5	48.8	51.0	48.4	48.8	49.5	49.2
RAZON DE LOS SEXOS*	109.0	110.0	119.2	116.4	103.2	102.0	104.9	96.0	106.6	104.9	102.0	103.2

RAZON DE LOS SEXOS: (Numero de Varones/Numero de Hembras) X 100

CUADRA 4: PORCENTAJE DE NINOS BAJO DE PESO Y MUY BAJO DE PESO
POR CENTRO SANITARIO Y/O CIUDAD
(Bajo de Peso: <2500 G; Muy Bajo de Peso: <1500 G)

ENTRO SANITARIO Y/O CIUDAD	1982	1983	1984	1985	1986
ANTO DOMINGO					
Bajo del Peso	11.5	6.5	9.6	13.5	10.0
Muy Bajo del Peso	0.6	0.2	1.0	0.8	0.2
SD: Hospital Maternidad					
Bajo del Peso	15.5	10.0	16.8	16.7	13.3
Muy Bajo del Peso	1.7	0.8	4.2	1.7	0.8
SD: Clinica Abreu					
Bajo del Peso	4.2	1.7	5.0	10.8	6.7
Muy Bajo del Peso	0.0	0.0	0.0	0.2	0.8
SD: Hospital Gaspar Hern.					
Bajo del Peso	15.0	4.2	5.8	12.5	7.5
Muy Bajo del Peso	0.8	0.0	0.0	0.2	0.0
SD: Clinica Abel Gonzalez					
Bajo del Peso	11.7	10.0	10.8	14.2	12.5
Muy Bajo del Peso	0.0	0.0	0.0	0.0	0.0
A ROMANA					
Bajo del Peso	24.2	20.8	23.3	25.0	25.8
Muy Bajo del Peso	0.8	0.0	0.0	0.8	0.8
A VEGA					
Bajo del Peso	10.0	9.2	10.0	10,8	9.2
Muy Bajo del Peso	0.2	0.0	1.7	0.8	0.0
AJABON					
Bajo del Peso	10.1	10.0	8.3	8.3	11.7
Muy Bajo del Peso	2.5	0.0	0.0	0.0	0.0
EIBA					
Bajo del Peso	15.0	6.7	15.8	7.5	11.7
Muy Bajo del Peso	0.0	0.0	0.0	0.8	0,0
ELIAS PINA					
Bajo del Peso	20.8	28.3	18.3	17.5	18.3
Muy Bajo del Peso	0.8	0.0	0.0	0.0	0.0
HIGUEY					
Bajo del Peso	14.2	10.0	13.3	13.3	12.5
Muy Bajo del Peso	0.8	0.8	0.0	1.7	2.5
POBLACION TOTAL					
Bajo del Peso	11.7	6.8	9.9	13.6	10.3
Muy Bajo del Peso	0.8	0.2	0.6	0.8	0.4

CUADRA 5 : EXACTITUD DE BASCULAS PARA INFANTES POR CENTRO SANITARIO

CENTRO SANITARIO	PESO DE BASCULA 1 (libras)	PESO DE BASCULA 2 (libras)	PESO DE BASCULA 1 MAS PESO DE BASCULA 2 (libras)
PESO REAL	3.2	3.3	6.5
HOSPITAL MATERNIDAD	6.4	6.3	12.7 *
CLINICA ABREU	3.2	3.6	6.8
GASPAR HERNANDEZ	3.4	3.3	6.7
ABEL GONZALEZ	3.5	3.6	6.11 *
LA ROMANA	3.0	3.3	6.3
LA VEGA	3.5	3.7	6.11 *
DAJABON	3.2	3.2	6.5
NEIBA	3.5	3.3	6.8
ELIAS PINA	3.6	3.5	6.11 *
HIGUEY	3.4	3.3	6.7

TABLE 6: SIGNIFICANT CHANGES IN BIRTHWEIGHT BY REGION AND FACILITY, AND CONCLUSIONS

REGION/ FACILITY	1982-1986 (Discrete)	1983 vs All Other Years Comb.	1983-1985 vs 1984-1986	CONCLUSIONS
SANTO DOMINGO	NS	3244 g vs 3184 g	3246 g vs 3173 g	Increasing over time
SD: Hospital Materni	NS	3193 g vs 3055 g	NS	1983 "peak"
SD: Clinica Abreu	NS	NS	NS	No significant change between years
SD: Gaspar Hernandez	NS	3266 g vs 3154 g	NS	1983 "peak"
SD: Abel Gonzalez	NS	NS	3325 g vs 3231 g	Birthweight decline in last 3 years
LA ROMANA	NS	NS	NS	No significant change during study years
LA VEGA	NS	NS	NS	No significant change during study years
DAJABON	NS	NS	NS	No significant change during study years
NEIBA	p=0.008	NS	NS	"Peaks" during both 1983 and 1985
ELIAS PINA	NS	2854 g vs 2974 g	2897 g vs 2985 g	Birthweights increasing over time
HIGUEY	p=0.01	3246 g vs 3035 g	3179 g vs 3076 g	Birthweights declining over time

FIGURA 1:

