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9. ABSTRACT
The overall objective of the Inter-American Investigation of Mortality in Childhood was to establish death rates for infancy and childhood that would be as accurate and comparable as possible, taking into account biological as well as nutritional, sociological and environmental factors. One major factor on which information was desired for the living children was nutritional status. This paper presents an analysis of the growth and nutritional status of children in 21 areas of the 13 projects in Latin America. It describes the selection of the study areas, sampling, measurement procedures, population, classification of nutritional status, urban and rural differences, and comparisons. Weights were obtained on 18,708 children or 96% of those identified in the household sample survey. In most projects the median weights of the children are generally at or above the Harvard standard growth curves during the first 6 months of life. By 9 months of age the weights have begun to fall away from the standard and during the next four years at least 75% of the children have weights below standard. In relation to their respective standards the female growth curve for each project is generally below that of the curve for males. The weights of the children in the suburban and rural areas were generally lower than those in the corresponding urban areas. Generally a greater percentage of females than males was classified as malnourished. In most areas the prevalence of malnutrition increased with age. This report includes numerous illustrative tables.

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GROWTH CURVES AND NUTRITIONAL STATUS OF CHILDREN IN SELECTED STUDY AREAS OF LATIN AMERICA

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The Inter-American Investigation of Mortality in Childhood[1/] was carried out in the period 1968-1972 in 15 projects.[2/] Its overall objective was to establish death rates for infancy and childhood that would be as accurate and comparable as possible, taking into account biological as well as nutritional, sociological and environmental factors. From the beginning it was clear that to estimate the risk of mortality in relation to these factors, data on deaths of children in the selected communities would not be sufficient. Information on living children would also be essential. Following considerable discussion the problems of selecting "control" living children for comparison, it was decided to study in each project a probability sample of households and all living children under 5 years of age in these households.

One major factor on which information was desired for the living children was nutritional status. Since weight in relation to age is commonly used as an indicator of nutritional status, each child under five years of age was weighed at the time of the household interview. Arm

1/This research project was made possible by a contract between the Agency for International Development of the United States of America and the Pan American Health Organization.

2/R. R. Puffer and C. V. Serrano. *Patterns of Mortality in Childhood*, Pan American Health Organization, Scientific Publication 262, Washington, D.C., 1973.

circumference, also believed to be a reliable indicator of nutritional status was also measured on the same visit. These measurements on living children under five provide some insight into the prevalence of nutritional deficiencies in these selected communities of Latin America

This paper presents an analysis of the growth and nutritional status of children in 21 areas of 13 projects in Latin America.

Selection of Study Areas

The thirteen projects included in this study are distributed in both Middle and South America (Figure 1). Seven are confined to cities, while the other six include both urban and rural areas. Since one of the aims of the study was to investigate urban-rural differences, these comparisons will be presented whenever useful

In Argentina, the provinces included were Chaco and San Juan; within these, Departments were drawn from both urban and rural areas. In Chaco, the Department of San Fernando with its inhabitants living principally in the city of Resistencia comprised the urban area while the six Departments-Comandante Fernandez, General Donovan, Libertad, Presidencia de la Plaza, 1° de Mayo and Quitilipi--made up the rural area. The entire Province of San Juan was studied, divided into three sections--the city of San Juan, four suburban Departments around the capital (Chimbas, Rawson, Rivadavia and Santa Lucia) and the remaining seven essentially rural Departments.

The city of La Paz was chosen in Bolivia in order to include in the study a population from a high altitude. The small city of Viacha, 32 km. outside of La Paz, which was also a part of the project, was not included in this analysis due to small sample size and the use of a different definition for households in the sample population.

In Brazil, there were three distinct, widely separated projects: Recife in the Northeast, and Ribeirão Preto and São Paulo in the South. The study in Recife covered the heavily populated districts of Beberibe, Encruzilhada and Casa Amarela in which socioeconomic and cultural conditions were considered representative of the city. In the Ribeirão Preto project, there were three sectors: the city of Ribeirão Preto, the city of Franca, which is 200 kms. from Ribeirão Preto and a sector composed of five smaller communities: Batatais, Brodosqui, Cravinhos, Jardinopolis and Sertãozinho. The project area in São Paulo was entirely urban, covering only the District of São Paulo.

The study in Chile was carried out in the metropolitan area of Santiago (Greater Santiago) and in four "comunas": Colina, Lampa, Quilicura and Til-Til to the north and west of the city.

The three projects in Colombia were designed to provide data for three distinct regions of the country: the Pacific, the Caribbean and the Central. The investigation was conducted in the urban sectors of the cities of Cali, Cartagena and Medellín.

The study in El Salvador was carried out in the Municipio of San Salvador, almost entirely urban, and in the three rural municipios (Apopa, Nejapa and Quezaltepeque)

In the Caribbean Island of Jamaica, the project included the capital city - metropolitan Kingston - and the rural portion of St. Andrew Parish.

The project in Mexico was carried out in the entire Municipio of Monterrey, which includes the city itself and 40 surrounding localities. The rural population comprises less than 1% of the population of the Municipio.

In addition to the 13 projects in Latin America, the Inter-American Investigation of Mortality in Childhood included two projects in Northern America, one in the United States and the other in Canada. In the United States, the project was conducted in the Bay Area of Northern California, and comprised the City of San Francisco and the urban and suburban areas of Alameda, Contra Costa and San Mateo counties. In Canada, the Sherbrooke project covered the Eastern Townships, south of the St. Lawrence River, in the southeastern part of Quebec Province. Weight and arm circumference data will not be included in this paper for either the California or the Sherbrooke project.

Sampling

A sample of dwelling units was selected in each project using probability sampling techniques. Those households associated with the dwelling units formed the sample for this study. Sufficient dwelling structures or households were selected to insure that approximately 2,000 children under 5 years of age were included in the sample in each project. The field work of interviewing the households was distributed over the period of two years.

The sampling procedures were similar for most projects, and were carried out in two stages. At the initial stage, the area was divided into distinct well-defined geographic subareas consisting of one or more blocks and from these subareas a selection was made. The probability of selection at this stage was proportional to the number of dwelling units estimated to be in the subarea. For each subarea selected, a complete list was made of the dwelling units within the area. At the second stage, equal size clusters of approximately 33 dwelling units per subarea were selected. The

interviewing was carried out over the two-year period, in approximately 3 subareas per month. To insure that strict probability sampling techniques were used, consultant services for the design and selection of the samples were provided to each project

The samples selected in 13 projects consisted of 30,155 occupied dwelling units; for 95% or 28,658 households, interviews were completed. Few refusals were encountered, but for some households it was not possible to find a person at home, despite repeated visits. Of the 28,658 households in which interviews were completed, 12,079 were households with children under 5 years of age. Within these households, measurements of weight and arm circumference were taken on children under 5 years of age in order to assess nutritonal status. The children measured in this age group totalled 19,519.

Measurement Procedures

Since the measurements were to be made in the homes of the children, they had to be easily performed, requiring neither expensive nor delicate equipment nor difficult techniques. For these reasons, weight and arm circumference were selected. To ensure accurate data, emphasis was placed on standardization of equipment and procedures.

Training sessions were held for all home interviewers on the use and calibration of the equipment. Also included was an explanation of the nature and objectives of the study and the importance of the role that the interviewer would play. Standardization procedures were discussed and practiced to insure agreement between the instructor and interviewers by the end of the session. To maintain high quality in the data, once the study was under

way, the principal collaborators were encouraged to check each interviewer's measurements frequently and at random intervals. This meant accompanying them on home visits, reviewing the data, and at times independently reinterviewing the household. Periodic technical meetings were also encouraged for discussion of problems and for monitoring the progress of the study.

1. Weight

Equipment: 1) Scales to measure up to 30 kg., accurate to the nearest 100 grams or 1/4 lb. The beam balance was recommended because it required less care and was more likely to remain accurate, but a good quality spring balance was also acceptable. 2) A basket for weighing children too young to stand. 3) Four standard weights of 5 kg. each.

Since the equipment had to be transported, it was essential to calibrate the scales prior to the weighing in each home. The instructions were to adjust scales to zero and then to add the standard weights to check accuracy at 5, 10, 15, and 20 kgs.

Clothing was either to be removed or subtracted from the child's weight if it consisted of more than light underwear. The child was to stand in the center of the platform and the weight was to be recorded precisely, and to the nearest 100 grams. A child unable to stand was to have clothing removed and was to be placed in the basket on the scales; the basket weight was to be subtracted from the registered weight. Only the remainder, the child's weight, was to be recorded on the questionnaire. Nutritonal status using the Gómez classification based on weight and age in relation to weight standards developed at Harvard was not to be entered but determined at the time of analysis.

2. Arm Circumference

Equipment: A flexible steel tape measure. The same type was provided to study groups in all cities.

The mid-point between the acromion and the olecranon was to be determined and marked on the left arm with a ballpoint pen. The circumference of the arm was then measured at that marked point with the arm hanging loosely. It was pointed out to the study personnel that a more accurate measurement would be obtained if a position on the tape other than 0 was used as the initial point. Mild tension was to be applied to the tape to assure that it was touching the surface of the skin in its entire circumference. The measurement to be recorded on the questionnaire was to be expressed to the nearest 5/10 of a centimeter. Nutritional status based on the standards published by Jelliffe was to be determined at the time of the analysis.

Population

In Table 1, the distribution by age of the study population under 5 years of age is presented by project with further subdivision of six projects by urban and rural areas. The distribution by age of the children within each study area suggests that there may be an underrepresentation of children in the sample in the first month of life in several areas, but only in La Paz, Franca and in the comunas of the Chile Project are the numbers of children in this age period clearly deficient. For the five single year age groups, the totals were of approximately the same size; namely, under 1 year, 3,921; 1 year, 3,931; 2 years, 3,884; 3 years, 3,921; 4 years, 3,862. The numbers under one year of age would be expected to be at least as large as the numbers in the second year of life; however, family planning

in a few areas might account for the higher proportion of the older children.

There were 5 areas in which the number of children less than one year of age was more than 10 less than the number of one year olds: rural Chaco, the city of Ribeirão Preto, São Paulo, Santiago and San Salvador.

Based on the estimated distribution of the population under 5 years used in *Patterns of Mortality in Childhood* as the denominator for calculation of death rates, the expected number of children under one year of age (in a sample of 19,519) was 4,175, which is 254 more than the 3,921 enumerated in the sample. Hospitalization of immature or ill infants could account for part of the deficiency.

In every area, it was possible to obtain arm circumference measurements on at least 92% and weights on almost 90% of the children under 5 years of age (Table 2). The overall percentage with measurements for both weight and arm circumference was 96% for the 13 projects. Measurements were missing most often for children under 3 months of age and for those 54 to 59 months of age (Table 3); for the latter, perhaps because they were more likely to be absent from the home at the time of the interview. But even these percentages remained in the middle 90's.

A. WEIGHT MEASUREMENT

Age and Sex Patterns

Growth curves based on median weight for age and sex have been prepared for each of the 13 study projects (Figures 2 and 3), with medians calculated for age intervals of 3 months. On each section of the graph a curve of standard median weights for age and sex is also shown. These

standards, developed at the Harvard School of Public Health, are based on measurements of children of Northern European ancestry living in Boston in the period 1930 to 1956 (Nelson, 1969; Appendix I). The children were mainly from families in the lower economic brackets, but had the advantage of regular health supervision. In addition to the standard curve, similar curves representing 90%, 75% and 60% of the standard are shown. On the figure the arrangement of the 13 projects was determined by the percentage of children under 5 years of age with normal weight, that is a weight greater than or equal to 90% of the standard weight for age. For example, San Juan Province appears in the first section since it had the highest percentage of children with normal weight.

Inspection of the 13 growth curves in relation to the Harvard standard reveals differences between projects in the median weights of children under 5 years of age. These differences are more evident after the children reach their first birthday. Under 6 months of age, in most projects the median weights are generally at or above the standard. The rapid rate of growth expressed by the standard for the first year of life is not attained in many of the projects after 9 months of age.

In San Juan Province the male growth curve tends to follow the standard throughout the first 5 years of life. The growth curves in the next six projects in Figure 2 - Chaco Province, Ribeirão Preto, Chile, São Paulo, Monterrey and El Salvador - tend to deviate progressively farther from the standard but within the range of 90% to 100% of standard. In the Jamaican project, the median weights are clearly below those of San Juan, following the 90% of standard curve. The weights in Recife and Cali also tend to approximate this curve. In La Paz and the two Colombian cities of Cartagena

and Medellín, the median weights appear to be lower, dropping below the 90% curve after one year of age in La Paz and after two years of age in Cartagena and Medellín.

In relation to their respective standards, the female growth curve for each project is generally below that of the curve for males. For example, in Chaco Province and Ribeirão Preto projects the weights of the males tend to approximate the standard while those of the females range between 90 and 100% of standard. In Recife and Cali, the male growth curves after one year of age follow the 90% curve while the female median weights range between 90 and 75% of standard.

It was not expected that median weights of children under 6 months of age would be close to the standard in areas where the infant mortality is high. However, this may be, in part, due to underrepresentation in the sample of children in this age group with nutritional problems. The newborn with low birthweights may have died or have been missed due to prolonged hospitalization. Children at home with severe illnesses may also not have been weighed.

For each of the age groups, the range of weights of the middle 50% of the children is indicated by the shaded area on the figure. The medians and first and third quartiles are presented in Appendix II. In general, weights of the middle 50% of children fall within an interval which represents about 20% of the median weight and which almost always lies below the standard weight curves for age and sex. Under 6 months, however, the corresponding interval is usually a higher percentage of the median.

Urban, Suburban and Rural Patterns

Separate distributions of weight by age and sex are available for the urban, suburban and rural areas of six study projects: El Chaco Province, San Juan Province, Ribeirão Preto, Chile, El Salvador and Jamaica. In all six, the weights of the children in the suburban-rural areas were lower than those in the corresponding urban areas. Figure 4 presents the male growth curves for four projects as examples of the differences observed. In the capital cities of San Juan and Chaco Provinces, the medians were above or close to the standard at most ages; however, they were in the 90 to 100% range in suburban and rural sectors in the former and somewhat lower in the latter. In Santiago the median weights ranged between 90 and 100% of standard while in the suburban-rural comunas of the Chile project they were usually below the 90% curve. The most marked difference between urban and rural regions occurred in El Salvador, where the median weights of the urban children were at or above the 90% curve while in the rural area they fell between 75 and 90% of the standard, after 6 months of life.

Classification of Nutritional Status

Each child was graded as to nutritonal status on the basis of his weight for age and sex using the Gómez classification scale in relation to the Harvard standards (Gómez et al, 1955, and Ramos-Galván et al, 1958). Children with weight at or above 90% of standard were considered to be in the normal range. Those with weights below 90% of standard were classified as malnourished and graded according to degree. Those children with weights from 75 to 89% of standard were considered to have mild malnutrition, Grade I;

from 60 to 74% moderate malnutrition, Grade II; and those below 60% severe malnutrition, Grade III.

The percentages of children with malnutrition, Grade I, II or III, are shown in Figure 5 and Table 4, by sex, for 21 study areas within the 13 projects. The study areas are arranged on the Figure in decreasing order of the prevalence of nutritional deficiency among male children. In all but three areas - the capital city of San Juan and the rural areas of Chile and Jamaica - the percentage of children classified as malnourished was greater for females than for males. This was also evident from the levels of the growth curves in Figures 2 and 3, to which reference was made earlier. The percentage of children with moderate and severe malnutrition was also higher among the females than the males with the exception of the comunas of Chile and rural St. Andrew in Jamaica. Among both the male and female children, malnutrition was the most prevalent in the rural area of El Salvador and the least prevalent in the capital city of San Juan Province. The percentage wa high in Medellín, Cartagena, La Paz, Recife and Cali projects.

Because of small sample sizes in some study areas, data for both sexes were combined to observe the changes in the prevalence of nutritional deficiency by age (Figure 6 and Table 5). Four age groups are compared, 0-5 months, 6-11 months, 1 year and 2-4 years. In Figure 6, the study areas are arranged in decreasing order by the percentage with malnutrition among 2-4 years old children. The bar for each age group is divided to show the percentage with moderate or severe malnutrition, Grade II or III, and the percentage with only a mild deficiency, Grade I.

During the first 6 months of life, the average percentage of children with malnutrition, Grade I, II or III, was 15.3, varying from 0 in the capital

city of San Juan to 29.0 in Medellín. Moderate and severe forms of malnutrition, represented by 3.2% of the total children in this age group, were most frequent in the rural sectors of El Salvador and Jamaica, in La Paz, Medellín, the small communities of the Ribeirão Preto project and in Recife where over 5% of the children under 6 months of age had a nutritional deficiency of Grade II or III. However, it should be pointed out that in several of the areas, the number of children under 6 months included in the sample was small and thus the percentages may be subject to large sampling variations. In addition the percentage may be understated as a result of the exclusion from the sample of children with low birthweight or severe malnutrition who may have died or been hospitalized.

Among the children 6-11 months of age, in all study areas combined, the percentage with malnutriton reached 29.3%. The percentage was higher in this age group than in the previous age group in all places except rural San Juan, ranging between 9% in Resistencia and 56% in rural El Salvador. In the majority of areas, moderate and severe forms of malnutrition, Grades II and III, were also more prevalent in this age group than among the younger children. In La Paz, Recife, Medellín, Cali, rural St. Andrew in Jamaica, Chile comunas and in rural San Juan, at least 10% of the children in this age group were classified as either moderately or severely malnourished.

Among children of 1 year of age, in all the study areas combined, 44% had some degree of malnutrition, with a range from 14% in the capital city of San Juan to 62% in rural St. Andrew. In addition to the elevated proportion in the latter area, over 50% of the children had some degree of malnutrition in rural El Salvador, La Paz, Medellín, Cartagena and Recife. The percentage with moderate and severe malnutrition increased over that in the

previous age group in most areas. Malnutrition of Grades II and III ranged from 2 to 24% with an overall average of 10.4% and with 9 areas above the mean percentage.

