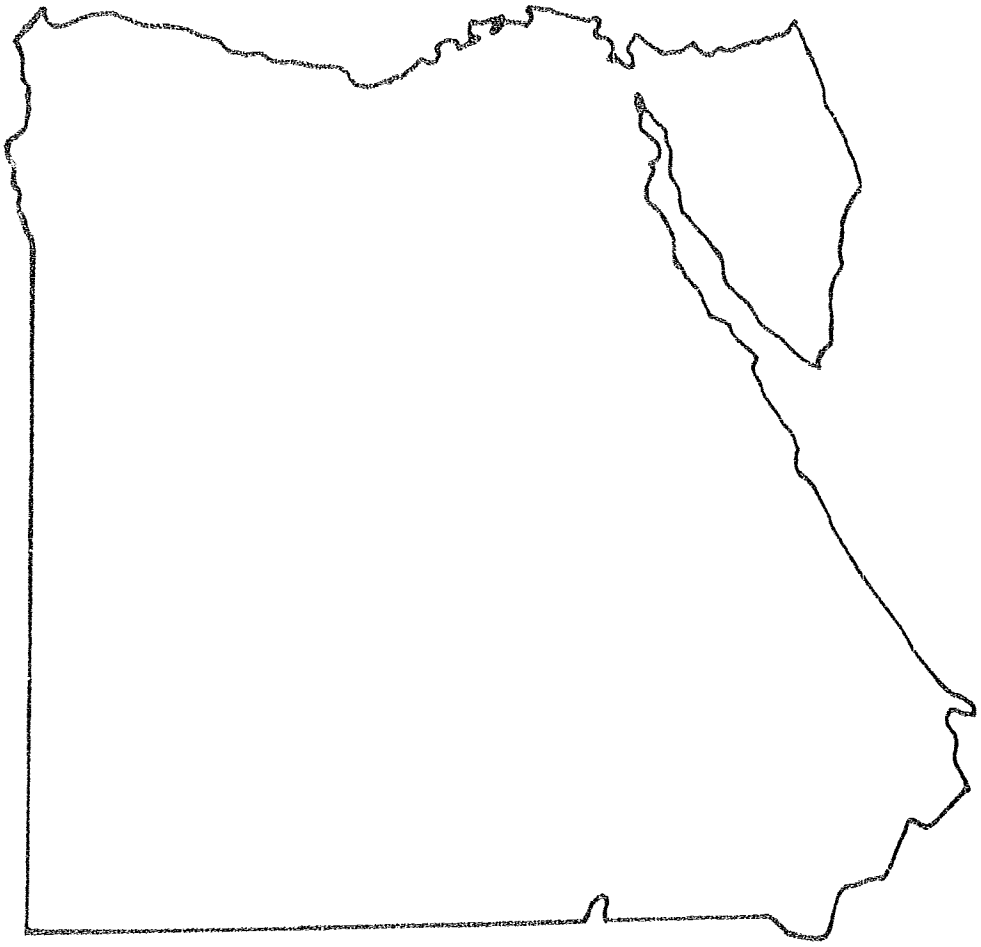
PN-AAH-564

ARAB REPUBLIC OF EGYPT

National Nutrition Survey



1978

Office of Nutrition
Development Support Bureau
Agency for International Development
Washington, D.C. 20523

ARAB REPUBLIC OF EGYPT

NUTRITION STATUS SURVEY, 1978

conducted by

The Nutrition Institute
Ministry of Health
Arab Republic of Egypt

with the assistance of the

Department of Health, Education, and Welfare
Public Health Service
Center for Disease Control

in cooperation with the

United States Agency for International Development
Department of State
Washington, D.C.

BEST AVAILABLE

CONTENTS

Page No.