PESO POR REGION

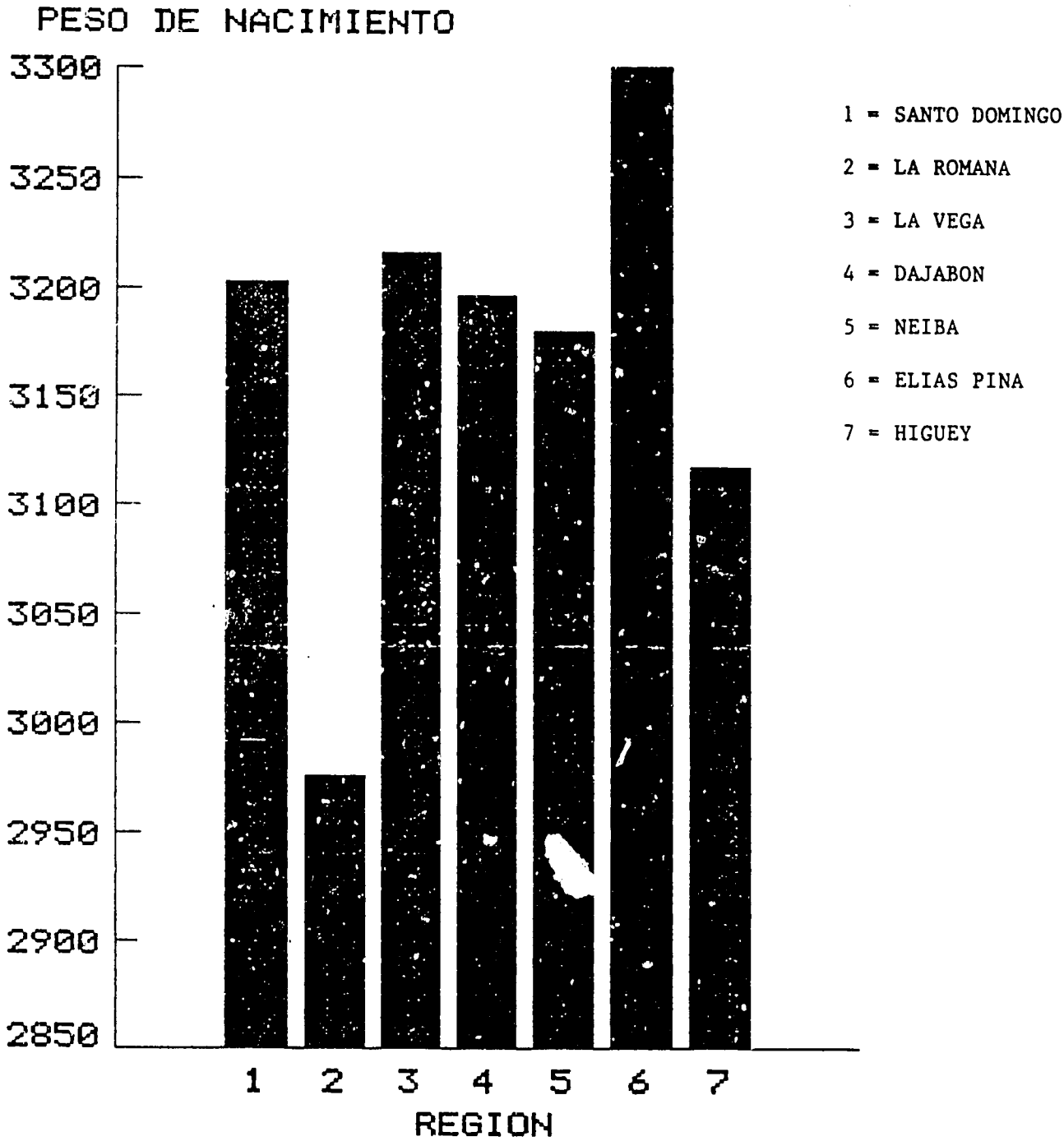


FIGURA 2: PESO POR CENTRO SANITARIO EN SANTO DOMINGO

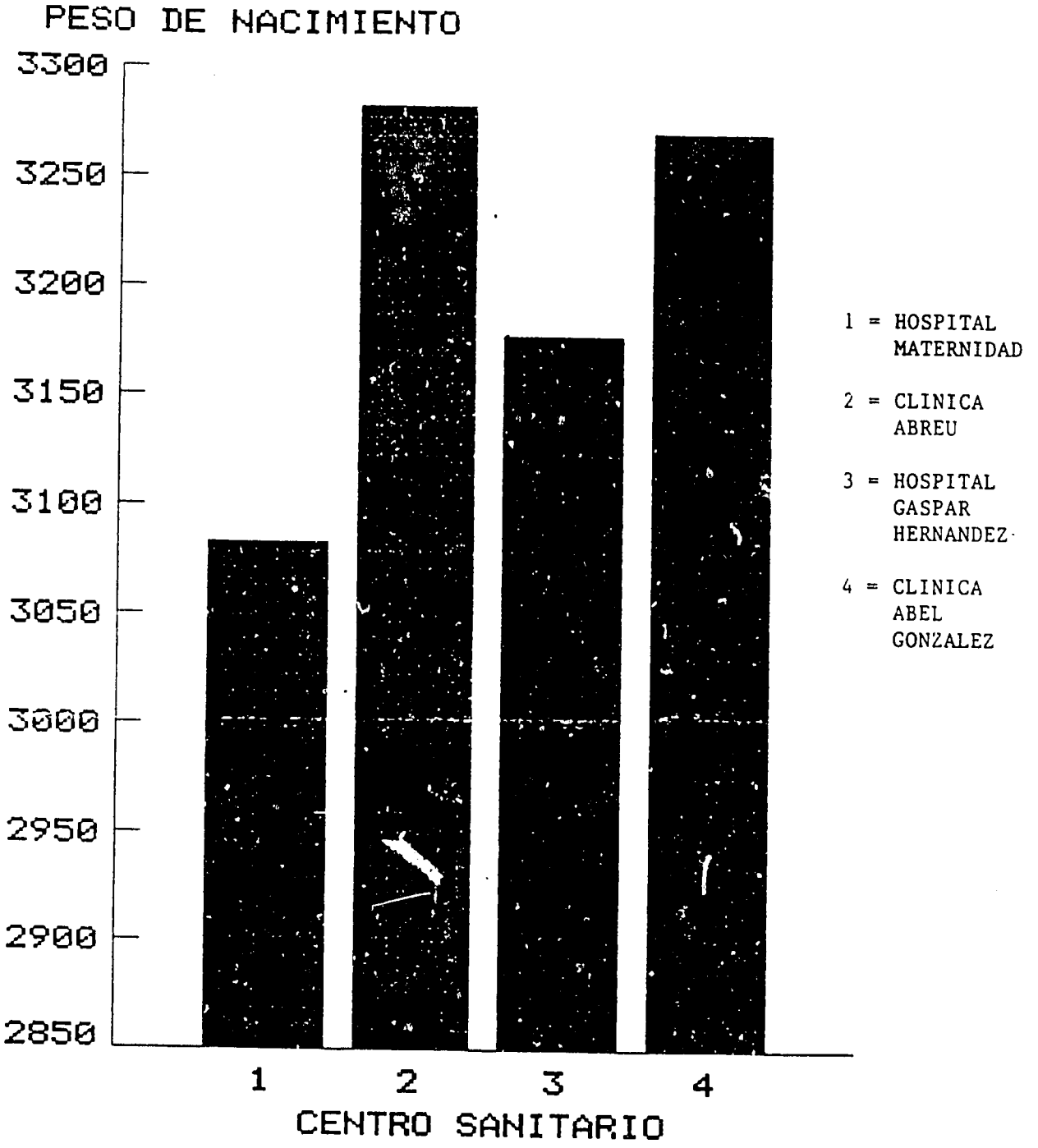