In the age group of 2-4 years, 12 areas showed an increased in the percentage of malnutrition over the level of the group of 1 year olds. The overall average had increased to 46.7% and the range of percentages was very large (from 9 to 71%). In 8 areas at least 50% of children were classified as malnourished--Chile comunas, Cali, Cartagena, Medellín, La Paz, Recife, rural El Salvador and rural St. Andrew. Of the total children in the samples, 9.5% were suffering from moderate or severe malnutrition. In general, the areas with the highest levels for all grades, that is, with at least 50% malnourished, also had the highest percentages with moderate or severe deficiency, ranging from 10 to 19%.

In most areas, the prevalence of malnutrition increases with age. This finding is also suggested by the growth curves in Figures 2 and 3 where, as age increases, the median weights depart farther from the standard curve. Exceptions are found in all 3 areas of the San Juan Province, in Ribeirão Preto communities and in the rural area of El Chaco Province. The prevalence of moderate or severe malnutrition reached its highest point in the age group of 2-4 years in the three cities of Colombia, and in São Paulo, Ribeirão Preto and San Salvador.

Figure 7 shows the percentage of children with Grade II or III malnutrition in projects which covered urban, suburban and rural areas. Wide differences exist in five of the six projects. In San Juan the greatest difference between the urban and rural children occurs between 6 to 11 months of age. Similarly, in Chile it is in this age group that children in Santiago

are dissimilar to those in the comunas. In Chaco, El Salvador and Jamaica the one year olds differ most markedly. In several proejcts differences become less marked for the 2-4 year olds; however, in El Salvador, a large urban-rural differential remains even in this oldest age group.

B. ARM CIRCUMFERENCE

Arm circumference has been proposed as a measure of nutritional status because of the relative ease with which the measurement can be taken under field conditions. Several studies have been undertaken to establish a set of standard arm circumference measurements for age and sex and are compiled in a monograph (1969) by Jelliffe. Figures for mid-upper arm circumference obtained by Wolanski in a study of healthy well-fed Polish children are the most widely used (Jelliffe, 1966; Appendix III). Similar figures were also recorded, in a 1969 monograph, by Robinow for children living in Ohio in the United States. Other studies were carried out in Sweden (Karlberg et al, 1968) and in Greece (Kondakis, 1969); however, the recorded measurements in the latter two at 1, 2, and 3 years of age were below those of Wolanski and Robinow. All studies have demonstrated little difference between the sexes and have resulted in the same type of curve with a period of rapid change during the first 6 to 8 months of life followed by relatively little change after the first year.

Since arm circumference values vary only slightly between one year and 4 years of age, Jelliffe has modified Wolanski's data and presents a single value for each year of age. The variance associated with these measurements was not given by Wolanski; but Robinow does state that in his study the standard deviation remained virtually constant at 1.1 cm throughout the age range from 1 to 60 months.

Age and Sex Differences

Each child under 5 years of age in the sample of households had his arm circumference measured during the same interview session at which he was weighed. The mean arm circumference by age and sex is plotted for all areas combined in Figure 8. These points are shown in comparison with the standard curve described by Wolanski. For each mean, the standard deviation is also shown (Table 6 and Figure 8). This measure of dispersion which varies from 1.5-1.9 cms. was uniformly larger than the 1.1 cms. observed by Robinow and mentioned previously.

During the first year of life the standard curve shows a period of rapid growth; in the following 4 years the increase in this measurement is very small. The mean for each sex in the 13 projects combined starts out slightly below standard and moves progressively farther away from the standard during the first 18 months. After that period the averages move again toward the standard. The means for the two sexes were at no age more than .4 cm. apart with the largest difference occurring during the first year of life. The averages for females are consistently lower than those for males, a significant difference according to the sign test.

The mean arm circumference curves were plotted for each project area in Figure 9 along with curves indicating the standard and 90% of standard. Data for both sexes were combined. The projects have been arranged in the Figure in decreasing order by percentage of total children with arm circumference 90% of standard or above. The most marked difference between these curves and the standard occurs between 6 and 24 months of age. A table of the means and standard deviations by age and project is presented in Appendix IV. The growth curves for the projects in Chile,

San Juan Province, El Salvador, São Paulo and Monterrey follow the general pattern by age observed for all projects combined, with the means remaining between the standard and 90% of standard curves.

In most of the remaining areas the means fall around or below the 90% curve during the first year of life. However, they move above the level of that curve during the second year of life in Ribeirão Preto and in Medellín and during the third year of life in remaining areas with the exception of Recife and Cartagena. The mean arm circumference is lowest in Recife where from the beginning of life it was below the 90% of standard curve and only by the end of the fifth year of life did it reach that level

Urban, Suburban and Rural Differences

The differences between mean arm circumference of children in the urban, suburban and rural sectors of four projects are presented in Figure 10 by age group In each of the projects the differences are generally positive, indicating larger arm circumferences among the urban children than the suburban and rural children (Table 7).

In the Chile project, except for children 6-11 months of age, the differences between Santiago and comunas are relatively small. Under one year of age the differences are from -.4 cm. under 6 months of age to +1.1 cm. among the 6-11 month olds. In San Juan Province children from the capital are compared with those from the rural departments. Nine out of 10 differences are positive with the most marked differences around one and three years of age.

In the El Salvador project the means for urban and rural areas are separated by +.5 cm. or more between the ages of 6 months and 3 years,

but under 6 months there is no difference between the sectors. On the other hand, in El Chaco Province the difference is the largest in this very young age group.

Nutritional Status

To classify nutritional status from arm circumference measurements, dividing points of 90, 75 and 60% of standard were used in the same way as for weights. These were arbitrarily taken because there is no generally accepted criteria which corresponds to the Gómez classification. The standard used was that of Wolanski modified to a single year value for each year from one to five as suggested by Jelliffe. Measurements, 90% of standard or above were classified as normal (0); those 75 to 89% as Grade I malnutrition; those 60 to 74% as Grade II and those below 60% of standard as Grade III malnutrition.

For the children divided into three age groups, 1-5 months, 6-11 months and 1-4 years, the number and percentage distribution by nutritional status are presented by project area (Table 8). For all areas combined the percentage of children with malnutrition, as classified above, is 24.2 for all children. By age group it varies, increasing from 19.3% for those 1-5 months of age to 30.1% at 6-11 months of age; however, among the 1-4 year olds the percentage falls to 24.0.

In the age group 1-5 months, this percentage ranges from 33.1% in Recife to 9.7% in São Paulo, with only four projects (Recife, El Chaco, Jamaica and Medellín) above the mean for all areas combined. In the next age group of 6-11 months, all but two areas showed an increase in the percentage of children considered malnourished by this indicator. The

range between projects was wider than in the younger age group, varying between 11.9% in São Paulo and 56.3% in Recife. A similar spread in the percentage of malnutrition was seen in the age group 1-4 years, with Recife (54.8%) and San Juan Province (10.5%) at the two extremes. In all but three projects, São Paulo, El Chaco Province and La Paz, there was a decrease in the percentage compared with that in the preceding age group.

Comparison

To evaluate the potential and comparability of the two measurements, weight and arm circumference, as indicators of nutritional deficiency, either to define the extent of a community's problem or to assess the individual's problem, the nutritional status assigned according to the Gómez classification for weight was compared to that assigned according to the arm circumference measurement.

In defining the extent of malnutrition in the projects, the two indicators generally did not agree (Table 9). Under 6 months of age 16.1% and 19.5% were judged to be malnourished according to weight and arm circumference, respectively, a significant difference at the one percent level. At 6-11 months, both indicators showed approximately 30% of the children with some nutritional deficiency. After the first year of life, low weight for age was found for approximately 44% and 47% of the children of 1 year of age and of 2-4 years, respectively. In contrast, in these two age groups the percentage considered malnourished was only half as great when based on arm circumference (22 and 24 percent, respectively).

A comparison was made of the two assessments for each child in a two-way cross classification of nutritional status (Table 10, and Figure 11)

grouping the children in two age groups, 1-11 months and 1-4 years. For all areas combined, agreement between the two indicators was 72% for children of 1-11 months of age and 59% for those of 1-4 years. By agreement it is meant that a child is assigned to the same Grade of nutritional status by the two indicators.

For the younger age group, for all areas combined, the two indicators assigned a different nutritional status for 28% of the children. Arm circumference, with the criteria and standards described, served to identify fewer cases of Grade II and Grade III deficiency, but more of Grade I. Of the 43 children with Grade III malnutrition based on weight, only 4 were classified as Grade III by arm circumference. Seventeen or 40 percent of the 43 fell into the normal range on the basis of arm circumference. Similarly, of the 20 children classified as Grade III by arm circumference, 6 or 30 percent were normal on the basis of weight.

Grade II or III malnutrition was assigned to 204 children on the basis of weight. Of these only 52 or 25 percent were also classified as Grade II or III on the basis of arm circumference. At least as many (55) were classified as normal based on arm circumference. Children classified as Grade II or III malnutrition from arm circumference numbered 134; of these 49 or 37 percent were normal on the basis of weight.

When the 13 projects are considered separately, the percentage of children 1-11 months of age for whom there is agreement in assignment ranged from 65% to 87% (Table 11). Of the individual projects, the numbers malnourished by weight standards were greater for 8 and fewer for five. However, in 11 of the 13 projects more children under one year of age were assigned to Grades II or III malnutrition on the basis of weight than on

Of the 1,442 children of 1-4 years of age classified as Grade II or III malnutrition on the basis of weight, 545 or 38 percent were judged normal by the standards used for arm circumference. Only 83 or 6 percent were classified as Grade II or III malnutrition

In the 1-4 year age group, agreement between the two indicators ranged from 42% in La Paz to 78% in San Juan Province. A much higher percentage of children was classified as malnourished on the basis of weight than of arm circumference in every area.

These findings suggest that the arm circumference curves for 90, 75 and 60% of standard may not differentiate normal and malnourished children in this age group of 1-4 years. It is conceivable that more satisfactory boundaries could be established to discriminate between normal and malnourished by moving upward the percentage level of separation. However, the precision of measurement recommended for this study, that is to the nearest 0.5 centimeter, could perhaps mask any real differences.

For the children in each of three nutritional status groups based on weight: normal; Grade I, and Grade II or Grade III, a growth curve representing mean arm circumference for age appears in Figure 12 and Table 12 together with the appropriate standard deviation. These mean arm circumference values, by age and nutritional status according to weight, form three distinct curves separated by approximately 1 cm.

For each age group the difference between the mean arm circumference of children with Grade 0 and Grade I malnutrition based on weight is less than one standard deviation. This is also true for children with Grade I and Grade II or III malnutrition based on weight. If arm circumference is to be used to assess nutritional status, the mean arm circumference value

in the three groups clearly would need to be farther apart, particularly in view of the variance observed within the groups.

As Table 10 shows, the classification was not always to an adjacent nutritional status group but often to a more extreme group. For example 38% of the 1-4 year olds classified with Grade II or III malnutrition on the basis of weight were judged normal on the basis of arm circumference.

Discussion

Criteria for selection of a standard for use in anthropometric surveys vary considerably. Some investigators support the use of a local standard based on children of families, ethnically similar to the study population but from a socioeconomic class in which children are healthy, well-fed and developing at their full genetic potential. Such standards are difficult to develop due to the relative inaccessibility of children under 5 years of age since, in general, they are not yet in school. Also their number may be small in some areas. Standards which have been established have often been based on measurements of children from lower socioeconomic groups who may in fact have been undernourished from 6 months of age onward and continuously exposed to a succession of infectious and parasitic diseases (Dean and Jelliffe, 1960).

Other investigators recommend the use of United States or European standards which are already available since it has been reported that well-fed people of various ethnic groups tend after a few generations to approximate similar weights. This finding was observed for a study of Japanese Americans (Greulich, 1957). Ford (1964) reported on this trend among well-nourished infants and pre-schoolchildren of various genetic backgrounds

The children attained weights close to those obtained in the Harvard longitudinal study (Nelson, 1969). Similar findings were also reported for West Indian schoolchildren in Haiti (King et al, 1963), and Jamaica (Ashcroft and Lowell, 1964; Ashcroft et al, 1965) and for a privileged group of African children (Kahn and Freedmen, 1959). No statistically significant difference by race was found between the mean weights of white and negro children in the U.S. Health and Nutrition Examination Survey in 1971-1972 (DHEW, 1975).

Since one of the aims of the investigation was to compare growth and nutritional status of children in various areas of Latin America, it was desirable to use a single reference standard. For this the Harvard standard was selected which was based on data collected from a longitudinal study of children in Boston from 1930 to 1956.

Growth curves for the 13 projects were compared with the Harvard standard weights by age and sex. The general form of the curves is one of normal development during the first six months of life followed by a period during the latter part of the first year and the second year of life, when weights fall away from the standard. A normal growth rate is again resumed by the end of the second year of life but at a level below the standard.

The finding of weights at or above the standard during the first 6 months of life seems contradictory in light of the high frequency of low birthweight children (2,500 grams or less) in Latin America and the documented high infant mortality. Analysis of birthweights in three projects in Latin America--Ribeirão Preto, Mexico and El Salvador--showed that the prevalence of immaturity or low birthweight varied from 8.7% in Ribeirão Preto to 11.7% in a Mexico City hospital and 14.4% in a large maternity

hospital in San Salvador (Serrano and Puffer, 1974). A similar analysis in Recife (Nunes, 1976) found that 14.6% of the newborns had low birthweight.

The tendency for weights under 6 months of age to approximate the standard curves has been observed in other nutritional surveys, including those conducted by the U.S. Interdepartmental Committee on Nutrition for National Defense (ICNND), e.g., in Paraguay (DHEW, 1967) and Chile (ICNND, 1960). This was also true of an anthropometric survey in São Paulo (Marques et al, 1975). However, in the surveys in Northeast Brazil (ICNND, 1965) and Venezuela (ICNND, 1964) the weights fell below standard by 3 months of age for the females and at 1 month for the males.

In the studies in Chile and São Paulo, just mentioned, the growth curves dropped below the standard by 6 months of age, but remained above 90% of standard during the next 4 years. In the study in Paraguay the growth curves dropped below standard after 6 months for females and after 9 months for males, falling below 90% of standard after 1 year of age and remaining at this level among the 2-4 year olds. A similar growth curve pattern after one year of age was found among Venezuelan children in the ICNND survey. The mean weights were lowest in the Northeast Brazil study varying between 75% and 90% of standard from very early in life.

Preliminary findings are now available for the United States Health and Nutritional Examination Survey (HANES) carried out by the National Center for Health Statistics in 1971-1972. Data on several indicators o nutritional status were collected on a probability sample of the U.S. civilian, non-institutionalized population between 1 and 74 years of age. Median weights of children of 1-4 years of age in this study tended to

follow the Harvard standard for each sex (Figure 13). Weights of U.S. children were very similar to those of children in this age group in San Juan Province. This Province was the project in which the percentage of children with nutritional deficiency was lowest among the 13 projects in Latin America.

Preliminary findings on weights of children under 5 years of age are also available from the pilot phase of the Infant and Early Childhood Mortality Study being carried out in Trinidad and Tobago in County Caroni was as a part of a WHO Interregional Project (PAHO, 1975). The growth curve for young children very closely approximated the median weights for females observed in the Jamaican project of the Inter-American Investigation.

The comparison between growth curves of the males and females was presented in only a few of the surveys previously mentioned. In Paraguay and in Northeast Brazil among children 1-5 years of age there was a tendency for the female average weights to depart slightly more than those of the males from their respective standards. This was also true in the U.S. Health and Nutrition Survey among children 1-5 years of age.

In most surveys reviewed the use of the Gómez classification scale for weight in assigning nutritional status permits further comparison of the Inter-American Investigation of Mortality in Childhood with others in the Region. In the Caribbean, a survey carried out by the Caribbean Food and Nutrition Institute in Trinidad indicated that approximately one-third of the children had some form of protein calorie malnutrition (PCM) and/or anemia especially in the second year of life. The Inter-American Investigation in the Kingston-St. Andrew area of Jamaica, found approximately 41% of the children under 5 years with some form of protein-calorie malnutrition.

The highest percentage of malnutrition was observed during the second year of life in both studies.

The project cities in the Investigation of Colombia had a high prevalence of children with protein-calorie malnutrition as evidenced by weight. Studies from the National Institute of Nutrition in Colombia (1967) report even higher levels. In San Jacinto, Colombia, the proportion of children with a nutritional deficiency increased from 42% under 1 year of age to 81% among the 2-4 year olds. In the Medellín project the corresponding increase was from 35% to 61%.

In a survey by INCAP and NIH in 6 Central American countries nutritional deficiency was identifed in over 50% of the children in each country, In El Salvador, 68.5% of the children under 5 had some form of malnutrition (Viteri, et al, 1970). This corresponds to the Investigation findings of 62% malnourished in the rural area outside San Salvador. In San Salvador, a much lower prevalence was observed (33%); however, approximately 60% of the population of El Salvaodor lives in rural areas, many in communities with poorer health status than the rural villages included in the Investigation.

Several surveys have been conducted in communites of Northeast Brazil. In those in the Agua Fria and Beberibe areas of Recife (Beghin, 1972), 57% of the children had weights of below 90% of standard as compared to 48% in the present study in the districts of Beberibe, Encruzilhada and Casa Amarella in the Recife area.

Weights of children whose birthweights were 2,500 grams or less were compared with those of children whose birthweights were more than 2,500 grams Findings suggest that the low birthweight group was not able to catch up to the higher group with respect to weight during the first five years of

life. Birthweights were available for comparison for 97% of male children in the sample in San Juan Province and for 86% in Recife. The growth curves for the children divided into the two groups on the basis of birthweight appear in Figure 14.

Summary

The Inter-American Investigation of Mortality in Childhood was carried out in the period 1968-1972 in 15 projects to establish death rates for children under 5 years of age that would be as accurate and comparable as possible To estimate the risk of mortality from nutritional, sociological and environmental factors, a probability sample of households and all living children under 5 years of age in these households was studied in each of the projects.

Growth curves based on median weight for age and sex have been prepared for the living children under 5 years of age in each of the 13 Latin American projects. Weights are obtained on 18,708 children or 96 percent of those identified in the household sample survey. In most projects the median weights of the children are generally at or above the Harvard standard growth curves during the first 6 months of life. By 9 months of age, however, the weights have begun to fall away from the standard and during the next 4 years of life at least 75% of the children have weights below standard.