FIGURA 3: PESO DE NACIMIENTO POR AÑO

Pob. Total, Maximimo, y Minimo

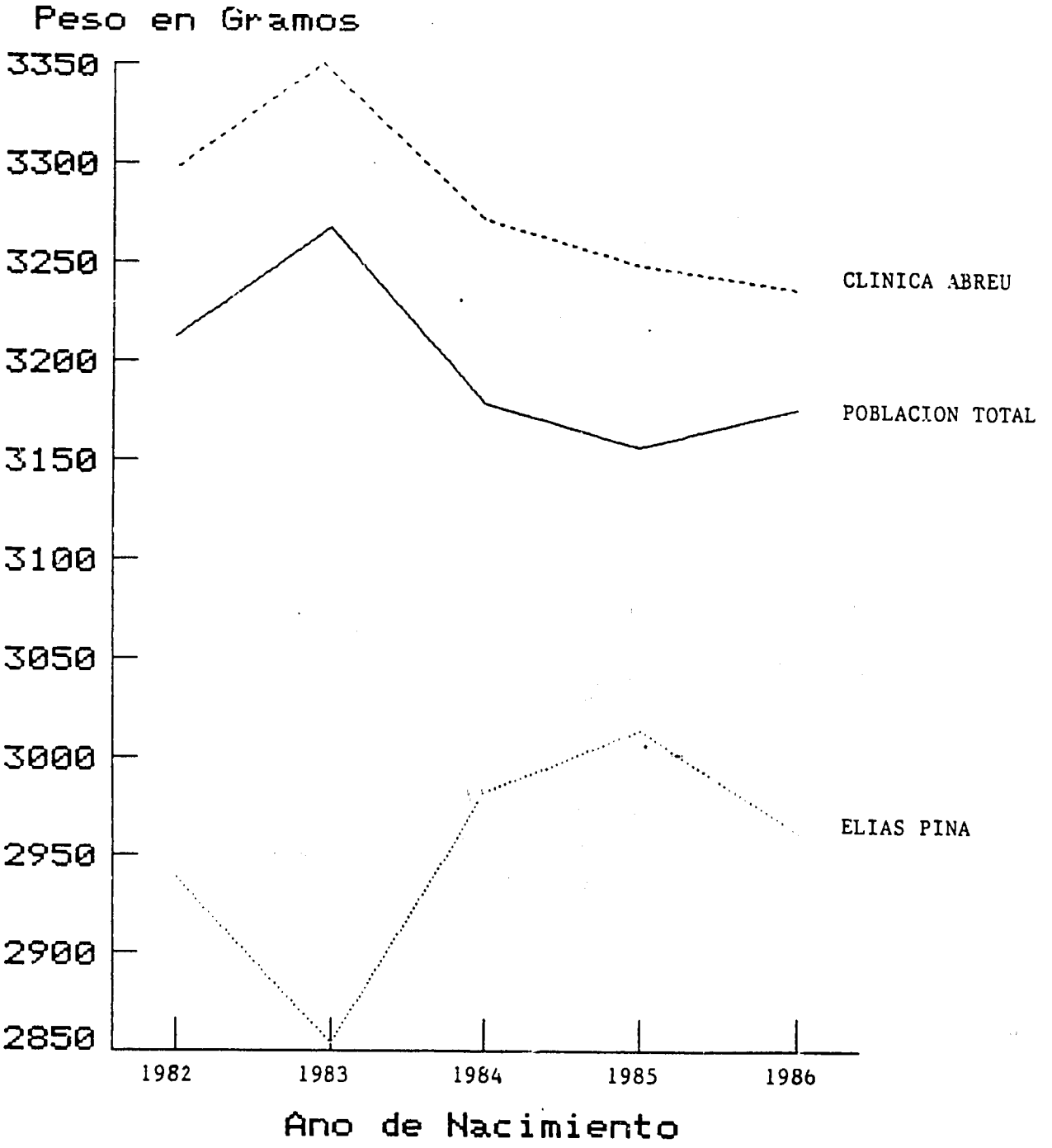


FIGURA 4: PESO POR AÑO

REGION: SANTO DOMINGO