In San Juan Province, the growth curve tends to follow the standard throughout the first 5 years of life. The growth curves in Chaco Province, Ribeirão Preto, Chile, São Paulo, Monterrey and El Salvador tend to deviate progressively farther from the standard but within the range of 90% to 100% of standard. In the Jamaican project, the median weights follow the 90% of

standard curve. The weights of Recife and Cali also tend to approximate this curve. In La Paz and the two Colombian cities of Cartagena and Medellín, the median weights appear to be lower, dropping below the 90% of standard curve after one year of age in La Paz and after two years of age in Cartagena and Medellín.

In relation to their respective standards the female growth curve for each project is generally below that of the curve for males. In all 6 projects with urban, suburban and rural areas, the weights of the children in the suburban and rural areas were generally lower than those in the corresponding urban areas.

Each child was graded as to nutritional status on the basis of his weight for age and sex using the Gómez classification scale in relationship to the Harvard standards. Generally a greater percentage of females than males was classified as malnourished, that is with weight below 90% of standard. This difference was also evident from the levels of the growth curves by sex. In most areas the prevalence of malnutrition increased with age. In all study areas combined the average percentage of children with malnutrition increased from 15.3% under 6 months of age to 29.3% among those 6-11 months old and to approximately 46% for those 1 year of age and older. Exclusion of newborns with low birthweight and of children with severe malnutrition due to death or hospitalization may have lowered to some extent the percentage of children under 6 months with malnutrition.

Arm circumference was also measured on each child in order to evaluate its usefulness as an indicator of nutritional status. A comparison of the two independent nutritional assessments for each child showed agreement for 72% of the children 1-11 months of age and for 59% of those 1-4

years. By agreement it is meant that a child is assigned to the same nutritional grade by the two indicators. Among those children for whom there was disagreement, the tendency was for a more deficient nutritional status to be assigned based on weight than on arm circumference. It is possible that part of the discrepancy arises from selection of dividing points used to identify the various grades of deficiency. However, the data also suggest that the large number with extreme disagreement would not be affected by a different selection. Further studies are needed on the precision of this measurement and on the development of standards.

REFERENCES

Ashcroft, M. T. and H. G. Lovell. "Heights and Weights of Jamaican Children of Various Racial Origins." *Trop Geogr Med* 16: 346-353, 1964.

Ashcroft, M. T., H. G. Lovell, M. George and A. Williams. "Heights and Weights of Infants and Children in a Rural Community in Jamaica." *J Trop Ped* 11: 56-68, 1965.

Beghin, I. D. "Improvement of Nutritional Status of Infants and Children - Consideration of Northeast Brazil Program. *Proceedings of Western Hemisphere Nutrition Congress III*. Futura Publishing Co., Inc., Mt. Kisco, N.Y., 1972.

Dean, R. F. A. and D. B. Jellife. "The Diagnosis and Treatment of Protein-Calorie Malnutrition." *Courrier* 10: 429-439, 1960.

Ford, F. I. "Can a Standard for 'Malnutrition' in Childhood be Devised?" *J Trop Ped* 10: 47-58, 1964.

Gómez, F., R. Ramos-Galván, J. Cravioto and S. Frank. "Malnutrition in Infancy and Childhood with Special Reference to Kwashiorkor." *Advances in Pediatrics* (Vol. 7, pp. 131-169), Ed. S. Levine. Yearbook Publishers, New York, 1955.

Gordon, J. E., and N. S. Schrimshaw. "Infectious Diseases in the Malnourished." *Med Clin of N Amer* 54: 1495-1508, 1970.

Greulich, W. W. "A Comparison of the Physical Growth and Development of American-Born and Native Japanese Children." *Amer J Phys Anthropometry* 15: 489-515, 1957.

Instituto Nacional de Nutrición (Colombia). Nutrition Survey of San Jacinto, 1967.

Jelliffe, E. F. P. and D. B. Jelliffe, eds. "The Arm Circumference as a Public Health Index of Protein-Calorie Malnutrition of Early Childhood" (Monograph No. 8). *J Trop Ped* 15: 177-260, 1969.

Jelliffe, D. B. "The Assessment of the Nutritional Status of the Community." *WHO Monograph Series* No. 53, Geneva, 1966.

Kahn, E. and M. Freedman. "The Physical Development of a Privileged Group of African Children." *S Afr Med J* 33: 934-936, 1959.

Karlberg, P., I. Engstrom, H. L. Lichtenstein and I. Svennburg. "The Development of Children in a Swedish Urban Community. A Prospective Longitudinal Study." *Acta Paediatrica Scandinavica Suppl* 187: 48-66, 1968.

King, K. W., J. Faucauld, W. Fougere and E. L. Severenghaus. "Height and Weight of Haitian Children." *Amer J Clin Nut* 13: 106-109, 1963.

Kondakis, X. G. "Field Surveys in North Greece and Dodoma Tanzania." *J Trop Ped* 15: 201-204, 1969.

Marques, R. M., E. Berquó, J. Yunes and E. Marcondes. *Crecimiento de Niños Brasileños: Peso y Altura en Relacion con la Edad y el Sexo y la Influencia de Factores Socioeconomicos.* Pan American Health Organization, Scientific Publication 309, Washington, D.C.

Nelson, W. E.; W. C. Vaughn, III; and R. J. McKay. *Textbook of Pediatrics.* W. B. Saunders Co., Philadelphia, 1969. (Pages 42-43 contain data on weight from studies of Child Health and Development, Department of Maternal and Child Health, Harvard School of Public Health. This table was given in previous editions and in the 1959 edition on pages 50-51).

PAHO. *Investigation of Infant and Early Childhood Mortality in Trinidad.* Semi-Annual Project Report. 1/I/75 - 22/V/75.

Puffer, R. R. and C. V. Serrano. *Patterns of Mortality in Childhood.* Pan American Health Organization, Scientific Publication 262, Washington, D.C., 1973.

Ramos-Galván, R., J. Cravioto and A. Navarrete. "La Letalidad en el Niño Desnutrido, Analisis de 1,100 Casos Internados en el Servicio de Nutrición del Hospital Infantil de México durante los Años 1953 a 1957, Inclusive." *Bol Med Hosp Inf* (Mexico City) 16: 875-923, 1958.

Robinow, M. and D. B. Jelliffe. "The Use of Arm Circumference in a Field Survey of Early Childhood Malnutrition in Busoga, Uganda." *J Trop Ped* 15: 217-221, 1969.

Serrano, C. V. and R. R. Puffer. "Utilization of Hospital Birthweights and Mortality as Indicators of Health Problems in Infancy." *Bulletin of Pan American Health Organization, VIII:* 325-346, 1974.

U.S. Department of Health, Education and Welfare, Public Health Service. *Nutrition Survey - Republic of Paraguay, May-August, 1965,* Washington, D.C., 1967.

U.S. Department of Health, Education and Welfare, Public Health Service. *Preliminary Findings of the First Health and Nutrition Examination Survey, U.S. 1971-72, Anthropometric and Clinical Findings.* National Center for Health Statistics, Washington, D.C., 1975.

U.S. Interdepartmental Committee on Nutrition for National Defense. *Chile Nutrition Survey, March-June 1960.* Washington, D.C., 1960.

U.S. Interdepartmental Committee on Nutrition for National Defense. *Colombia 1960 Nutrition Survey,* Washington, D.C., 1961.

U.S. Interdepartmental Committee on Nutrition for National Defense. *Northeast Brazil Nutrition Survey, March-May 1963.* Washington, D.C., 1965.

U.S. Interdepartmental Committee on Nutrition for National Defense. *Venezuela Nutrition Survey, May-June 1963.* Washington, D.C., 1964.

Viteri, F. E., M. Behár, and J. Alvaredo. *El Problema de la Desnutricion Proteinico-Calorica en el istmo Centro-Americano.* Publicaciones Cientificas del INCAP. Monograph 7, Vo. 21, 1970.

Nunes, R. M. "Estudio e Açõe sobre Reprodução Humana e Nutrição em Recife." *Boletin de la Oficina Sanitaria Panamericana, LXXXI,* No. 4, 1976.

Table 1. Age Distribution of Children under 5 Years of Age in 21 Areas of 13 Projects

Project and Area	Age in months													
	Total	0	1-2	3-5	6-8	9-11	12-17	18-23	24-29	30-35	36-41	42-47	48-53	54-59
ALL AREAS	19 519	337	691	965	967	961	1,985	1,946	1,934	1,950	1,986	1,935	1,924	1,938
ARGENTINA														
Chaco Province														
Resistencia	233	2	8	15	11	11	22	25	31	26	26	21	22	13
Rural Departments	422	6	12	24	16	19	43	54	41	43	41	39	45	39
San Juan Province														
San Juan (city)	157	7	6	7	12	8	12	23	17	15	15	17	9	9
Suburban Departments	360	5	17	26	12	24	36	44	24	38	31	28	36	39
Rural Departments	374	9	22	21	16	14	48	41	35	29	37	34	34	34
BOLIVIA														
La Paz	1 632	18	66	87	86	93	167	149	162	155	178	163	134	174
BRAZIL														
Recife	1 960	33	65	93	128	106	211	194	180	200	188	198	157	207
Ribeirão Preto														
Ribeirão Preto (city)	819	18	28	22	38	49	83	86	80	65	81	91	85	93
Franca	337	3	16	12	13	15	25	35	26	42	32	49	36	33
Communities	281	7	14	18	8	10	23	21	31	28	25	40	22	34
São Paulo	1 594	34	58	73	59	84	173	154	147	157	188	150	173	144
CHILE														
Santiago	1 551	24	37	75	78	70	169	140	162	166	142	157	161	170
Comunas	248	1	8	18	13	15	24	32	26	31	21	26	19	14
COLOMBIA														
Cali	1 934	32	55	90	107	88	201	174	191	189	216	200	200	191
Cartagena	997	16	28	41	47	42	88	93	117	89	100	112	120	104
Medellin	1 261	20	44	62	56	56	123	111	141	136	118	109	147	138
EL SALVADOR														
San Salvador	921	16	39	39	40	44	93	99	98	113	83	88	80	89
Rural Municipios	193	5	8	6	4	12	18	26	18	19	21	22	21	13
JAMAICA														
Metropolitan Kingston	2 128	47	83	120	111	100	218	225	190	189	238	187	207	213
St. Andrew, rural	189	3	9	11	8	12	13	12	23	24	12	20	21	21
MEXICO														
Monterrey	1 928	31	68	105	104	89	195	208	194	196	193	184	195	166

Table 2. Number and Percentage of Children under 5 Years of Age with Weight and Arm Circumference Measurements in 21 Areas of 13 Projects

Project and Area	Total children	Weight		Arm circumference (1)	
		Number	%	Number	%
ALL AREAS	19 519	18 708	95.8	18 406	96.0
ARGENTINA					
Chaco Province					
Resistencia	233	227	97.4	225	97.4
Rural Departments	422	403	95.5	388	93.3
San Juan Province					
San Juan (city)	157	155	98.7	146	97.3
Suburban Departments	360	351	97.5	346	97.5
Rural Departments	374	361	96.5	348	95.3
BOLIVIA					
La Paz	1 632	1 505	92.2	1 492	92.4
BRAZIL					
Recife	1 960	1 906	97.2	1 885	97.8
Ribeirão Preto					
Ribeirão Preto (city)	819	806	98.4	772	96.4
Franca	337	320	95.0	320	95.8
Communities	281	271	96.4	262	97.6
São Paulo	1 594	1 555	97.6	1 482	95.0
CHILE					
Santiago	1 551	1 520	98.0	1 486	97.3
Comunas	248	245	98.8	242	98.0
COLOMBIA					
Cali	1 934	1 733	89.6	1 823	95.8
Cartagena	997	927	93.0	910	92.8
Medellin	1 261	1 179	93.5	1 170	94.3
EL SALVADOR					
San Salvador	921	894	97.1	867	95.8
Rural Municipios	193	190	98.4	183	97.3
JAMAICA					
Kingston-St. Andrew					
Metropolitan Kingston	2 128	2 111	99.2	2 052	98.6
St. Andrew, rural	189	184	97.4	179	96.2
MEXICO					
Monterrey	1 928	1 865	96.7	1 828	96.4

(1) Excluding children under one month of age.

Table 3. Number and Percentage of Children with Weight and Arm Circumference Measurements, by Age in 13 Latin American Projects Combined

Age in months	Total children	Weight		Arm circumference	
		No.	%	No.	%
Total	19 519	18 708	95.8	18 406	96.0
0	337	318	94.4		
1-2	691	656	94.9	647	93.6
3-5	965	932	96.6	922	95.5
6-8	967	926	95.8	920	95.1
9-11	961	915	95.2	923	96.0
12-17	1 985	1 909	96.2	1 914	96.4
18-23	1 946	1 869	96.0	1 874	96.3
24-29	1 934	1 862	96.3	1 863	96.3
30-35	1 950	1 874	96.1	1 877	96.3
36-41	1 986	1 920	96.7	1 919	96.6
42-47	1 935	1 847	95.5	1 853	95.8
48-53	1 924	1 844	95.8	1 850	96.2
54-59	1 938	1 836	94.7	1 844	95.1

Table 4. Number and Percentage of Children Under 5 Years of Age by Grade of Nutritional Deficiency in Accordance with the Gomez Weight Classification Scale, by Sex in 21 Areas of 13 Projects

Project Area	Total					Male					Female				
	Number			%		Number			%		Number			%	
	Total	Grade I	Grades II & III	Grade I	Grades II & III	Total	Grade I	Grades II & III	Grade I	Grades II & III	Total	Grade I	Grades II & III	Grade I	Grades II & III
ALL AREAS	18 708	6 039	1 669	32.3	8.9	9 635	2 987	803	31.0	8.3	9 073	3 052	866	33.6	9.5
ARGENTINA															
Chaco Province															
Resistencia	227	36	10	15.9	4.4	109	13	3	11.9	2.8	118	23	7	19.5	5.9
Rural Departments	403	109	34	27.0	8.4	209	52	14	24.9	6.7	194	57	20	29.4	10.3
San Juan Province															
San Juan (city)	155	15	1	9.7	0.6	75	8	-	10.7	-	80	7	1	8.8	1.2
Suburban Departments	351	72	13	20.5	3.7	174	32	6	18.4	3.4	177	40	7	22.6	4.0
Rural Departments	361	70	11	19.4	3.0	194	31	5	16.0	2.6	167	39	6	23.4	3.6
BOLIVIA															
La Paz	1 505	534	247	35.5	16.4	774	258	124	33.3	16.0	731	276	123	37.8	16.8
BRAZIL															
Recife	1 906	684	227	35.9	11.9	966	336	115	34.8	11.9	940	348	112	37.0	11.9
Ribeirao Preto															
City	806	197	45	24.4	5.6	437	93	22	21.3	5.0	369	104	23	28.2	6.2
Franca	320	77	17	24.1	5.3	167	35	7	21.0	4.2	153	42	10	27.4	6.5
Communities	271	84	16	31.0	5.9	125	34	6	27.2	4.8	146	50	10	34.2	6.8
Sao Paulo	1 555	462	86	29.7	5.5	787	225	40	28.6	5.1	768	237	46	30.9	6.0
CHILE															
Santiago	1 520	444	59	29.2	3.9	776	216	25	27.8	3.2	744	228	34	30.6	4.6
Comunas	245	89	23	36.3	9.4	137	54	14	39.4	10.2	108	35	9	32.4	8.3
COLOMBIA															
Cali	1 733	641	202	37.0	11.7	887	306	103	34.5	11.6	846	335	99	39.6	11.7
Cartagena	927	368	133	39.7	14.3	485	201	59	41.4	12.2	442	167	74	37.8	16.7
Medellín	1 179	468	185	39.7	15.7	633	250	93	39.5	14.7	546	218	92	39.9	16.8
EL SALVADOR															
San Salvador	894	252	46	28.2	5.1	470	138	16	29.4	3.4	424	114	30	26.9	7.1
Rural Municipios	190	88	30	46.3	15.8	108	51	14	47.2	13.0	82	37	16	45.1	19.5
JAMAICA															
Metropolitan Kingston	2 111	697	153	33.0	7.2	1 091	346	74	31.7	6.8	1 020	351	79	34.4	7.7
St.Andrew, rural	184	69	18	37.5	9.8	89	37	9	41.6	10.1	95	32	9	33.7	9.5
MEXICO															
Monterrey	1 96[illegible]	583	113	31.3	6.1	942	271	54	28.8	5.7	923	312	59	33.8	6.4

Table 5. Children Under 5 Years of Age by Grade of Nutritional Deficiency in Accordance with the Gomez Weight-Classification Scale, by Age Group in 21 Areas of 13 Projects