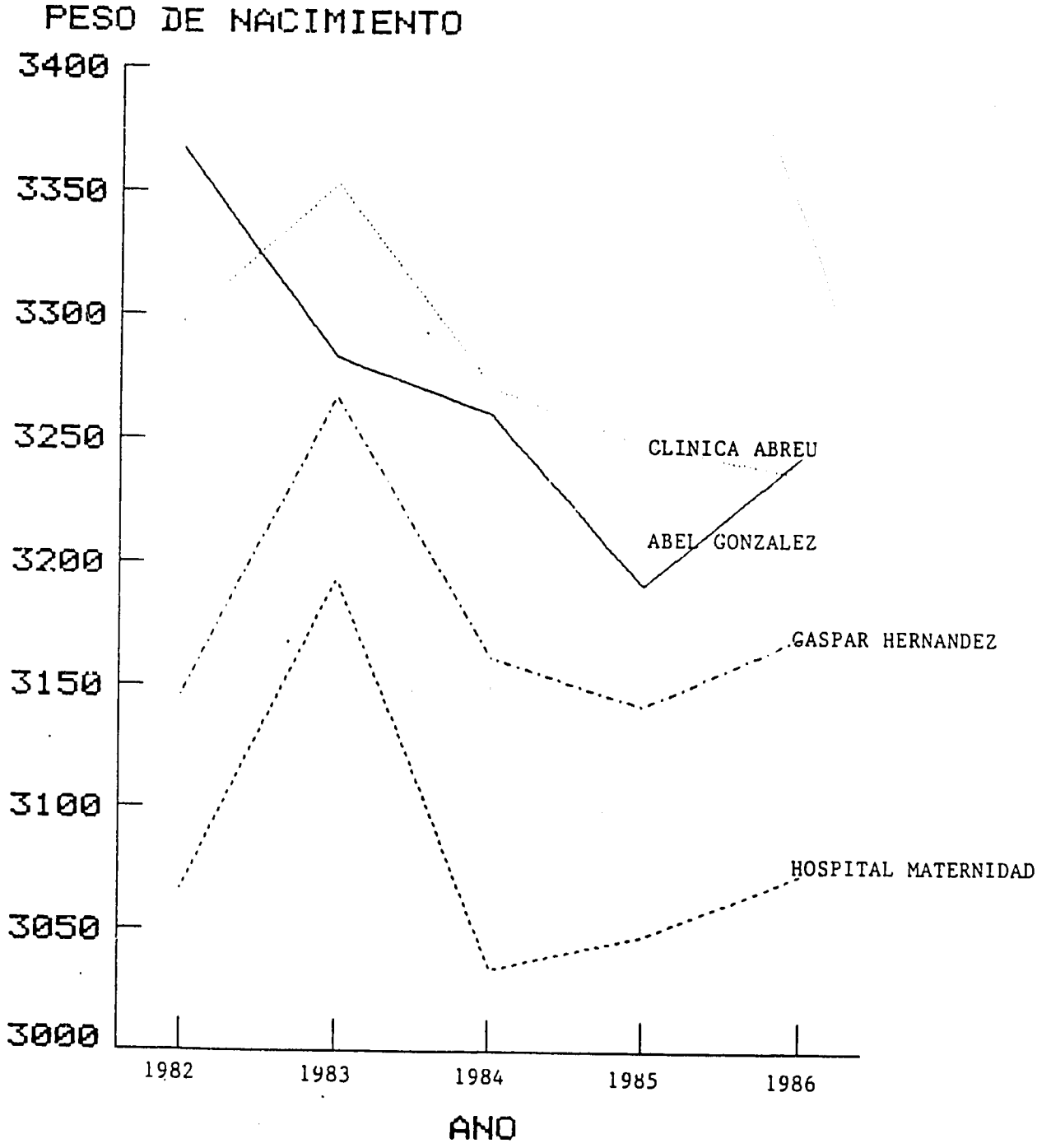


FIGURA 5: PESO POR AÑO

OTRAS REGIONES

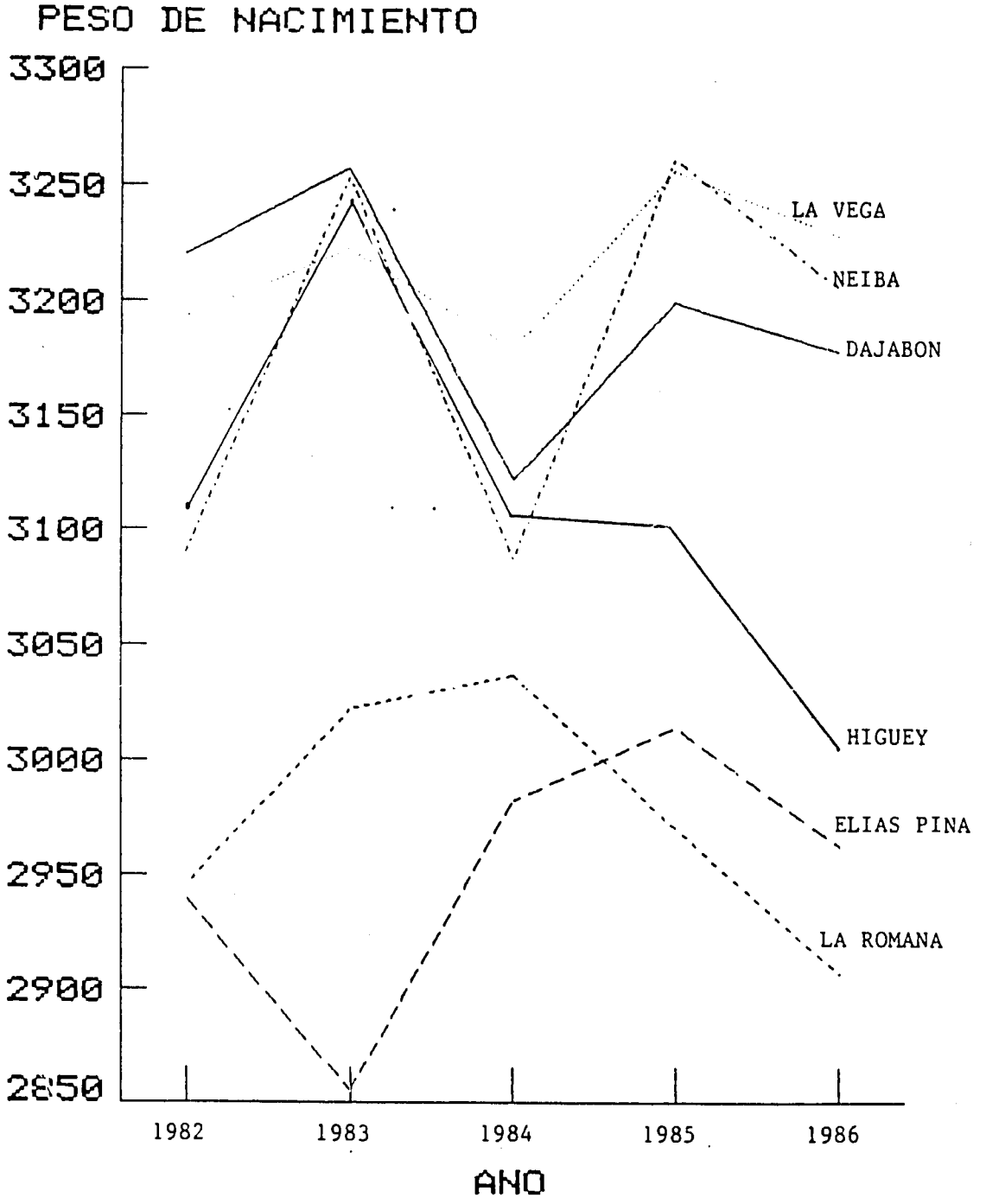
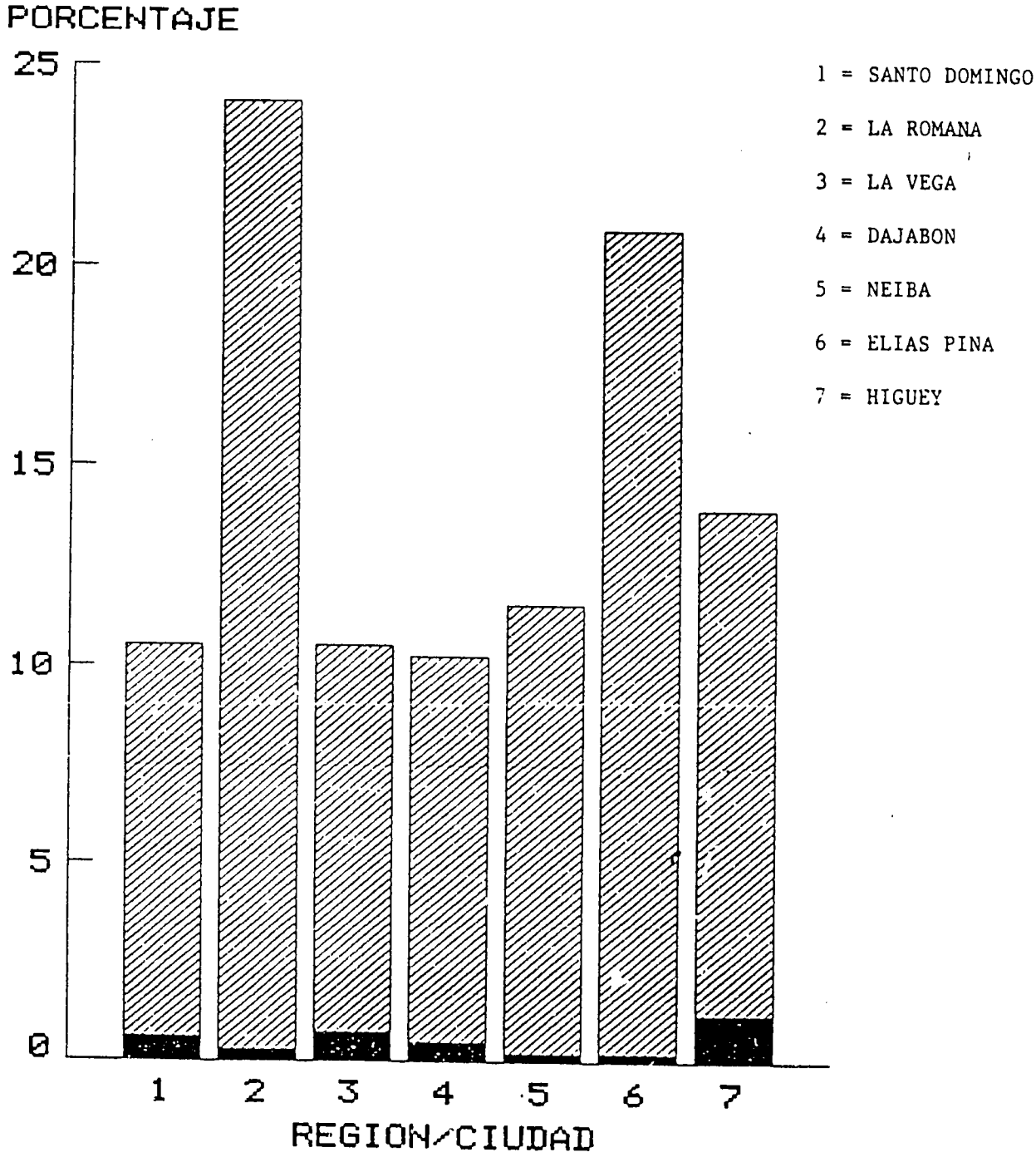