Grade	Number				Percent				Number				Percent			
	0-5 months	6-11 months	1 year	2-4 years	0-5 months	6-11 months	1 year	2-4 years	0-5 months	6-11 months	1 year	2-4 years	0-5 months	6-11 months	1 year	2-4 years
	ALL AREAS								BRAZIL, São Paulo							
Total	1 906	1 841	3 778	11 183	100.0	100.0	100.0	100.0	160	136	323	936	100.0	100.0	99.9	100.0
0	1 614	1 302	2 129	5 955	84.7	70.7	56.4	53.3	145	112	223	527	90.6	82.4	69.0	56.3
I	231	388	1 256	4 164	12.1	21.1	33.2	37.2	14	20	87	341	8.8	14.7	26.9	36.4
II & III	61	151	393	1 064	3.2	8.2	10.4	9.5	1	4	13	68	0.6	2.9	4.0	7.3
	ARGENTINA, Chaco Province Resistencia								CHILE project Santiago							
Total	25	22	46	134	100.0	99.9	100.0	100.0	133	143	302	942	100.0	100.0	100.0	99.9
0	23	20	36	102	92.0	90.9	78.3	76.1	118	117	206	576	88.7	81.8	68.2	61.1
I	2	1	7	26	8.0	4.5	15.2	19.4	13	20	82	329	9.8	14.0	27.2	34.9
II & III	-	1	3	6	-	4.5	6.5	4.5	2	6	14	37	1.5	4.2	4.6	3.9
	Rural Departments								Comunas							
Total	42	35	92	234	100.1	100.0	100.0	100.1	27	27	56	135	100.0	100.0	100.0	99.9
0	34	25	49	152	81.0	71.4	53.3	65.0	21	14	31	67	77.8	51.9	55.4	49.6
I	6	7	31	65	14.3	20.0	33.7	27.8	6	8	20	55	22.2	29.6	35.7	40.7
II & III	2	3	12	17	4.8	8.6	13.0	7.3	-	5	5	13	-	18.5	8.9	9.6
	ARGENTINA, San Juan Province San Juan (city)								COLOMBIA, Cali							
Total	20	19	35	81	100.0	100.0	100.0	100.0	152	173	336	1 072	100.0	99.9	100.0	100.0
0	20	15	30	74	100.0	78.9	85.7	91.4	130	108	171	481	85.5	62.4	50.9	44.9
I	-	4	4	7	-	21.1	11.4	8.6	19	44	123	455	12.5	25.4	36.6	42.4
II & III	-	-	1	-	-	-	2.9	-	3	21	42	136	2.0	12.1	12.5	12.7
	Suburban Departments								COLOMBIA, Cartagena							
Total	47	36	77	191	100.0	99.9	100.0	100.0	78	79	173	597	100.1	100.0	100.0	100.0
0	40	25	58	143	85.1	69.4	75.3	74.9	63	52	82	229	80.8	65.8	47.4	38.4
I	5	8	15	44	10.6	22.2	19.5	23.0	13	20	68	267	16.7	25.3	39.3	44.7
II & III	2	3	4	4	4.3	8.3	5.2	2.1	2	7	23	101	2.6	8.9	13.3	16.9
	Rural Departments								COLOMBIA, Medellín							
Total	51	30	86	194	100.0	99.9	100.1	99.9	117	101	223	738	99.9	100.0	99.9	100.1
0	42	25	55	158	82.4	83.3	64.0	81.4	83	59	100	284	70.9	58.4	44.8	38.5
I	9	1	27	33	17.6	3.3	31.4	17.0	26	29	96	317	22.2	28.7	43.0	43.0
II & III	-	4	4	3	-	13.3	4.7	1.5	8	13	27	137	6.8	12.9	12.1	18.6
	BOLIVIA, La Paz								EL SALVADOR project San Salvador							
Total	156	163	295	891	100.0	99.9	100.0	100.1	92	82	186	534	100.0	100.0	100.0	100.0
0	121	106	125	372	77.6	65.0	42.4	41.8	83	70	119	324	90.2	85.4	64.0	60.7
I	22	32	98	382	14.1	19.6	33.2	42.9	8	10	57	177	8.7	12.2	30.6	33.1
II & III	13	25	72	137	8.3	15.3	24.4	15.4	1	2	10	33	1.1	2.4	5.4	6.2
	BRAZIL, Recife								Rural Municipios							
Total	187	231	387	1 101	99.9	100.0	100.0	100.0	19	16	43	112	99.9	100.0	99.9	100.1
0	156	139	188	512	83.4	60.2	48.6	46.5	15	7	17	33	78.9	43.8	39.5	29.5
I	21	56	152	455	11.2	24.2	39.3	41.3	2	8	17	61	10.5	50.0	39.5	54.5
II & III	10	36	47	134	5.3	15.6	12.1	12.2	2	1	9	18	10.5	6.2	20.9	16.1
	BRAZIL, Ribeirão Preto Ribeirão Preto (City)								JAMAICA, Kingston-St. Andrew Metropolitan Kingston							
Total	67	86	167	486	100.0	100.0	100.1	100.0	247	209	439	1 216	100.0	100.0	100.0	99.9
0	64	69	121	310	95.5	80.2	72.5	63.8	208	154	226	673	84.2	73.7	51.5	55.3
I	3	14	39	141	4.5	16.3	23.4	29.0	35	48	155	459	14.2	23.0	35.3	37.7
II & III	-	3	7	35	-	3.5	4.2	7.2	4	7	58	84	1.6	3.3	13.2	6.9
	Franca								St. Andrew, rural							
Total	30	28	55	207	100.0	100.1	100.1	100.0	22	20	24	118	100.0	100.0	100.0	100.0
0	27	22	36	141	90.0	78.6	65.5	68.1	18	13	9	57	81.8	65.0	37.5	48.3
I	2	5	15	55	6.7	17.9	27.3	26.6	2	5	10	52	9.1	25.0	41.7	44.1
II & III	1	1	4	11	3.3	3.6	7.3	5.3	2	2	5	9	9.1	10.0	20.8	7.6
	Communities								MEXICO, Monterrey							
Total	35	18	43	175	100.0	100.0	100.0	100.0	199	187	390	1 089	100.0	100.0	100.0	99.9
0	29	13	23	106	82.9	72.2	53.5	60.6	174	137	224	634	87.4	73.3	57.4	58.2
I	4	5	19	56	11.4	27.8	44.2	32.0	19	43	134	387	9.5	23.0	34.4	35.5
II & III	2	-	1	13	5.7	-	2.3	7.4	6	7	32	68	3.0	3.7	8.2	6.2

Table 6. Mean Arm Circumference and Standard Deviation by Sex and by Age Group for 13 Projects Combined (measurements in centimeters)

Age in months	Total			Males			Females		
	Number	Mean	Standard deviation	Number	Mean	Standard deviation	Number	Mean	Standard deviation
01-02	647	11.4	1.8	309	11.6	1.8	338	11.2	1.9
03-05	922	13.1	1.8	488	13.2	1.8	434	13.0	1.8
06-08	920	13.6	1.8	489	13.8	1.8	431	13.4	1.7
09-11	923	14.1	1.7	489	14.3	1.7	434	13.9	1.8
12-17	1,914	14.3	1.6	985	14.4	1.6	929	14.2	1.6
18-23	1,874	14.7	1.6	975	14.8	1.6	899	14.5	1.6
24-29	1,863	15.0	1.5	967	15.0	1.5	896	14.9	1.5
30-35	1,877	15.2	1.6	958	15.3	1.6	919	15.1	1.5
36-41	1,919	15.5	1.5	975	15.5	1.5	944	15.5	1.6
42-47	1,853	15.7	1.5	972	15.8	1.5	881	15.7	1.5
48-53	1,850	16.0	1.5	962	16.0	1.5	888	16.0	1.6
54-59	1,844	16.1	1.6	916	16.1	1.5	928	16.0	1.7

Table 7. Mean Arm Circumference in Urban, Suburban and Rural Areas of 4 Projects with Mean Differences by Age (measurement in centimeters)

Age in months	Chile Project					San Juan Province					El Salvador Project					El Chaco Province				
	Urban		Comunas		$\bar{x}_1-\bar{x}_2$	Urban (a)		Rural		$\bar{x}_1-\bar{x}_2$	Urban		Rural		$\bar{x}_1-\bar{x}_2$	Urban		Rural		$\bar{x}_1-\bar{x}_2$
	N	$\bar{x}_1$	N	$\bar{x}_2$		N	$\bar{x}_1$	N	$\bar{x}_2$		N	$\bar{x}_1$	N	$\bar{x}_2$		N	$\bar{x}_1$	N	$\bar{x}_2$	
0-5	126	12.5	27	12.9	- .4	20	12.6	51	12.1	+ .5	90	12.1	19	12.1	0.0	25	12.6	40	11.6	+ 1.0
6-11	143	14.8	27	13.7	+1.1	19	14.6	30	14.4	+ .2	82	14.7	15	14.2	+ .5	22	14.1	34	13.8	+ .3
12-17	168	15.1	23	15.0	+ .1	12	15.9	45	14.8	+1.1	90	15.0	17	14.5	+ .5	21	14.3	42	13.7	+ .6
18-23	132	15.7	32	15.3	+ .4	23	14.6	39	15.1	- .5	94	15.4	26	14.9	+ .5	23	14.9	48	14.3	+ .6
24-29	160	15.7	26	15.5	+ .2	17	15.6	33	15.5	+ .1	96	15.6	18	15.1	+ .5	31	15.0	39	15.1	- .1
30-35	164	15.7	30	15.6	+ .1	15	16.2	29	15.6	+ .6	111	16.1	19	15.4	+ .7	24	15.6	39	15.3	+ .3
36-41	139	16.0	20	16.3	- .3	13	16.7	35	15.9	+ .8	80	16.2	19	16.2	0.0	26	15.5	41	15.5	0.0
42-47	152	16.4	25	16.0	+ .4	16	16.6	30	16.3	+ .3	82	16.1	22	16.1	0.0	21	16.0	35	15.7	+ .3
48-53	159	16.6	19	16.5	+ .1	9	16.7	34	16.6	+ .1	75	16.6	21	16.3	+ .3	21	16.2	42	15.9	+ .3
54-59	167	16.5	14	16.4	+ .1	9	16.7	31	16.5	+ .2	83	16.5	12	15.8	+ .7	13	15.9	34	15.9	0.0

(a) Capital city.
N = number
$\bar{x}$ = mean
$\bar{x}_1-\bar{x}_2$ = mean difference

Table 8. Children Under 5 Years of Age by Grade of Nutritional Deficiency According to Arm Circumference, by Age Group in 13 Projects[a)]

Grade	Number				Percent				Number				Percent			
	Total	1-5 months	6-11 months	1-4 years	Total	1-5 months	6-11 months	1-4 years	Total	1-5 months	6-11 months	1-4 years	Total	1-5 months	6-11 months	1-4 years
	ALL AREAS								CHILE project							
Total	18 406	1 569	1 843	14 994	100.0	99.9	100.0	100.0	1 728	128	170	1 430	100.0	100.0	100.0	100.0
0	13 951	1 265	1 289	11 397	75.8	80.6	69.9	76.0	1 524	105	145	1 274	88.2	82.0	85.3	89.1
I	4 139	258	464	3 417	22.5	16.4	25.2	22.8	192	22	22	148	11.1	17.2	12.9	10.3
II & III	316	46	90	180	1.7	2.9	4.9	1.2	12	1	3	8	0.7	0.8	1.8	0.6
	ARGENTINA, El Chaco Province								COLOMBIA, Cali							
Total	613	57	56	500	100.1	100.1	100.0	100.0	1 823	137	186	1 500	100.0	100.0	100.1	100.0
0	451	42	42	367	73.6	73.7	75.0	73.4	1 376	119	124	1 133	75.5	86.9	66.7	75.5
I	150	12	13	125	24.5	21.1	23.2	25.0	439	18	58	363	24.1	13.1	31.2	24.2
II & III	12	3	1	8	2.0	5.3	1.8	1.6	8	-	4	4	0.4	-	2.2	0.3
	ARGENTINA, San Juan Province								COLOMBIA, Cartagena							
Total	840	96	85	659	100.	99.9	100.0	100.0	910	65	76	769	100.0	100.0	100.0	100.0
0	738	80	68	590	87.9	83.3	80.0	89.5	578	56	42	480	63.5	86.2	55.3	62.4
I	90	13	14	63	10.7	13.5	16.5	9.6	291	8	26	257	32.0	12.3	34.2	33.4
II & III	12	3	3	6	1.4	3.1	3.5	0.9	41	1	8	32	4.5	1.5	10.5	4.2
	BOLIVIA, La Paz								COLOMBIA, Medellín							
Total	1 492	140	165	1 187	100.0	100.0	100.0	100.0	1 170	93	106	971	100.1	100.0	100.0	100.0
0	1 101	118	120	863	73.8	84.3	72.7	72.7	875	66	69	740	74.8	71.0	65.1	76.2
I	374	19	36	319	25.1	13.6	21.8	26.9	278	27	31	220	23.8	29.0	29.2	22.7
II & III	17	3	9	5	1.1	2.1	5.5	0.4	17	-	6	11	1.5	-	5.7	1.1
	BRAZIL, Recife								EL SALVADOR project							
Total	1 885	154	229	1 502	100.0	100.0	100.0	99.9	1 050	88	97	865	100.0	100.0	99.9	100.0
0	881	103	100	678	46.7	66.9	43.7	45.1	894	77	82	735	85.1	87.5	84.5	85.0
I	902	39	98	765	47.9	25.3	42.8	50.9	146	9	14	123	13.9	10.2	14.4	14.2
II & III	102	12	31	59	5.4	7.8	13.5	3.9	10	2	1	7	1.0	2.3	1.0	0.8
	BRAZIL, Ribeirão Preto project								JAMAICA, Kingston-St. Andrew							
Total	1 354	99	126	1 129	100.0	100.0	100.0	100.0	2 231	220	227	1 784	100.0	100.0	100.0	100.0
0	1 074	81	77	916	79.3	81.8	61.1	81.1	1 705	161	154	1 390	76.4	73.2	67.8	77.9
I	273	18	44	211	20.2	18.2	34.9	18.7	470	40	59	371	21.1	18.2	26.0	20.8
II & III	7	-	5	2	0.5	-	4.0	0.2	56	19	14	23	2.5	8.6	6.2	1.3
	BRAZIL, São Paulo								MEXICO, Monterrey							
Total	1 482	124	134	1 224	100.0	100.0	100.0	100.0	1 828	168	186	1 474	100.0	100.0	100.0	99.9
0	1 255	112	118	1 025	84.7	90.3	88.1	83.7	1 499	145	148	1 206	82.0	86.3	79.6	81.8
I	218	12	14	192	14.7	9.7	10.4	15.7	316	21	35	260	17.3	12.5	18.8	17.6
II & III	9	-	2	7	0.6	-	1.5	0.6	13	2	3	8	0.7	1.2	1.6	0.5

(a) Gomez classification scale applied to Wolanski Standard for arm circumference.

Table 9. Children Under 5 Years of Age with a Nutritional Deficiency of Grade I, II or III, Based on Weight and Arm Circumference, by Age Group for 13 Projects Combined

Age	Total children[a]	Children[a] with nutritional deficiency			
		By weight		By arm circumference	
		Number	%	Number	%
1-5 months	1,548	250	16.1	302	19.5
6-11 months	1,804	527	29.2	537	29.8
1 year	3,727	1,628	43.7	825	22.1
2-4 years	11,048	5,177	46.9	2,704	24.5

a) Children with both weight and arm circumference measurements present.

Table 10. Two-Way Comparison of Nutritional Status According to Arm Circumference and Weight, by Age Group for 13 Project Areas

Nutritional status (Arm circumference)	Age group: Under 1 year — Nutritional status (weight)					Age group: 1-4 years — Nutritional status (weight)				
	Total	0	I	II	III	Total	0	I	II	III
ALL AREAS										
Total	3,352	2,575	573	161	43	14,775	7,970	5,363	1,265	177
0	2,513	2,151	307	38	17	11,246	7,039	3,662	504	41
I	705	375	233	86	11	3,352	894	1,644	705	109
II	114	43	32	28	11	165	33	54	54	24
III	20	6	1	9	4	12	4	3	2	3
ARGENTINA, Chaco Province										
Total	113	94	13	5	1	496	332	127	30	7
0	84	78	5	-	1	366	280	73	12	1
I	25	14	7	4	-	122	48	53	16	5
II	2	1	-	1	-	7	4	1	1	1
III	2	1	1	-	-	1	-	-	1	-
ARGENTINA, San Juan Province										
Total	181	147	25	7	2	654	509	129	14	2
0	148	128	19	1	-	587	478	99	9	1
I	27	16	5	5	1	61	28	28	4	1
II	5	2	1	1	1	6	3	2	1	-
III	1	1	-	-	-	-	-	-	-	-
BOLIVIA, La Paz										
Total	301	211	52	29	9	1,180	495	478	175	32
0	234	182	32	15	5	859	386	366	97	10
I	55	25	17	12	1	317	107	111	77	22
II	12	4	3	2	3	4	2	1	1	-
III	-	-	-	-	-	-	-	-	-	-
BRAZIL, Recife										
Total	380	263	73	31	13	1,477	692	604	148	33
0	202	184	11	1	6	664	459	175	26	4
I	135	72	50	12	1	756	231	413	97	15
II	34	5	12	15	2	54	2	16	24	12
III	9	2	-	3	4	3	-	-	1	2
BRAZIL, Ribeirão Preto Project										
Total	225	188	31	6	-	1,120	728	322	63	7
0	1[illegible]3	143	14	1	-	907	647	221	35	4
I	62	41	17	4	-	211	81	101	27	2
II	5	4	-	1	-	2	-	-	1	1
III	-	-	-	-	-	-	-	-	-	-
BRAZIL, São Paulo										
Total	256	224	28	4	-	1,223	723	419	74	7
0	228	210	17	1	-	1,024	686	315	23	-
I	26	13	11	2	-	192	33	103	50	6
II	1	-	-	1	-	7	4	1	1	1
III	1	1	-	-	-	-	-	-	-	-

Nutritional status (Arm circumference)	Age group: Under 1 year — Nutritional status (weight)					Age group: 1-4 years — Nutritional status (weight)				
	Total	0	I	II	III	Total	0	I	II	III
CHILE Project										
Total	295	240	44	9	2	1,424	873	483	64	4
0	247	214	31	1	1	1,268	829	409	28	2
I	44	24	13	6	1	148	41	70	35	2
II	2	2	-	-	-	5	2	2	1	-
III	2	-	-	2	-	3	1	2	-	-
COLOMBIA, Cali										
Total	288	206	59	19	4	1,377	637	566	150	24
0	220	183	32	5	-	1,047	590	396	58	3
I	65	22	27	13	3	326	47	169	90	20
II	3	1	-	1	1	4	-	1	2	1
III	-	-	-	-	-	-	-	-	-	-
COLOMBIA, Cartagena										
Total	140	102	29	8	1	769	310	335	110	14
0	98	83	14	-	1	480	225	209	40	6
I	33	15	13	5	-	257	76	115	60	6
II	9	4	2	3	-	31	8	11	10	2
III	-	-	-	-	-	1	1	-	-	-
COLOMBIA, Medellín										
Total	192	121	50	16	5	940	374	405	142	19
0	131	101	25	5	-	721	336	309	73	3
I	56	20	23	10	3	208	34	93	67	14
II	4	-	2	-	2	10	3	3	2	2
III	1	-	-	1	-	1	1	-	-	-
EL SALVADOR Project										
Total	183	151	26	5	1	865	486	309	58	12
0	157	139	17	1	-	735	457	247	27	4
I	23	11	7	4	1	123	27	60	30	6
II	3	1	2	-	-	5	1	1	1	2
III	-	-	-	-	-	2	1	1	-	-
JAMAICA, Kingston-St. Andrew										
Total	446	348	84	11	3	1,783	958	671	145	9
0	314	259	49	3	3	1,389	878	465	44	2
I	99	69	26	4	-	371	80	192	95	4
II	31	19	9	3	-	22	-	14	6	2
III	2	1	-	1	-	1	-	-	-	1
MEXICO, Monterrey										
Total	352	280	59	11	2	1,467	853	515	92	7
0	292	247	41	4	-	1,199	788	378	32	1
I	55	33	17	5	-	260	61	136	57	6
II	3	-	1	-	2	8	4	1	3	-
III	2	-	-	2	-	-	-	-	-	-