FIGURA 6: PORCENTAJE DE NIÑOS BAJO Y MUY BAJO DE PESO POR REGION/CIUDAD



BAJO DE PESO (<2500 g)

MUY BAJO DE PESO (<1500 g)

FIGURA 7: PORCENTAJE DE NINOS BAJO Y MUY BAJO DE PESO EN SD CENTRO SANITARIO

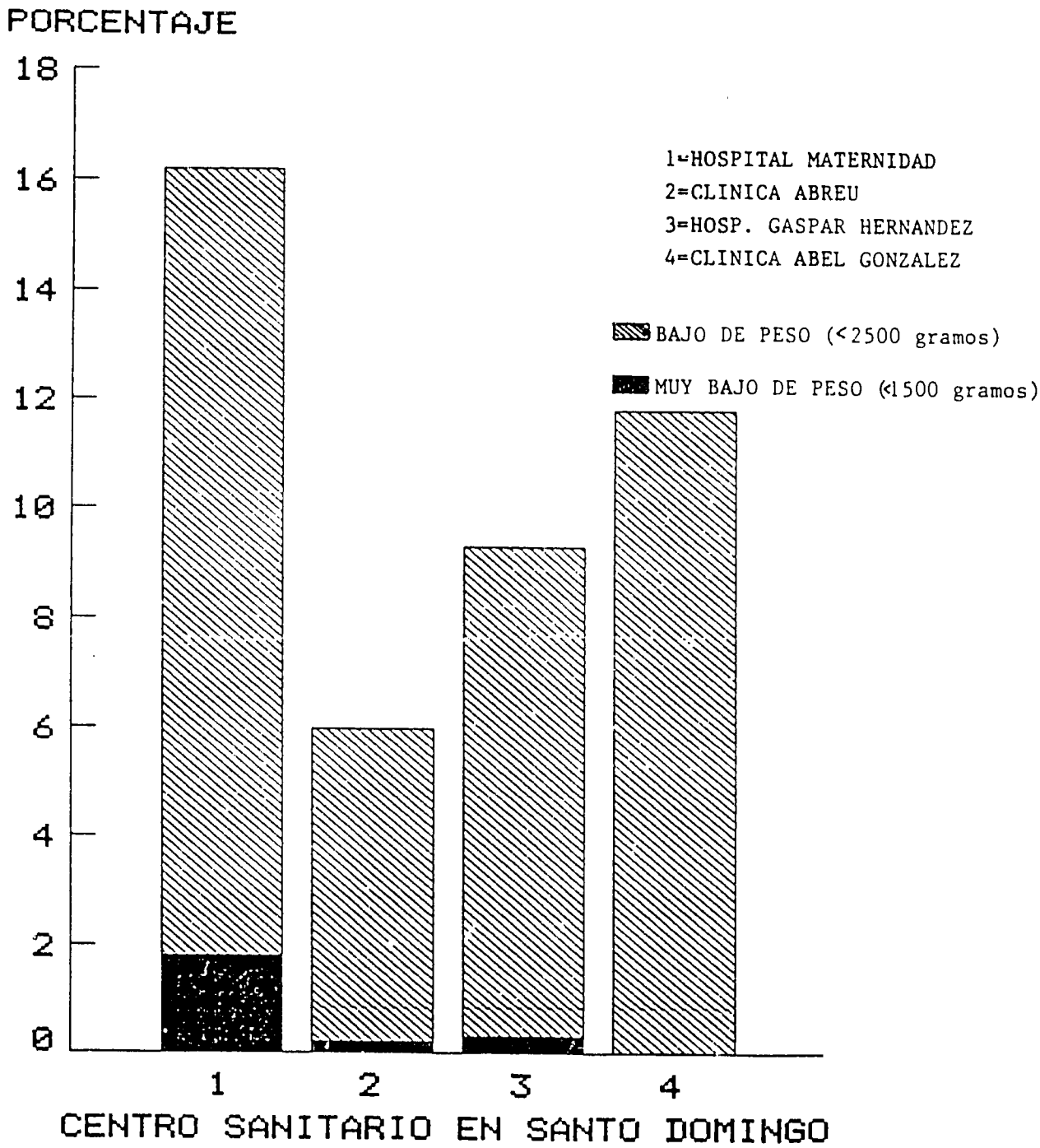
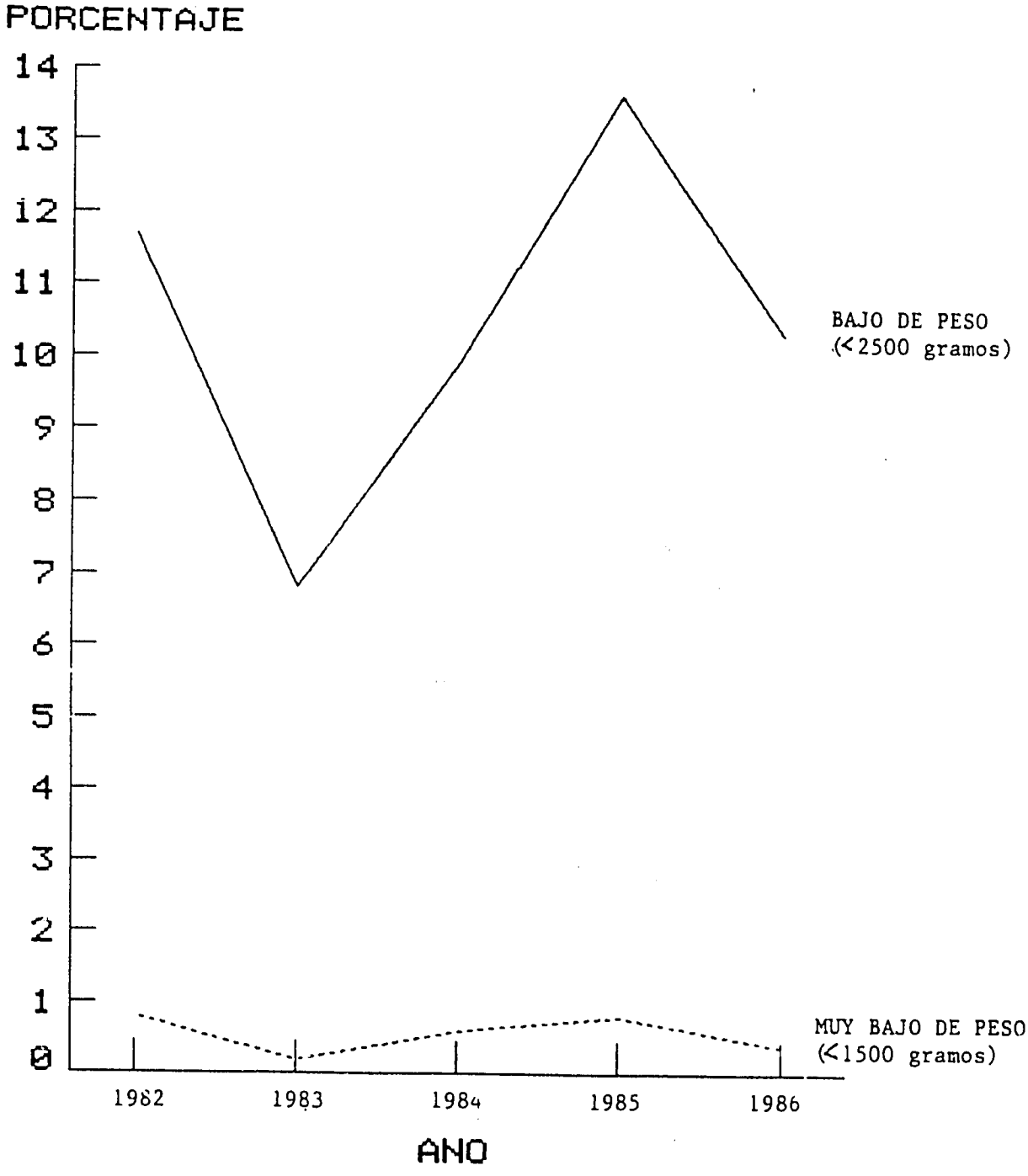


FIGURA 8: PORCENTAJE DE NINOS BAJO Y MUY BAJO DE PESO POR ANOS 1982-1986



APPENDICES 3 & 4

Field Aids

APPENDIX 3: FIELD AIDS

Major Events in
the Dominican Republic

ACONTECIMIENTOS IMPORTANTES DE LOS ULTIMOS
SIETE AÑOS EN LA REPUBLICA DOMINICANA

FECHA	ACONTECIMIENTO	PRESIDENTE
1979		Guzmán
25-Enero	El Papa vino	
31-Agosto	Cyclon David	
1980		Guzmán
	El gobierno de presidente Antonio Guzmán nacionalizó las minas de oro de la Rosario.	
1981		Guzmán
1982		Guzmán
?	Huelga grande	
16-Mayo	Elecciones nacionales	
4-Julio	El presidente Antonio Guzmán se suicidó y el vicepresidente Jacobo Majluta lo sustituyó.	Majluta
16-Agosto	Se juramentó el presidente Salvador Jorge Blanco	Blanco
1983		Blanco
1984		Blanco
24-Abril	Se iniciaron grandes disturbios callejeros en las principales ciudades del país, principalmente en la capital, por causa del subió précios. Los soldados abrían fuego y mataron, según cifras oficiales, a 84 personas.	
11-Octubre	El Papa Juan Pablo II visitó el país.	
1985		Blanco
4-Enero	Desapareció el banquero Héctor Méndez, quien fue asesinado y su cadáver fue encontrado poco después en las afueras de Santo Domingo.	
24-Octubre	El artista Tony Seval, director de una orquesta de merengues, fue asesinado dentro de un hospital militar, hecho que provocó protestas en todo el país, donde la gente llenaba las calles de velas encendidas por la noche.	
Nov.	Cyclon Kate	

FECHA	ACONTECIMIENTO	PRESIDENTE
1966		Blanco
16-Mayo	Elecciones nacionales. Gané Balaguer.	
16-Agosto	Se juramentó como presidente el doctor Joaquín Balaguer.	Balaguer

APPENDIX 4: FIELD AIDS

Calculation Table for Age and Weight

TABLE DE CONVERSIONES: KILOS A LIBRAS

KILOS	LIBRAS	KILOS	LIBRAS	KILOS	LIBRAS
2.0	5.0	10.0	22.0	18.0	39.6
2.5	5.5	10.5	23.1	18.5	40.7
3.0	6.6	11.0	24.2	19.0	41.8
3.5	7.7	11.5	25.3	19.5	42.9
4.0	8.8	12.0	26.4	20.0	44.0
4.5	9.9	12.5	27.5	20.5	45.1
5.0	11.0	13.0	28.6	21.0	46.2
5.5	12.1	13.5	29.7	21.5	47.3
6.0	13.2	14.0	30.8	22.0	48.4
6.5	14.3	14.5	31.9	22.5	49.5
7.0	15.4	15.0	33.0	23.0	50.6
7.5	16.5	15.5	34.1	23.5	51.7
8.0	17.6	16.0	35.2	24.0	52.8
8.5	18.7	16.5	36.3	24.5	53.9
9.0	19.8	17.0	37.4	25.0	55.0
9.5	20.9	17.5	38.5		