Table 11. Agreement between Classifications of Nutritional Status Based on Weight and Arm Circumference, by Age Group for 13 Projects

Project	1-11 months							1-4 years						
	Total	Nutritional status						Total	Nutritional status					
		Both agree		More deficient by weight		More deficient by arm circumference			Both agree		More deficient by weight		More deficient by arm circumference	
		Number	Percent	Number	Percent	Number	Percent		Number	Percent	Number	Percent	Number	Percent
All Areas	3352	2416	72.1	470	14.0	466	13.9	14775	8740	59.2	5045	34.1	990	6.7
ARGENTINA														
Chaco Province	113	86	76.1	10	8.8	17	15.0	496	334	67.3	108	21.8	54	10.9
San Juan Province	181	134	74.0	27	14.9	20	11.0	654	507	77.5	114	17.4	33	5.0
BOLIVIA														
La Paz	301	201	66.8	68	22.6	32	10.6	1180	498	42.2	572	48.5	110	9.3
BRAZIL														
Recife	380	253	66.6	33	8.7	94	24.7	1477	898	60.8	329	22.3	250	16.9
Ribeirão Prêto	225	161	71.6	19	8.4	45	20.0	1120	749	66.9	290	25.9	81	7.2
Sao Paulo	256	222	86.7	20	7.8	14	5.5	1223	790	64.6	395	32.3	38	3.1
CHILE project	295	227	76.9	40	13.6	28	9.5	1424	900	63.2	476	33.4	48	3.4
COLOMBIA														
Cali	288	211	73.3	54	18.8	23	8.0	1377	761	55.3	568	41.2	48	3.5
Cartagena	140	99	70.7	20	14.3	21	15.0	769	350	45.5	323	42.0	96	12.5
Medellín	192	124	64.6	45	23.4	23	12.0	940	431	45.9	468	49.8	41	4.4
EL SALVADOR project	183	146	79.8	23	12.6	14	7.7	865	518	59.9	316	36.5	31	3.6
JAMAICA														
Kingston-St. Andrew	446	288	64.6	59	13.2	99	22.2	1783	1077	60.4	612	34.3	94	5.3
MEXICO														
Monterrey	352	264	75.0	52	14.8	36	10.2	1467	927	63.2	474	32.3	66	4.5

Table 12. Mean and Standard Deviation of the Distribution of Arm Circumference for Children Grouped According to Nutritional Status Based on Weight, by Age Group for 13 Projects Combined (measurement in centimeters)

Age in months	Grade 0			Grade I			Grades II & III		
	Number	Mean	Standard deviation	Number	Mean	Standard deviation	Number	Mean	Standard deviation
1-5	1,298	12.8	1.8	193	11.6	1.6	57	10.5	1.9
6-11	1,277	14.3	1.6	380	13.1	1.4	147	11.9	2.2
12-23	2,099	15.1	1.5	1,240	14.0	1.4	388	13.0	1.5
24-35	1,992	15.7	1.4	1,317	14.6	1.3	376	13.7	1.5
36-47	2,036	16.2	1.4	1,340	15.1	1.3	344	14.1	1.3
48-59	1,843	16.6	1.6	1,466	15.6	1.2	334	14.7	1.3

Note: Gomez classification scale used.
Grade 0 -------- Weight greater than or equal to 90% of standard.
Grade I -------- Weight from 75 to 89% of standard.
Grades II, III - Weight less than 75% of standard.

Appendix I

Quartiles of Weight from Birth to 5 Years, by Sex
(weight in 100 grams)

Age in months	Males			Females		
	Quartile			Quartile		
	1st	Median	3rd	1st	Median	3rd
Birth	31	34	38	31	34	37
3 months	54	57	62	52	56	60
6 months	71	76	82	68	73	79
9 months	85	91	98	80	87	94
12 months	95	101	108	90	98	104
15 months	102	108	115	97	104	112
18 months	108	114	122	103	111	119
24 months	119	126	135	115	123	132
30 months	129	136	146	124	134	145
36 months	137	146	156	134	144	157
42 months	146	156	166	143	154	168
48 months	154	165	177	152	164	180
54 months	162	174	188	160	175	191

Source: From Studies of Child Health and Development, Department of Maternal and Child Health, Harvard School of Public Health (Nelson, 1969).

Note: Median = 2nd quartile

Appendix II

Table A. First, Second and Third Quartiles of the Distribution of Weights of Male Children in 13 Projects, by Age (weight in 100 grams)

Age in months	Chaco Province			San Juan Province			La Paz			Recife			Ribeirão Preto Project			São Paulo			Chile Project		
	Quartile			Quartile			Quartile			Quartile			Quartile			Quartile			Quartile		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
00-02	40	45	61	38	46	56	36	55	70	38	46	54	41	48	58	35	43	58	35	41	46
03-05	58	67	80	62	70	81	60	70	80	60	70	79	59	68	78	60	75	80	60	64	74
06-08	78	87	94	72	79	94	70	80	90	60	77	86	77	85	95	74	80	95	74	30	90
09-11	74	88	105	85	92	101	80	90	94	77	85	96	85	100	110	90	98	100	80	90	100
12-14	82	92	116	95	100	112	80	90	100	85	95	106	90	100	108	90	100	110	92	100	111
15-17	98	115	120	95	105	115	85	92	100	91	98	106	96	110	119	100	105	122	96	105	112
18-20	102	115	130	103	112	121	85	105	110	96	102	110	100	105	115	105	115	124	100	110	120
21-23	104	118	138	110	120	128	90	90	100	95	107	119	110	122	132	100	115	120	100	110	130
24-26	111	128	142	122	130	138	96	110	125	101	111	120	102	120	130	103	115	124	110	120	135
27-29	121	132	146	112	132	141	109	120	130	106	117	124	120	130	139	110	120	130	110	120	130
30-32	115	125	150	126	133	150	110	120	125	108	119	141	120	135	141	110	128	140	115	130	149
33-35	125	140	152	122	130	140	110	120	130	117	133	140	130	140	150	121	135	150	120	130	142
36-38	140	150	175	140	150	164	120	130	144	124	134	146	135	148	160	122	138	140	126	140	150
39-41	140	152	170	135	147	160	120	132	150	122	132	143	140	150	156	131	140	156	138	150	158
42-44	140	150	158	145	157	170	131	140	150	130	138	144	140	155	160	135	145	155	130	140	152
45-47	130	152	160	150	162	180	125	140	150	127	148	160	134	145	166	135	150	165	140	153	170
48-50	146	155	160	152	160	180	132	145	165	140	150	164	150	160	171	140	150	160	145	155	170
51-53	158	172	180	158	173	187	140	155	161	138	152	170	150	165	180	140	155	176	149	160	171
54-56	170	175	190	158	182	195	150	160	170	142	154	175	150	162	180	150	160	175	150	164	182
57-59	159	188	200	172	179	200	148	162	175	146	156	178	152	170	185	150	160	172	150	165	188

	Cali			Cartagena			Medellín			El Salvador Project			Kingston-St. Andrew			Monterrey		
00-02	35	50	60	40	45	50	40	41	50	43	54	56	36	45	52	40	49	60
03-05	60	70	75	55	60	76	50	60	66	59	68	77	59	68	77	60	72	82
06-08	65	75	85	68	80	90	70	80	84	76	82	92	73	82	91	75	82	92
09-11	70	85	99	79	90	95	80	88	90	77	91	101	82	91	100	80	89	99
12-14	85	95	100	80	92	100	80	92	105	82	95	109	77	91	100	84	95	101
15-17	90	100	110	89	100	105	90	100	112	91	104	114	90	95	111	95	100	106
18-20	95	100	110	100	105	108	94	100	120	100	110	118	91	104	113	99	109	116
21-23	100	110	115	100	113	120	100	110	120	104	113	124	100	113	126	100	114	125
24-26	105	110	120	100	106	115	100	110	120	109	127	136	104	113	127	106	120	130
27-29	110	120	140	100	115	130	102	115	125	111	118	132	112	122	131	114	122	130
30-32	109	125	140	110	118	140	109	120	130	113	132	141	118	129	140	117	132	142
33-35	105	128	140	110	125	140	105	120	134	119	136	145	117	131	136	122	130	140
36-38	120	130	141	122	132	145	120	128	140	127	136	146	120	132	144	125	140	150
39-41	129	135	145	120	130	150	120	130	151	132	136	145	131	136	150	125	140	148
42-44	130	140	155	119	138	151	120	130	140	133	145	163	135	141	159	127	142	160
45-47	130	145	155	135	140	150	121	135	150	132	145	154	136	145	159	135	150	160
48-50	135	145	160	134	145	156	135	145	168	149	159	164	136	150	160	145	150	163
51-53	140	150	180	135	150	160	130	150	170	141	156	166	144	159	168	150	160	170
54-56	140	155	170	142	152	164	150	160	180	145	154	163	150	159	177	155	165	173
57-59	147	160	171	142	153	170	135	150	170	145	163	186	152	168	181	150	166	183

Median = 2nd Quartile

Appendix II

Table B. First, Second and Third Quartiles of the Distribution of Weights of Female Children in 13 Projects, by Age (weight in 100 grams)

Age in months	Chaco Province			San Juan Province			La Paz			Recife			Ribeirão Preto Project			São Paulo			Chile Project		
	Quartile			Quartile			Quartile			Quartile			Quartile			Quartile			Quartile		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
00-02	31	39	47	36	45	50	34	40	54	36	40	46	37	42	50	38	44	52	36	42	47
03-05	55	62	80	55	61	70	58	64	70	56	63	72	53	61	70	65	70	75	53	63	71
06-08	90	99	108	66	72	78	70	75	85	66	73	80	69	79	84	68	77	86	70	75	81
09-11	80	95	100	84	86	95	70	82	95	68	78	89	75	83	91	84	90	100	81	90	94
12-14	78	98	105	85	94	100	69	90	95	81	89	97	85	100	110	85	100	110	84	95	105
15-17	88	90	100	99	105	111	80	90	100	83	92	100	94	100	109	90	100	106	90	95	100
18-20	99	106	121	100	106	113	85	100	111	92	99	110	95	105	120	95	100	112	92	100	120
21-23	102	112	122	98	114	127	90	95	112	91	101	115	101	112	130	99	110	122	100	110	121
24-26	110	113	125	113	123	135	100	110	128	103	114	122	102	115	125	105	120	135	104	120	130
27-29	110	120	130	120	126	134	100	112	130	107	116	125	108	120	130	110	113	130	110	119	131
30-32	120	129	141	122	132	142	105	110	122	110	118	126	114	130	135	115	125	140	114	120	125
33-35	117	128	142	120	130	140	102	112	130	112	124	138	110	135	150	110	120	138	115	130	140
36-38	119	140	152	140	149	160	119	130	145	118	127	137	120	145	154	123	135	150	120	135	149
39-41	140	148	152	140	150	153	115	135	145	118	129	147	130	140	160	125	130	150	130	140	150
42-44	138	154	159	145	153	160	120	130	140	126	142	146	130	150	160	135	150	160	132	150	160
45-47	131	144	153	148	158	168	126	145	155	130	138	155	130	145	160	135	150	160	135	150	160
48-50	150	160	175	142	165	175	130	140	150	135	145	154	130	150	155	138	150	165	145	150	160
51-53	148	162	184	153	165	182	130	145	165	136	145	154	140	160	175	140	155	165	148	160	178
54-56	150	160	171	162	170	182	140	150	160	136	150	162	140	157	175	149	154	165	150	160	175
57-59	160	167	197	163	175	191	145	150	168	140	152	169	150	168	180	144	150	166	150	170	180

	Cali			Cartagena			Medellin			El Salvador Project			Kingston-St. Andrew			Monterrey		
00-02	35	45	50	37	48	56	35	40	50	40	42	47	36	41	50	38	44	55
03-05	55	60	65	55	60	69	50	60	70	54	66	72	54	64	69	60	68	79
06-08	65	75	85	69	75	80	62	70	80	77	82	86	68	77	82	70	80	86
09-11	70	85	92	80	88	95	70	80	90	82	88	95	73	86	91	76	86	96
12-14	80	90	100	79	92	105	80	85	98	82	91	100	77	91	100	85	92	100
15-17	90	95	102	90	100	108	85	95	100	91	100	109	85	95	109	90	96	102
18-20	85	95	105	90	98	105	92	100	100	91	100	109	91	100	109	92	100	110
21-23	90	105	115	90	98	105	95	108	120	99	109	118	91	98	113	100	108	118
24-26	96	105	115	100	110	120	100	110	120	104	109	118	103	113	119	105	112	120
27-29	105	115	130	105	122	126	104	115	135	111	118	136	113	118	131	109	120	136
30-32	105	118	130	100	120	130	105	120	130	113	122	140	113	122	132	110	122	128
33-35	112	125	135	120	120	138	105	120	135	118	132	140	113	122	136	116	130	143
36-38	125	135	145	121	130	144	119	130	146	122	134	141	118	131	136	120	138	148
39-41	116	130	149	110	125	140	110	120	140	138	145	164	118	136	150	128	134	145
42-44	120	135	150	108	126	142	120	130	150	131	145	160	135	136	150	131	140	150
45-47	130	140	155	121	136	146	125	150	150	131	145	152	131	145	158	126	141	168
48-50	130	140	155	130	140	160	125	138	160	136	149	154	141	155	168	135	148	164
51-53	139	150	160	126	144	156	130	140	150	128	136	167	141	159	168	144	158	174
54-56	140	150	160	140	150	165	138	150	161	145	159	168	143	159	170	150	158	168
57-59	140	148	162	139	160	172	136	160	170	139	154	181	149	159	181	141	162	177

Median = 2nd Quartile

Appendix III

Average Mid-Upper Arm Circumference for Children Aged 1 Month to 5 Years (measurements in centimeters)

Age in months	Males	Females	Sexes combined	Year constants[a)]
01	11.5	11.1	11.3	
02	12.5	12.0	12.3	
03	13.5	13.0	13.3	
04	14.1	13.7	13.9	
05	14.5	14.2	14.4	
06	14.9	14.5	14.7	
07	15.2	14.8	15.0	
08	15.4	15.0	15.2	
09	15.6	15.2	15.4	
10	15.7	15.4	15.6	
11	15.8	15.5	15.7	
12	15.9	15.6	15.8	
15	16.1	15.8	15.9	
18	16.2	15.9	16.1	16.0
21	16.3	16.0	16.2	
24	16.4	16.1	16.2	
27	16.4	16.2	16.3	
30	16.5	16.3	16.4	16.25
33	16.5	16.3	16.4	
36	16.5	16.4	16.5	
39	16.6	16.4	16.5	
42	16.6	16.5	16.6	16.5
45	16.7	16.5	16.6	
48	16.7	16.6	16.7	
51	16.8	16.6	16.7	
54	16.8	16.7	16.8	16.75
57	16.9	16.8	16.9	

Based on Figures from Wolanski (Jelliffe, 1966).

a) Jelliffe recommends that a single standard mid-upper arm circumference figure for each year from one to five be used.

Appendix IV

Mean and Standard Deviation of the Distribution of Arm Circumference Measurements of Children Under 5 Years of Age in 13 Projects, by Age
(measurements in centimeters)

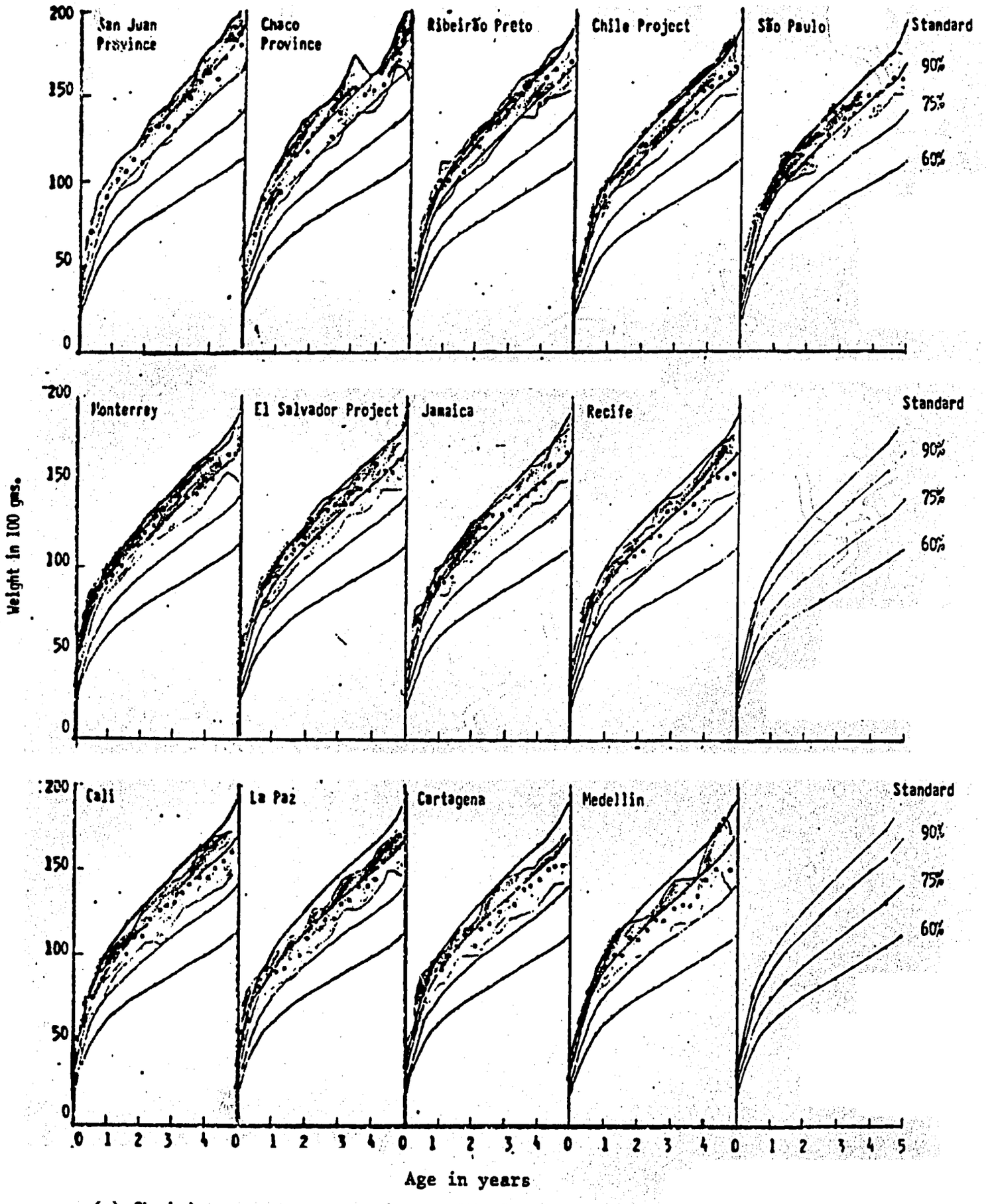
Age in months	Chaco Province			San Juan Province			La Paz			Recife			Ribeirão Preto Project			São Paulo			Chile Project		
	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.
00-02	27	11.3	1.8	62	11.8	1.9	74	12.2	1.6	95	10.2	1.8	80	11.3	1.7	83	11.5	1.8	68	11.5	2.0
03-05	38	12.5	2.0	53	13.4	1.9	81	13.3	1.5	92	12.3	1.9	45	13.0	1.8	68	13.6	1.2	85	13.4	1.6
06-08	26	14.2	1.5	39	14.2	1.6	77	13.7	1.7	126	12.6	1.8	55	13.2	1.5	55	14.0	1.5	88	14.4	1.7
09-11	30	13.7	1.1	46	14.5	1.8	88	13.9	1.5	103	13.3	1.9	71	14.0	1.8	79	14.9	1.5	82	14.8	1.5
12-14	35	13.5	1.8	40	14.8	1.5	73	14.2	1.4	113	13.3	1.4	67	14.3	1.5	100	14.7	1.5	93	15.0	1.7
15-17	28	14.5	1.4	51	15.2	1.6	81	14.3	1.4	93	13.2	1.4	58	14.3	1.3	69	14.9	1.3	98	15.2	1.4
18-20	33	14.0	1.6	59	15.2	1.3	74	14.3	1.3	87	13.4	1.3	71	14.8	1.5	67	15.0	1.6	81	15.5	1.5
21-23	38	14.9	1.3	47	15.2	1.7	67	14.5	1.0	102	13.5	1.8	67	15.1	1.7	81	15.0	1.2	83	15.8	1.5
24-26	27	15.0	1.2	28	15.4	1.4	80	14.7	1.3	89	13.8	1.2	77	15.0	1.5	68	15.1	1.3	96	15.5	1.5
27-29	43	15.0	1.0	45	15.7	1.3	75	14.9	1.3	91	13.9	1.5	53	15.2	1.7	69	15.2	1.4	90	15.9	1.2
30-32	29	15.4	1.3	44	16.0	1.4	62	14.7	1.3	97	14.0	1.2	72	15.4	1.4	76	15.1	1.2	93	15.7	1.6
33-35	34	15.4	1.5	37	15.8	1.0	81	15.0	1.3	98	14.5	1.6	57	15.4	1.5	70	15.4	1.1	101	15.7	1.8
36-38	31	15.6	1.3	39	16.1	1.2	94	15.3	1.0	93	14.2	1.5	64	15.9	1.4	80	15.8	1.1	74	16.0	1.6
39-41	36	15.4	1.6	39	15.9	1.7	69	15.5	1.2	94	14.4	1.5	72	16.2	1.6	100	15.8	1.3	85	16.1	1.4
42-44	31	15.8	1.2	42	16.4	1.9	63	15.5	1.2	91	14.6	1.2	88	16.1	1.3	76	15.7	1.4	93	16.4	1.5
45-47	25	15.9	1.3	30	16.7	1.3	90	15.4	1.1	104	14.8	1.6	89	15.8	1.4	63	16.1	1.4	84	16.2	1.2
48-50	31	15.8	1.5	41	16.5	1.2	77	15.7	1.4	71	15.0	1.4	73	16.0	1.2	83	15.7	1.1	93	16.5	1.3
51-53	32	16.1	1.5	38	16.2	1.2	46	15.6	1.2	80	15.1	1.7	69	16.6	1.6	83	16.0	1.4	85	16.6	1.3
54-56	28	15.6	1.4	40	16.8	1.6	71	15.7	1.1	95	15.0	2.0	76	16.4	1.6	74	16.2	1.4	78	16.6	1.3
57-59	19	16.3	1.7	39	16.6	1.4	84	15.9	1.3	104	14.8	1.4	76	16.3	1.2	65	16.1	1.2	103	16.4	1.4

	Cali			Cartagena			Medellín			El Salvador Project			Kingston-St. Andrew			Monterrey		
	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.
00-02	80	11.4	1.3	37	12.0	1.6	53	11.6	1.9	66	11.3	1.5	140	11.2	2.0	94	11.6	1.5
03-05	88	13.2	1.1	40	13.4	2.4	56	12.6	1.5	43	13.3	2.0	129	12.9	2.1	104	13.3	1.6
06-08	102	13.6	1.3	40	13.3	1.8	54	13.3	2.0	43	14.4	1.6	117	13.6	1.7	98	14.1	1.5
09-11	84	13.9	1.4	36	13.6	2.1	52	14.0	1.4	54	14.8	1.6	110	14.0	1.8	88	14.3	1.4
12-14	105	14.2	1.2	43	13.4	2.2	60	14.5	1.7	60	14.7	1.9	123	13.9	1.4	92	14.2	1.3
15-17	92	14.4	1.4	42	14.0	1.7	53	14.5	1.8	47	15.2	1.8	104	14.1	1.4	94	14.6	1.3
18-20	90	14.4	1.4	43	14.2	1.8	48	14.9	1.5	63	15.2	1.8	117	14.5	1.4	101	14.6	1.4
21-23	76	14.6	1.2	45	14.1	1.7	57	15.0	1.8	57	15.3	1.7	117	14.6	1.8	103	14.8	1.4
24-26	88	14.8	1.2	67	13.8	1.7	76	15.0	1.7	51	15.6	1.3	93	14.7	1.5	90	15.0	1.4
27-29	93	15.0	1.3	41	14.2	1.8	61	15.3	1.5	63	15.5	1.7	116	15.3	1.3	93	15.3	1.2
30-32	103	15.0	1.3	48	14.3	2.1	66	15.0	1.5	64	15.8	1.3	108	15.4	1.4	100	15.4	1.5
33-35	81	15.1	1.3	33	14.9	1.8	65	15.4	1.9	66	16.1	1.3	103	15.4	1.3	89	15.6	1.3
36-38	114	15.3	1.3	57	14.8	1.6	59	15.5	1.4	53	16.1	1.5	124	15.3	1.5	105	15.8	1.2
39-41	94	15.4	1.2	36	14.7	2.1	56	15.6	1.9	46	16.3	1.9	119	15.6	1.4	86	15.6	1.3
42-44	93	15.8	1.3	51	15.2	1.6	52	15.5	1.7	68	16.0	1.4	104	15.7	1.3	108	15.8	1.5
45-47	97	15.7	1.3	55	15.6	1.5	50	16.1	1.5	36	16.2	1.5	102	16.0	1.5	68	16.0	1.2
48-50	104	15.6	1.2	58	15.6	1.6	60	16.2	1.4	49	16.6	1.3	125	16.2	1.6	107	16.1	1.2
51-53	83	15.8	1.4	53	15.8	1.8	79	15.6	1.7	47	16.5	1.6	99	16.4	1.6	84	16.2	1.9
54-56	94	15.8	1.2	51	16.1	1.6	56	16.4	1.3	50	16.2	1.5	128	16.2	1.4	78	16.2	1.2
57-59	93	15.8	1.1	46	15.6	1.6	73	16.1	1.6	45	16.7	1.5	[illegible]	16.6	1.8	76	16.3	1.5

N = number $\bar{X}$ = mean S.D. = standard deviation

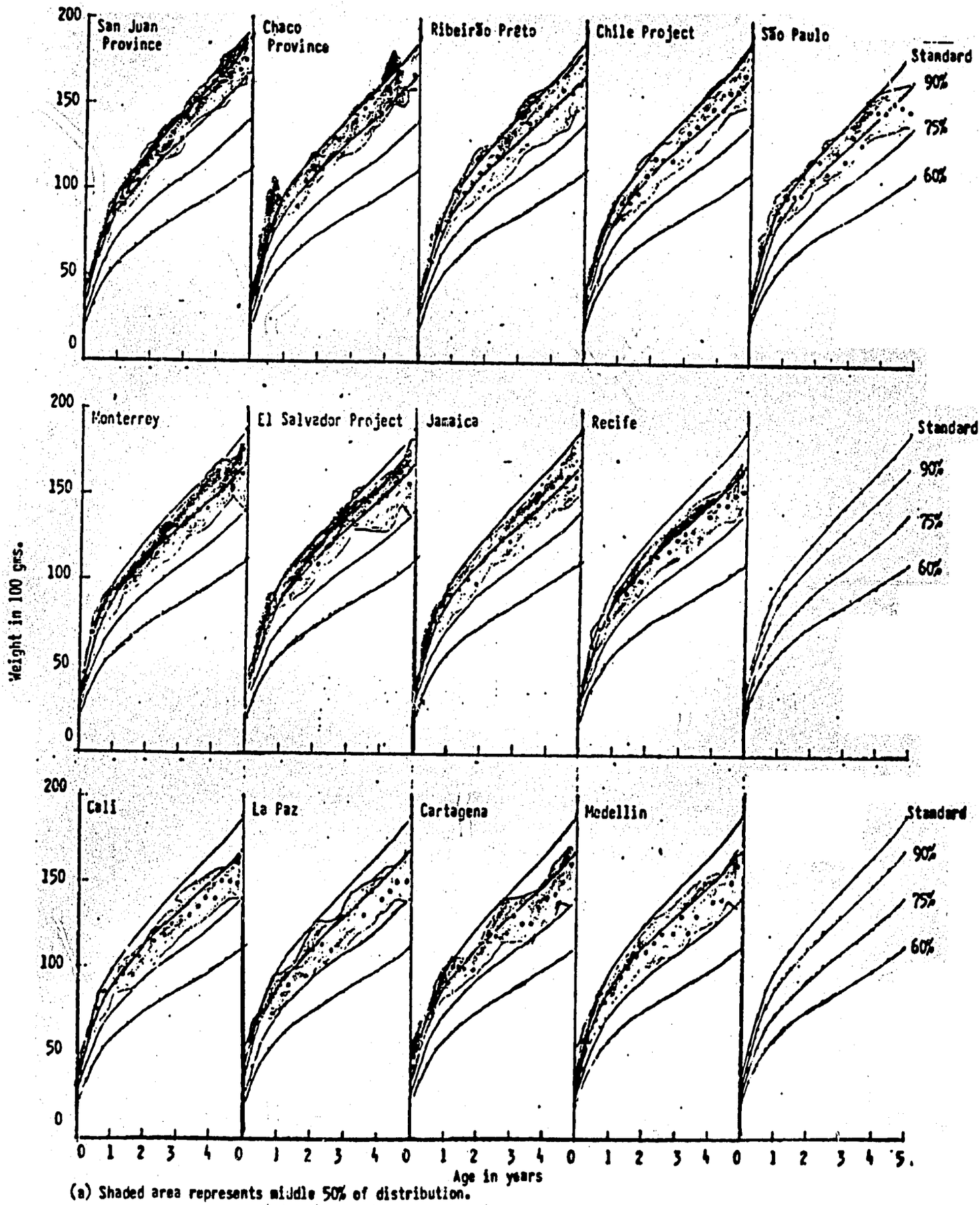
FIG. 1. Location of 15 Projects in the Inter-American Investigation of Mortality in Childhood.

Fig. 2. Median Weights for Males by Age for 13 Projects and Range of the Middle 50% of the Distribution[a]



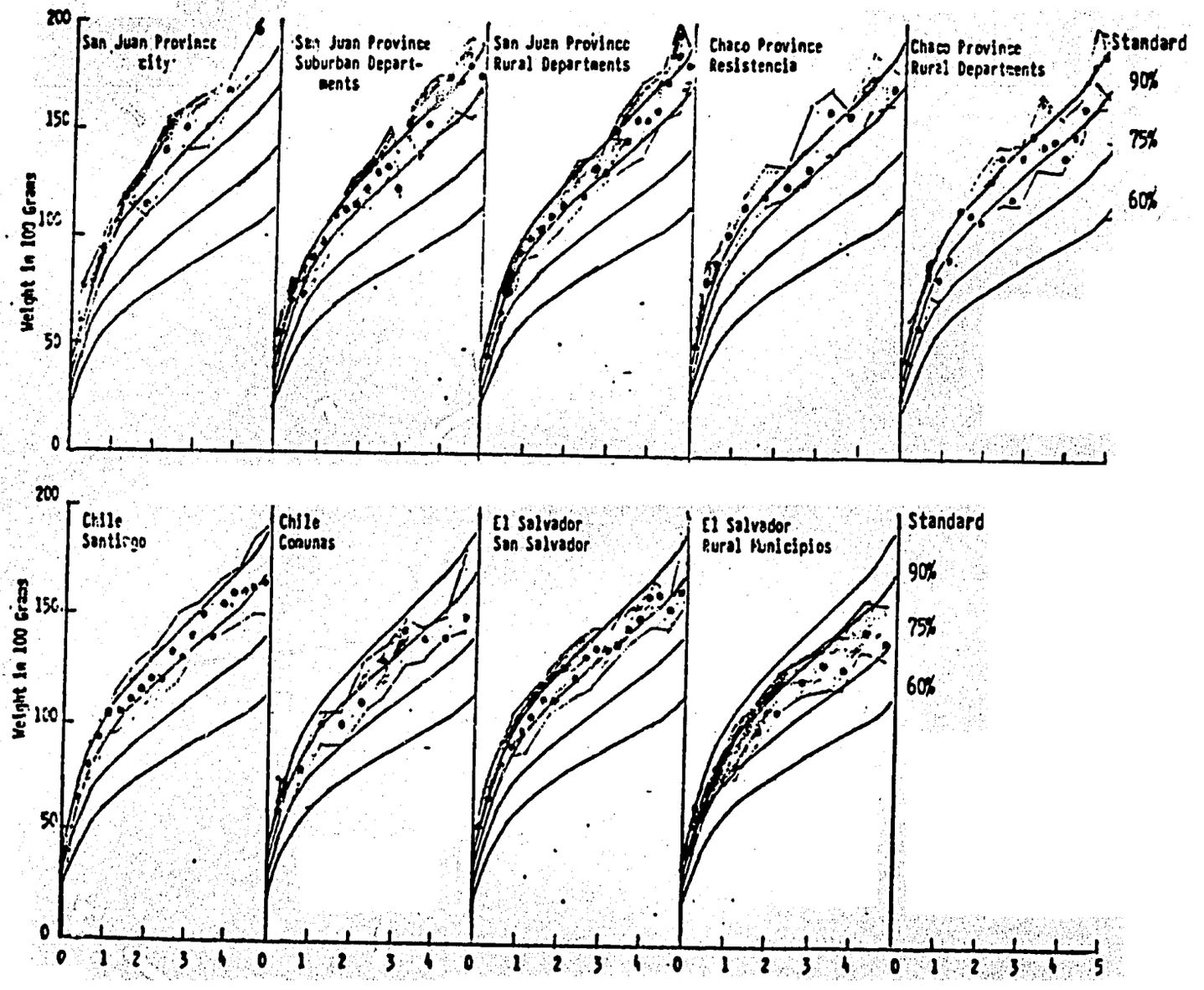
(a) Shaded area represents middle 50% of distribution.