II. FECHA DE NACIMIENTO A MESES POR DICIEMBRE, 1986

	1986	1985	1984	1983	1982	1981	1980
Dic	0	12	24	36	48	60	72
Nov	1	13	25	37	49	61	
Oct	2	14	26	38	50	62	
Sept	3	15	27	39	51	63	
Ago	4	16	28	40	52	64	
Jul	5	17	29	41	53	65	
Jun	6	18	30	42	54	66	
Mayo	7	19	31	43	55	67	
Abr	8	20	32	44	56	68	
Marz	9	21	33	45	57	69	
Feb	10	22	34	46	58	70	
Ene	11	23	35	47	59	71	

202

APPENDIX 4
SESPAS Grid

Hospital ☐ Sub-Centro Sanitario ☐ Clínica Rural ☐ No. de Registro ☐ Centro de Rec. Nut. ☐

1er. Apellido | 2do. Apellido | Nombre | Edad | Sexo

Dirección de los padres | Hnos. de madre | Hnos. de padre | Tipo de casa

No. de hab. | Nom. de la madre | Edad | Antecedentes familiares: Sífilis ☐ TB ☐ Diabetes ☐ Alergia ☐

Lugar de nacimiento ☐ Hospital ☐ Casa ☐ Clínica ☐ Médico ☐ Enfermera ☐ Comadrona ☐

Parto normal ☐ Cesárea ☐ Forceps ☐ Peso al nacer ☐ Talla ☐ C.C. ☐ CBI ☐

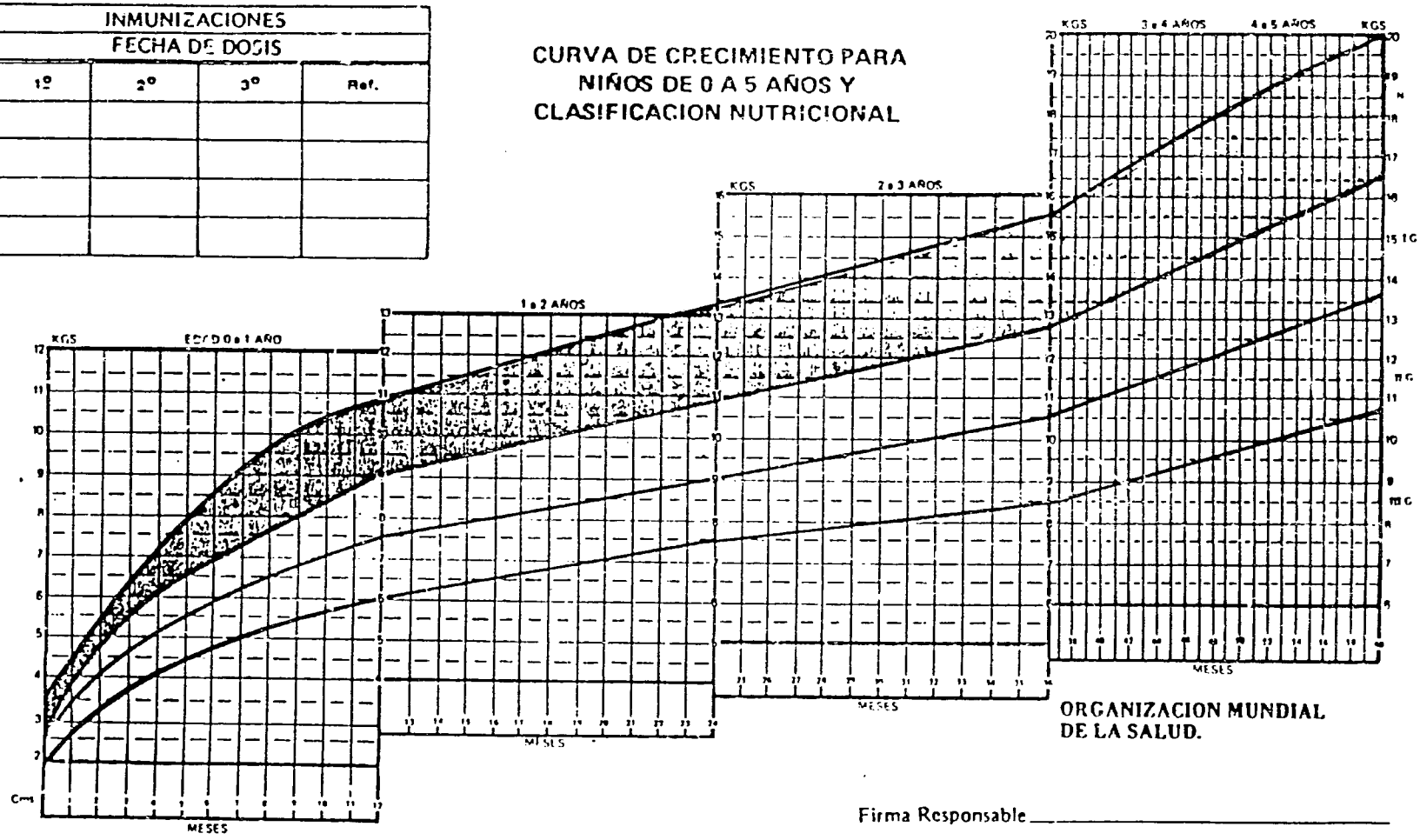
Alimentación materna ☐ desde hasta Artificial ☐ desde hasta vaca ☐ desde hasta

Jugo ☐ desde Fruta ☐ desde Sólido ☐ desde Cuales alimentos usó

Levantó la cabeza | Se sentó | Primer diente | Habló | Caminó

	INMUNIZACIONES FECHA DE DOSIS			
TIPO	1º	2º	3º	Ref.
DPT				
POLIO				
SARMP.				
BCG				

CURVA DE CRECIMIENTO PARA NIÑOS DE 0 A 5 AÑOS Y CLASIFICACION NUTRICIONAL



ORGANIZACION MUNDIAL DE LA SALUD.