Fig. 3. Median Weights for Females by Age for 13 Projects and Range of the Middle 50% of the Distribution[a)]



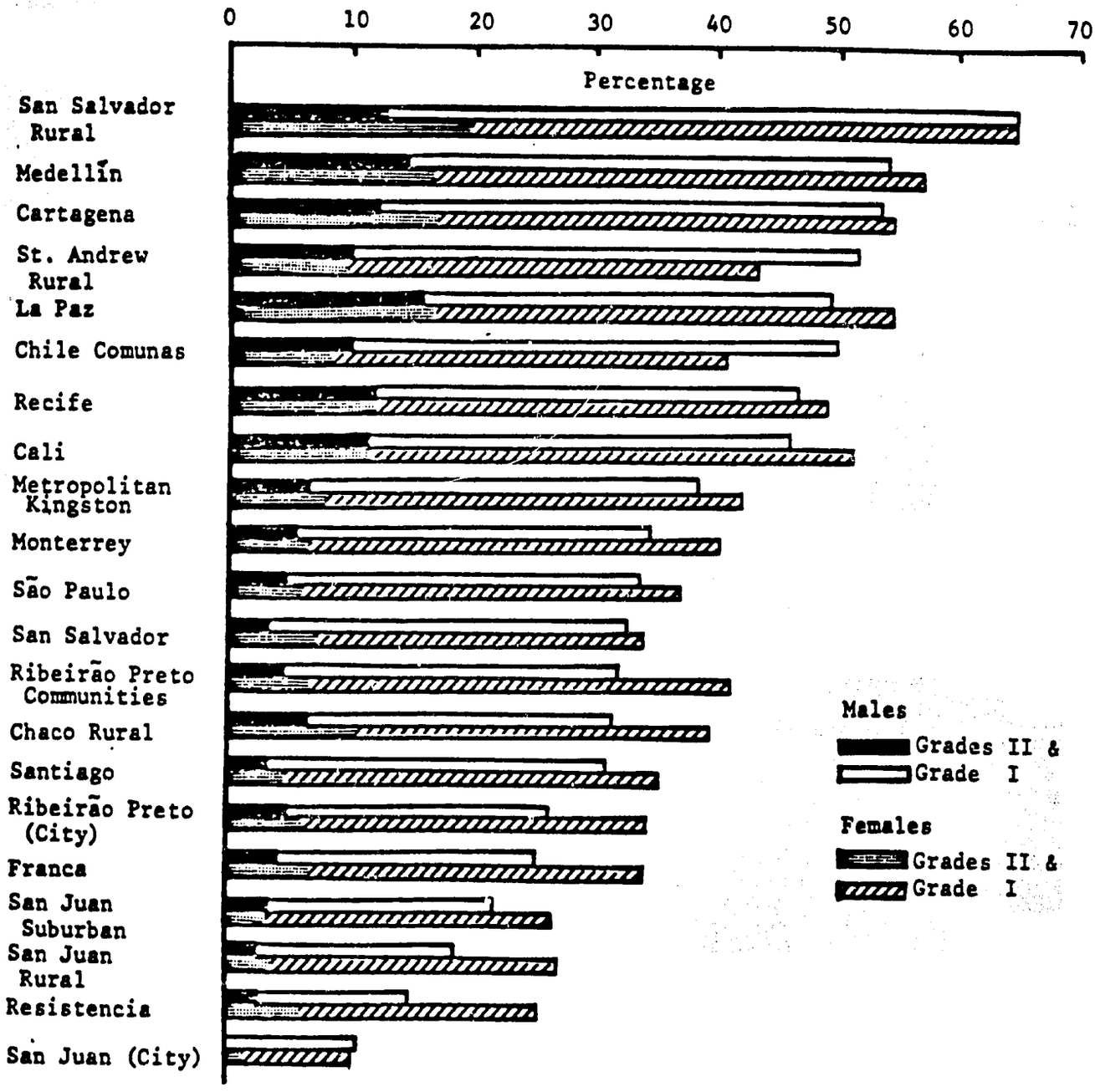
(a) Shaded area represents middle 50% of distribution.

Fig. 4. Median Weights for Males in Urban, Suburban and Rural Areas of Four Projects, by Age



Shaded area represents middle 50% of distribution.

Fig. 5. Percentage of Children Under 5 Years of Age with Nutritional Deficiency by Grade and Sex for 21 Areas of 13 Projects[a]



(a) Nutritional deficiency of Grades I, II or III based on weight (in accordance with Gomez Classification).

Fig. 6. Percentage of Children with Grades I and II or III Malnutrition Based on Gomez Weight Classification in 20 Study Areas for Four Age Groups Under 5 Years

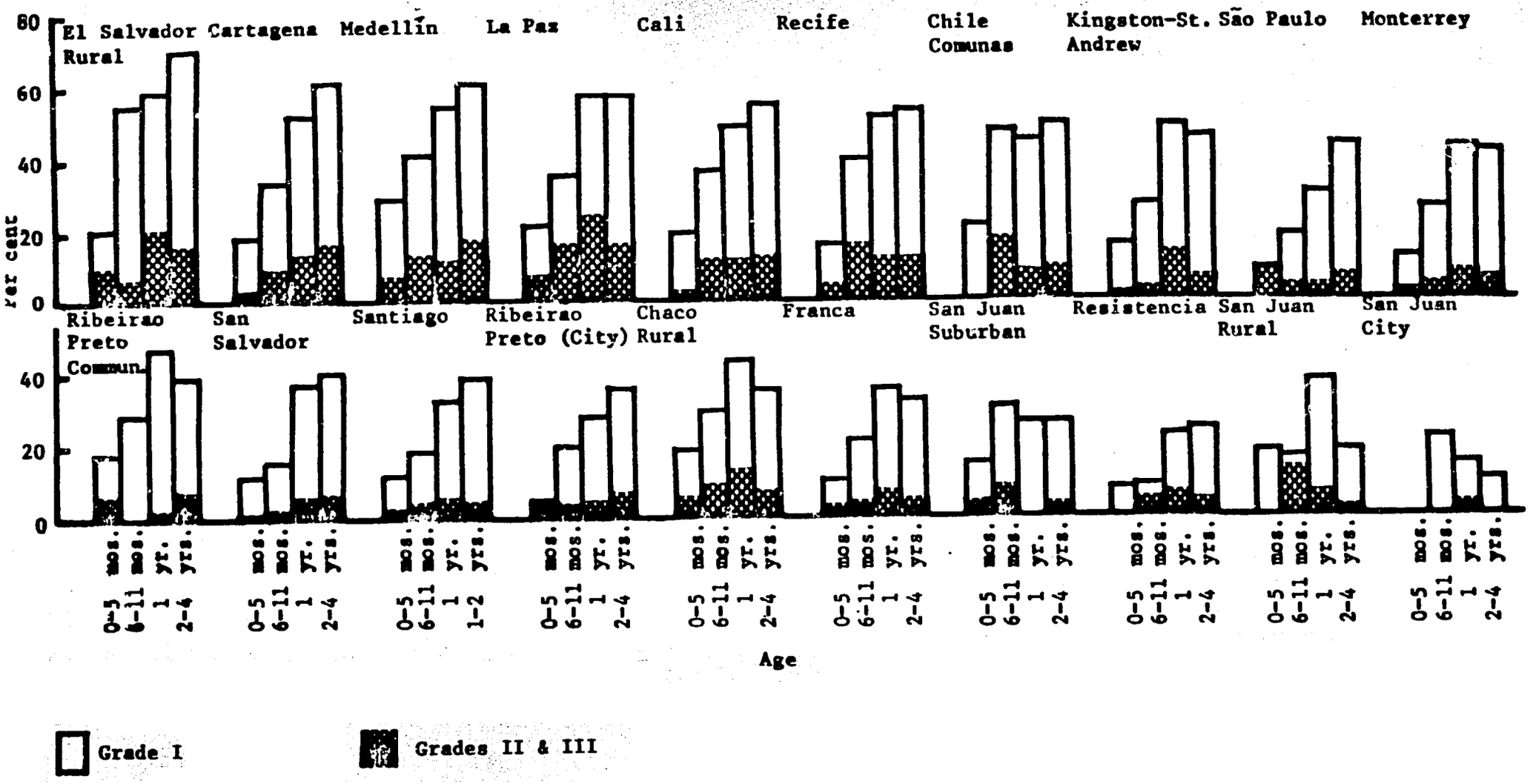
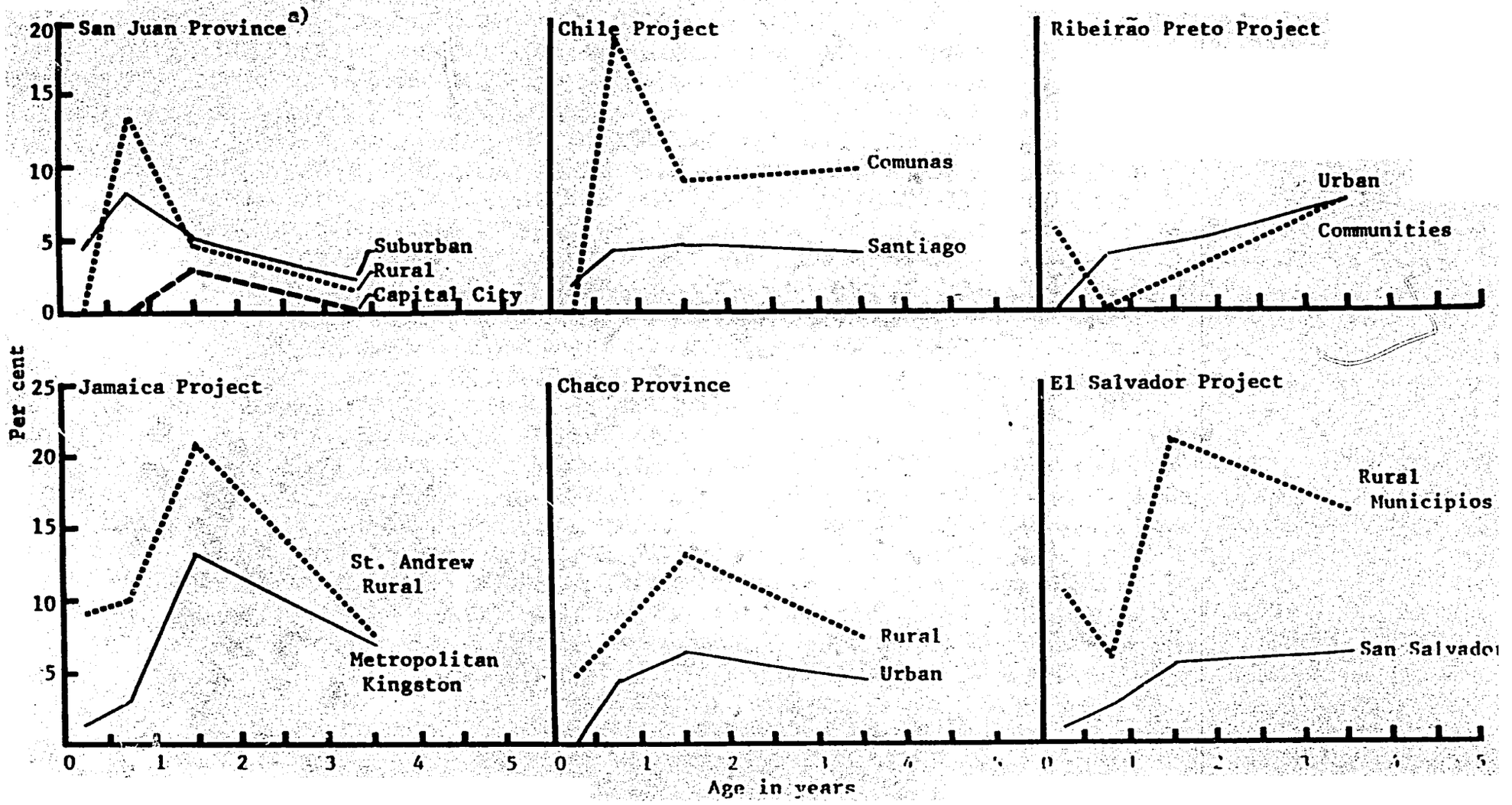
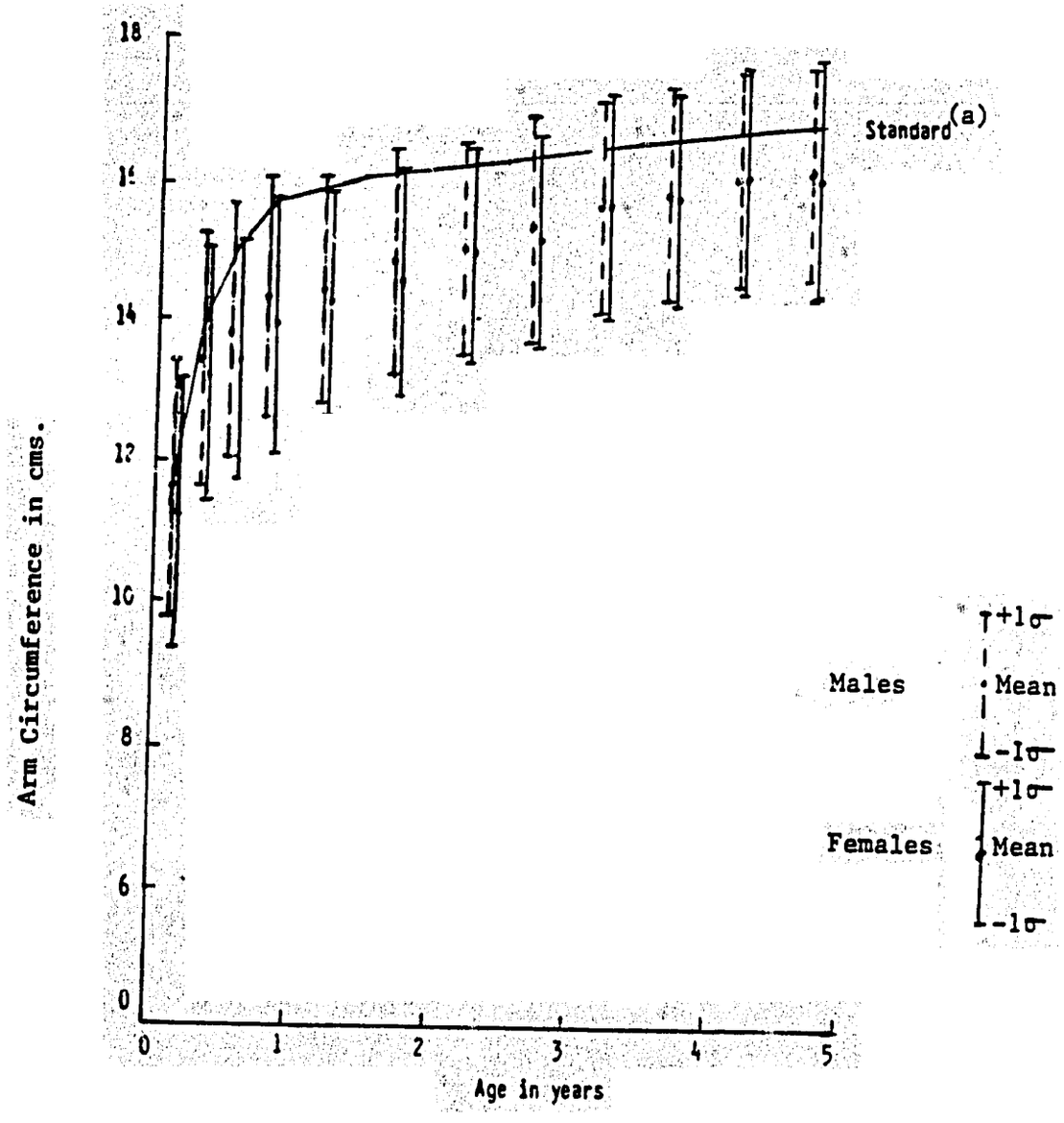


Fig. 7. Percentage of Children with Grade II or III Malnutrition Based on Gomez Weight Classification in 6 Projects with Urban, Suburban and Rural Area



a) San Juan Province:
- Capital City
- Suburban Department

Fig. 8. Mean Arm Circumference (± one standard deviation) by Age and Sex for 13 Projects Combined



(a) Standard Based on Wolanski's Values

σ Standard deviation

Fig. 9. Mean Arm Circumference by Age, for 13 Projects

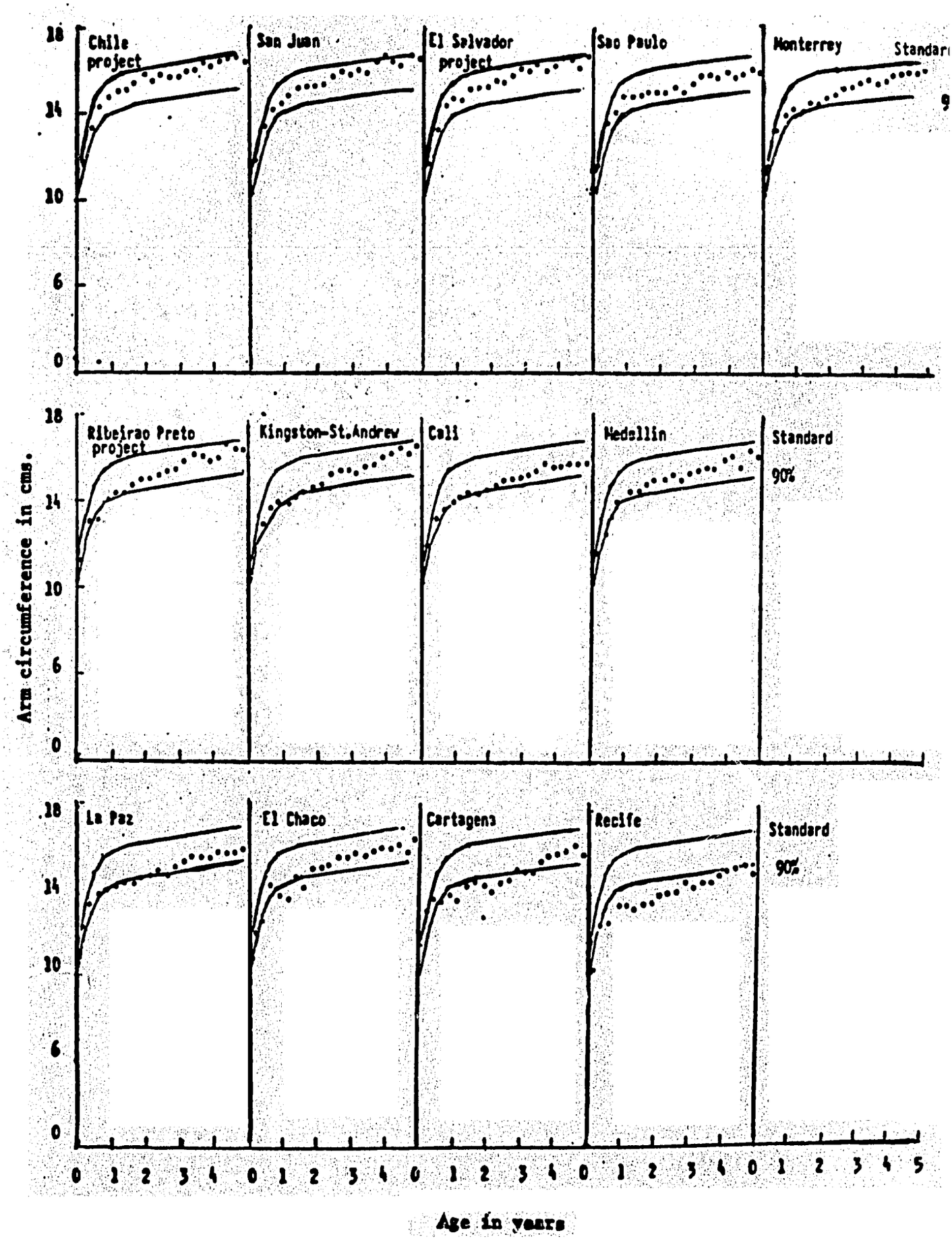
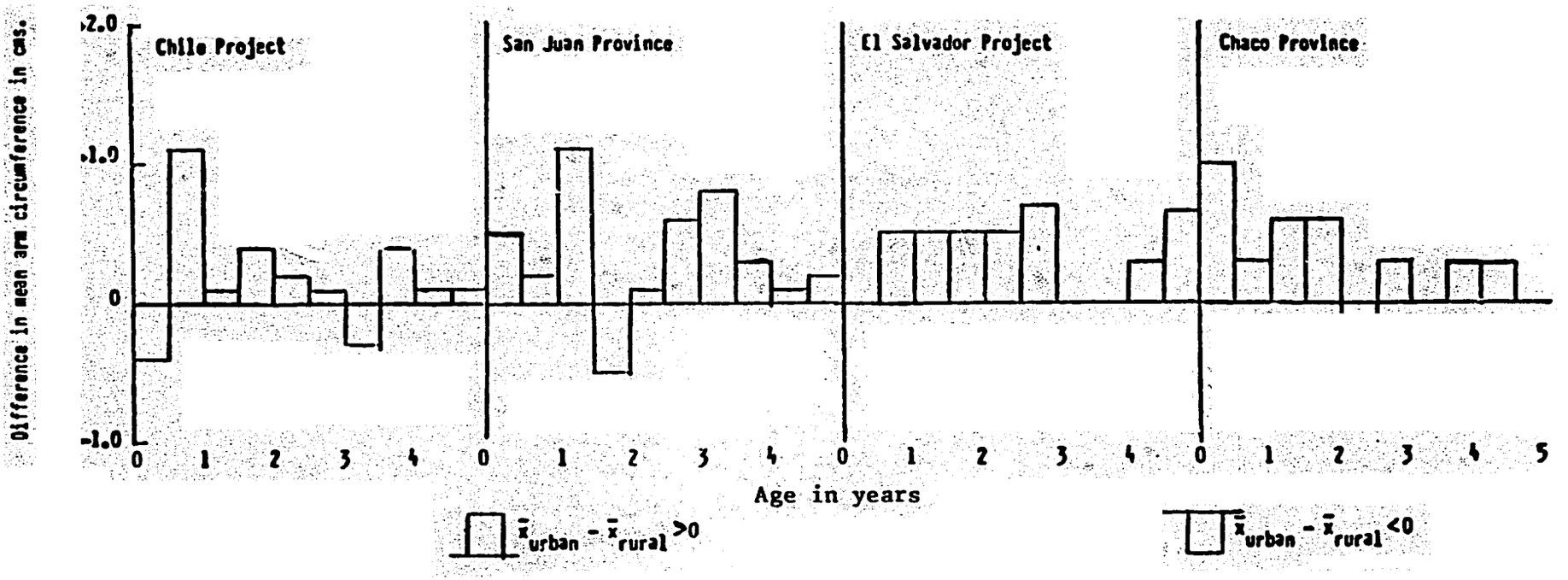


Fig. 10. Difference in Mean Arm Circumference Between Urban, Suburban and Rural Children in 4 Projects by Age



Difference = $(\bar{x}_{urban} - \bar{x}_{rural})$ in cms.

Fig. 11. Percentage of Children with a Disagreement Between Classifications of Nutritional Status Based on Weight and Arm Circumference, by Age Group, for 13 Project Areas

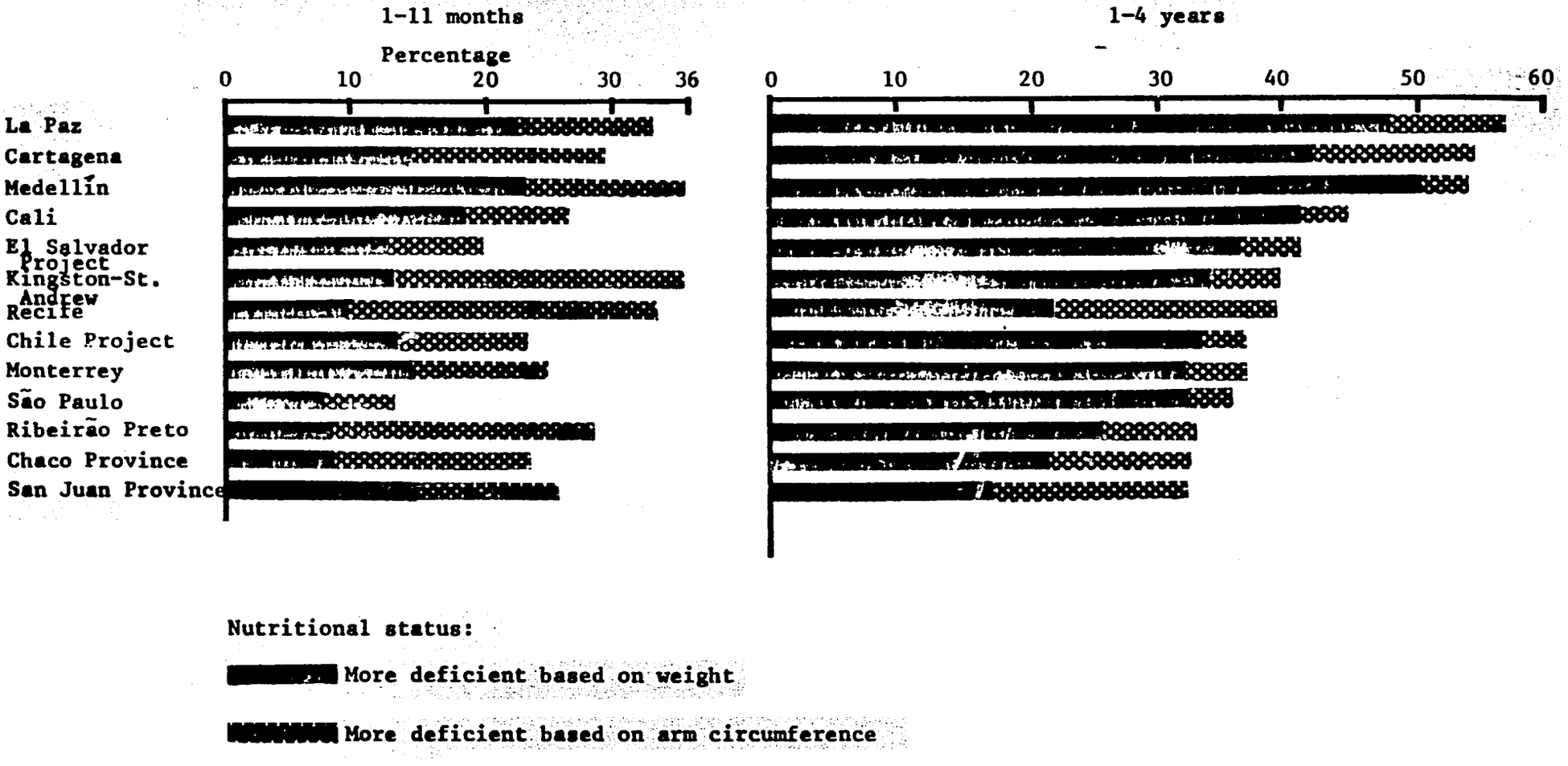


Fig. 12. Mean Arm Circumference (± One Standard Deviation) for Children Under 5 Years of Age Grouped According to Nutritional Status Based on Weight, by Age, in 13 Projects Combined

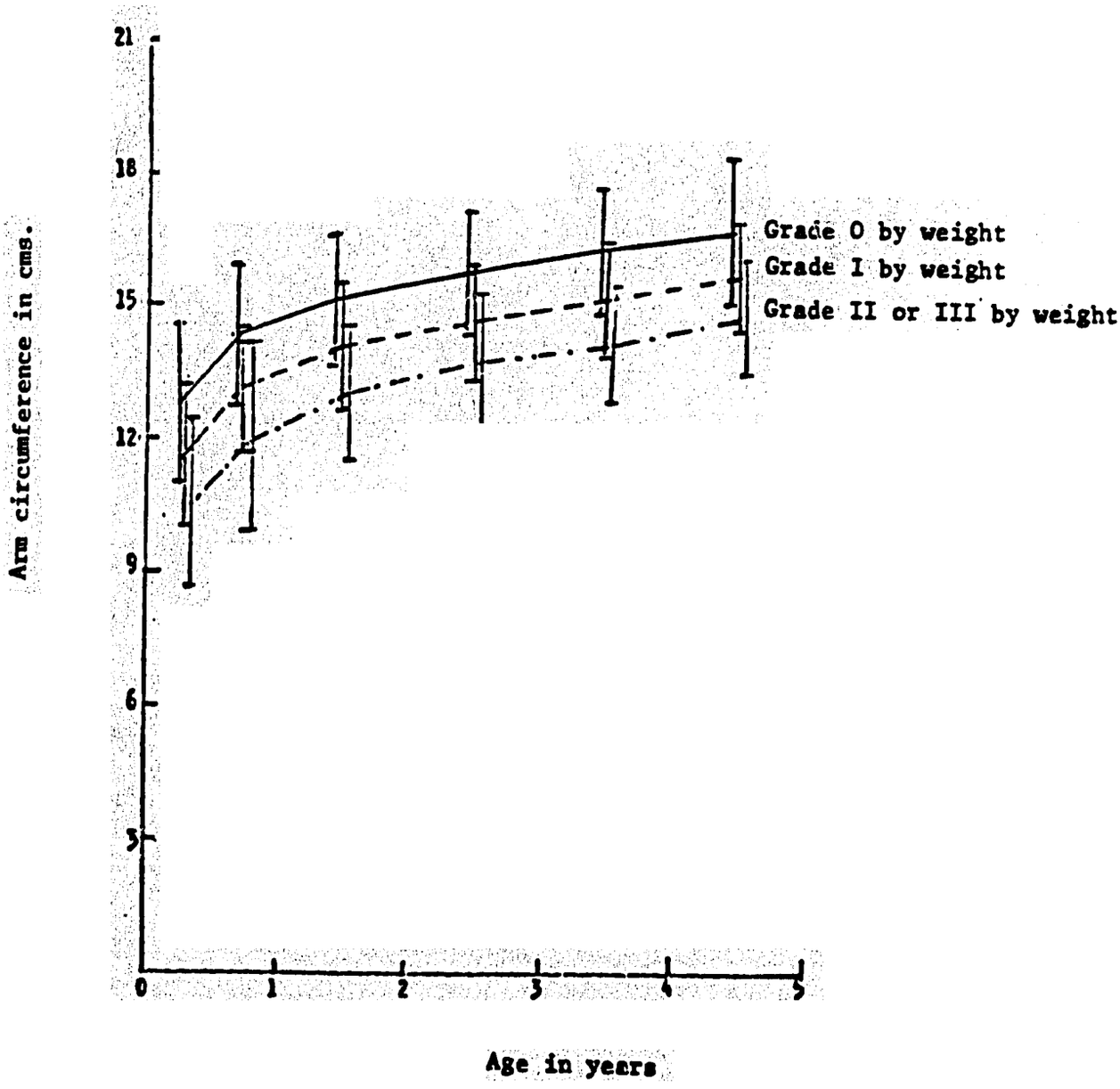
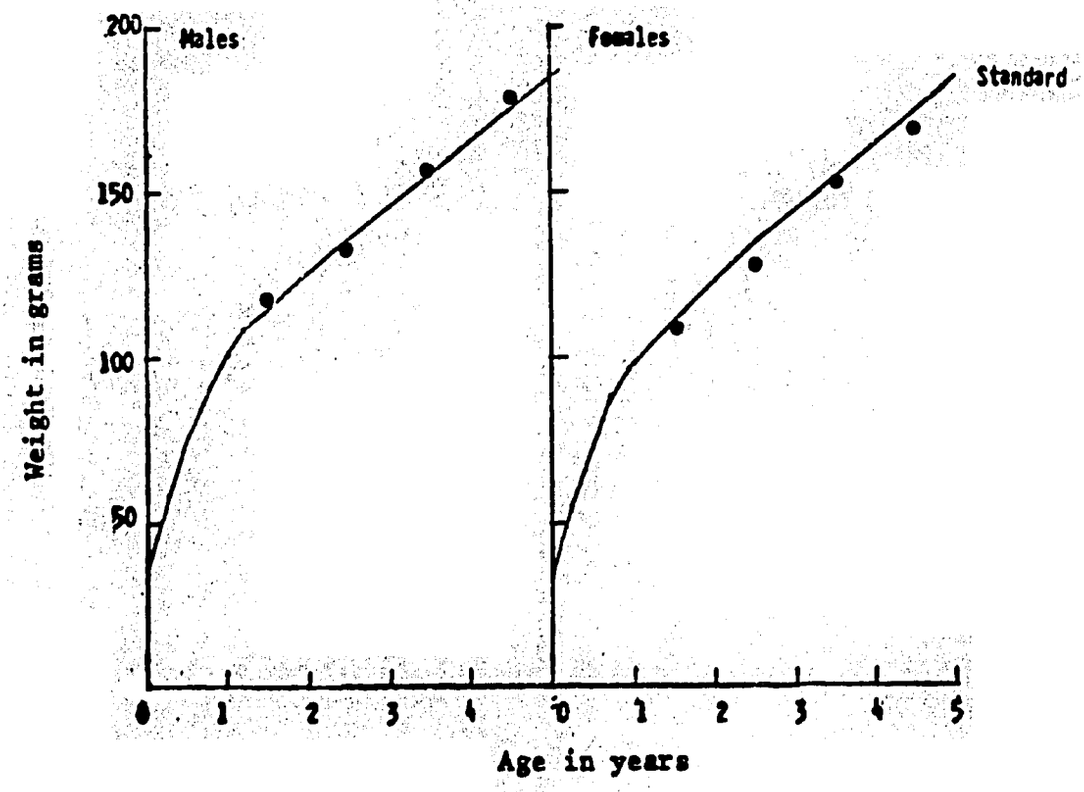
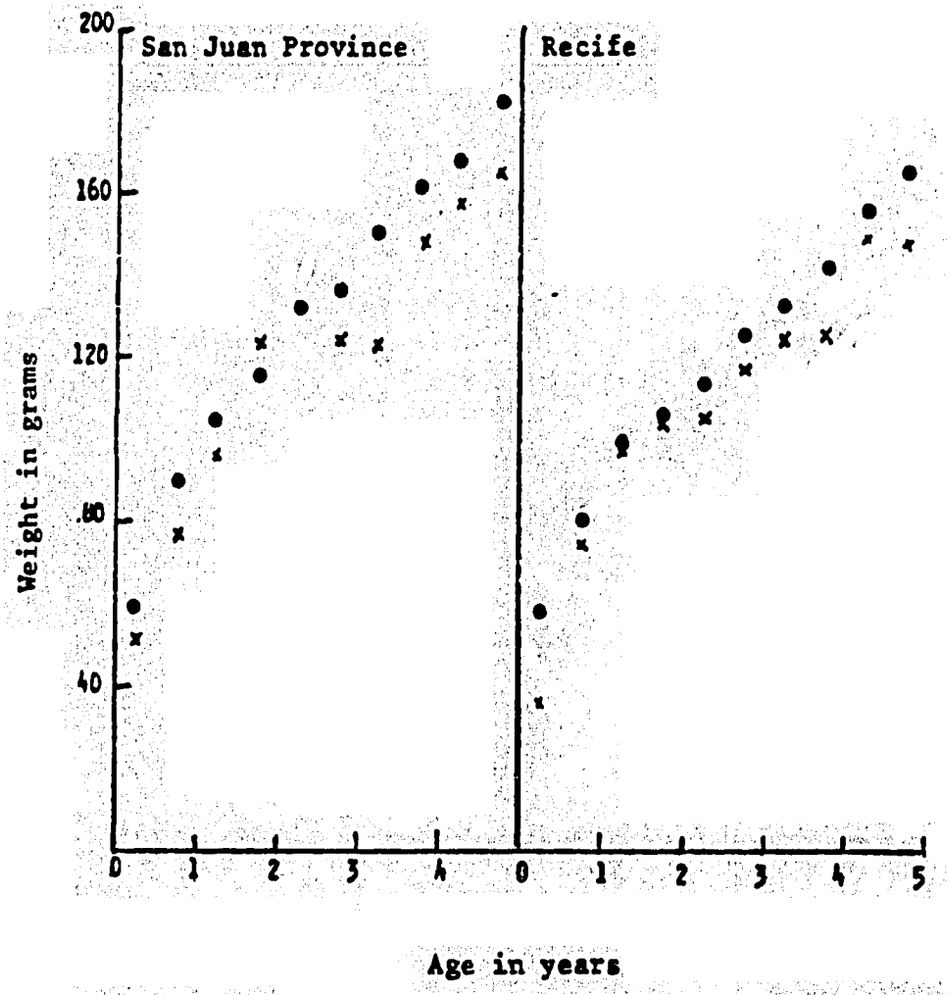


Fig. 13. Median Weights for Children Under 5 Years of Age in the United States Health and Nutrition Survey, 1971-1972, by Sex



Source: Preliminary Findings of the First Health and Nutrition Examination Survey, U.S. 1971-1972,"Anthropometric and Clinical Findings," NCHS, 1975.

Fig. 14. Mean Weights of Male Children Under 5 Years in 2 Projects by Age and Birthweight Group



x Birthweight ≤ 2500 gms

● Birthweight > 2500 gms