Firma Responsable _____

Fecha _____

MARASMO ☐ KWASHIORKOR ☐

APPENDIX 5

Calculation of Percent Adequacy By Adult Male Equivalent

CALCULATION OF PERCENT ADEQUACY BY ADULT MALE EQUIVALENT

The Rogers' team calculated caloric and protein intake variables from data at the household level, with input from the author as nutrition consultant. As stated in the body of the report, intake was examined in two ways: (1) per capita consumption (intake/number present at time of meal) and (2) per adult male equivalent consumption (intake/number of calculated adult males present in household). The latter figure was calculated by deriving caloric requirement of household members by age, sex, and prenatal or lactational status from FAO tables (1), then obtaining ratios of these requirements to those of adult males and summing for all household members for a total adult male equivalent score. Total calories and protein intake at the household was then divided by number of adult male equivalents present in the home. It was thus possible to control for household composition when viewing dietary intake.

Percent adequacy was calculated in the traditional way using FAO tables and guidelines (1). All calculations were based on a reference 145 pound man (65.9 kg), as this was deemed the average weight of adult males in the Dominican Republic. The age range used was 18 to 30 years due to the younger age distribution for the total population. Basal metabolic rate was first estimated, then activity level accounted for by eight-hour time segments of sleep, sedentary activity (leisure), and light activity. A conservative estimate was used in order to present a more accurate view of findings and not overly inflate problems of inadequate intake. In addition, physical adaptation to consistent marginal caloric intake was borne in mind. In this way, a figure of 2300 kilocalories and 52.5 grams protein was derived as 100 percent adequacy for the average male in this culture. Interestingly, this figure for calories is identical to the one currently in use by the Dominican Republic; the figure for protein is somewhat lower than the one officially utilized (60 grams), yet it was based on the fact that a high proportion of total protein intake was from animal sources in most cases.

Sample calculations for calories are as follows:

1. Calculate BMR for 18-30 year old male, weight 65.9 kg.

$$15.3W + 679 = (15.3 * 65.9) + 679 = 1687.4$$

2. Eight Hour Activity Segments and Caloric Requirement:

Activity:

2.1 Sleep: BMR * 1.0
(1687.4 * 1.0)/8 = 562.4

2.2 Sedentary: BMR * 1.4
(1687.4 * 1.4)/8 = 783.4

2.3 Light: BMR * 1.7
(1687.4 * 1.7)/8 = 956.0

3. Total of 2.1, 2.2, and 2.3:

2301.8 Kilocalories per Day

(1) FAO/WHO/UNU. "Energy and Protein Requirements." Technical Report #724, WHO, Geneva, 1985.

APPENDIX 6

Methodology and Results of Standing Height vs. Recumbent Length Study

METHODOLOGY AND RESULTS OF
STANDING HEIGHT VS. RECUMBENT LENGTH STUDY

This study was undertaken as part of the Tufts Nutrition Survey in order to accurately estimate standing height from recumbent length measurements taken in the Survey. Dr. Stephen Bailey, Associate Professor of Anthropolgy and Nutrition, provided guidance in analysis of the anthropometric data.

As stated in the Methods section, all children in the Survey were measured in the recumbent position. Recumbent lengths are more accurate measurements for all age groups; in addition, this population of young children exhibited a natural inclination toward activity and movement. Accurate standing heights were impossible to measure in a population so physically active.

Following WHO recommendations (1), the study sample wascompared to NCHS standards. These standards were gathered for infants and toddlers up to three years of age in the recumbent position three years of age, and for preschoolers and school-age children in the standing position. In order to maintain consistency between measurements between the study and reference population, it was necessary to predict standing height from recumbent length, then compare this predicted value to NCHS standards.

METHODS

Sixty children, 30 from low-income sections of Santo Domingo and 30 from low-income rural Dominican areas, were measured in both the standing and recumbent positions. Twenty children (10 from each rural/urban location) were aged 36 to 47 months, twenty were 48 to 59 months, and 20 were 60 to 71 months of age. Half of the children were male and half were female. (Only children who were highly cooperative and able to stay still during measurements were selected.)

The two field workers chosen for the task had consistently demonstrated the most reliable measurements for recumbent length during the Tufts Consumption Survey for six weeks prior to the present study. Both were standardized in standing height by the PI according to WHO protocol (1).

Children were measured independently by two field workers. A minimum of six measurements (three per worker) were recorded for both recumbent length and standing height. If inter- or intra-worker readings varied by 0.5 cm or more, a fourth reading was taken by one worker (if intra-observer error was present) or both workers (if inter-observer error was present).

To control for floor level, a special board was constructed with adjustable legs. Field workers placed this board on the most level place in the study home, then stood the measuring board vertically on the leveled stand. For standing height, the subject stood with feet on the head board, and a sliding foot board was lowered on the uppermost part of the head. Measurements were read to the nearest .1 cm.

For recumbent length, the identical technique that was used in the Tufts Nutrition Survey was applied. The same measuring device was used for both recumbent length and standing height.

As in the Tufts Nutrition Survey, suspended weight was taken for each child and plotted against age on the Dominican Nutrition Graph As with the Survey, nutrition intervention was then offered if appropriate.

ANALYSIS

The averaged value of each field worker's measurements was entered into the Digital VAXII system at Tufts University for analysis.

A significant difference was found between recumbent length and standing height for the rural and urban populations; no such difference was found between males and females. Thus, rural and urban regions were analyzed separately.

Using standard regression equations (SPSSX: Statistical Package for the Social Sciences, Version 2.1), a standing height was predicted from recumbent length. For the two groups, these equations are as follows:

URBAN:

$$\text{Pred. St. Ht.} = (1.0170 * RL) - 3.3804$$

RURAL:

$$\text{Pred. St. Ht.} = (1.0152 * RL) - 2.8584$$

where Pred. St. Ht. = Predicted Standing Height in cm.
RL = Recumbent Length in cm.

To test for accuracy of the predicted value, the difference between actual and predicted standing height, Pearson's correlation was run. The r2 value was 0.99 for both rural and urban populations.

A matched pair analysis was then conducted to test actual and predicted values. Only a slight difference was noted between these distributions for both the urban and rural group (Urban: Difference=-0.005 cm; p=0.955; Rural: Difference=0.0001 cm; p=0.999).

Given these results, predicted standing height was used for the Tufts Nutrition Survey study population at large. For all children three years and above, standing height for the urban subset was predicted from actual recumbent length via the first equation. Similarly, the second equation was utilized for children three years and above from rural areas. Using the NCHS Standards as the reference population, standard deviation scores and percent median scores were then calculated for each child using the new predicted values.

(1) WHO. "Measuring Change in Nutritional Status: Guidelines for Assessing the Nutritional Impact of Supplementary Feeding Programmes for Vulnerable Groups." Geneva, 1983.