PREFACE 1

INTRODUCTION 2

GOALS AND OBJECTIVES 3

SURVEY METHODOLOGY 5

SELECTION OF SURVEY UNIVERSE AND SAMPLING METHODS 5

Survey Universe 5

Special Group 7

Sampling Methods 7

DATA COLLECTION AND PRESENTATION 9

DATA COLLECTED 11

Direct Measurement Survey Items 11

Indirect Measurement Survey Items 12

Age Determination 15

DATA PRESENTATION 17

Anthropometry 17

Reference Population 19

Indices and Cutoff Levels 19

Hemoglobin 21

Cutoff Levels 21

SURVEY RESULTS AND DISCUSSION 22

I. ANTHROPOMETRY-(BY GEOGRAPHIC AREAS) 23

A. Results 23

B. Discussion 31

Contents (cont'd.)

Page No.

II. ANTHROPOMETRY - (BY AGE GROUPS) 33

A. Results 33

B. Discussion 35

III. HEMOGLOBIN STATUS (CHILDREN) 41

A. Results 41

B. Discussion 43

IV. HEMOGLOBIN STATUS (MOTHERS) 49

A. Results 49

V. NUTRITION RELATED CLINICAL SIGNS AND SYMPTOMS IN EGYPTIAN PRESCHOOL-AGE CHILDREN 52

A. Results 52

B. Discussion 56

VI. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF THE SURVEY POPULATION 56

A. Results 56

B. Discussion 64

VII. BREAST-FEEDING AND FOOD SUPPLEMENTATION PRACTICES 66

A. Results 66

B. Discussion 70

VIII. RECENT SICKNESS, DIARRHEA, AND FEVER 73

A. Results 73

B. Discussion 76

IX. ASSOCIATIONS OF SAMPLE CHILDREN'S NUTRITIONAL STATUS WITH RELEVANT INDIVIDUAL AND HOUSEHOLD CHARACTERISTICS 76

Contents (cont'd.)

Page No.

A. Results.....76

B. Discussion.....84

SUMMARY.....90

RECOMMENDATIONS.....95

REFERENCES.....97

APPENDICES.....99

1. Schedules, Survey Preparation Training, Logistic, Participating Organization and Personnel.....99

2. Description of Universe Composition.....102

3A. Determination of Sample Size.....105

3B. Selection of Sample sites and Survey Children.....107

4. ARE Nutritional Status Survey Questionnaire.....109

5. Procedures for Anthropometric Measurements.....110

6. Procedures for Collecting Blood Sample.....113

7. Reference Population for Anthropometry.....115

8. Anthropometric Tables.....117

9. Dietary Tables.....120

PREFACE

In response to a request by the Ministry of Health, Arab Republic of Egypt (ARE), to the United States Agency for International Development (USAID) mission in Cairo, and to the USAID Development Support Bureau/ Nutrition in Washington, the Nutrition Division, Center for Disease Control (Atlanta, Georgia), United States Department of Health, Education, and Welfare provided technical assistance to the Nutrition Institute of the ARE Ministry of Health to conduct a National Nutrition Status Survey.

The 1978 National Nutrition Survey resulted from the combined efforts of the Government of Egypt, AID/Cairo, United Nations Infants' and Children's Emergency Fund (UNICEF)/Cairo, and CDC.

The Arab Republic of Egypt provided survey personnel, training sites, and administrative and logistic support. The diligent efforts of the survey team members under varying and often difficult circumstances facilitated the survey's smooth implementation. A complete list of survey personnel appears in Appendix 1.

The AID/Cairo mission provided the funds for the CDC technical personnel, survey equipment, data analysis, and final report.

UNICEF/Cairo generously donated six new vehicles to the Nutrition Institute of the Ministry of Health for use in the survey.

INTRODUCTION

The Arab Republic of Egypt (excluding the Sinai Peninsula) covers an area of 386,200 square miles (1,002,000 square km) in the northeast corner of the African continent. The country is divided for administrative purposes into 25 governorates or provinces. The 1976 Census recorded a population of 36.6 million currently living in the country, reflecting an average annual rate of population increase of 2.3 percent from 1966 through 1976. (An additional 1.4 million were outside the country, plus 0.1 million in Sinai at the time of the census). Ninety-eight percent of the population live in 3.5 percent of the country's area located within the Nile Valley and the Delta. The average population density in these areas is 930 persons per square kilometer. Lower Egypt, composed of nine governorates north of Cairo, includes 43.4 percent of the population; Upper Egypt, composed of eight governorates south of Cairo, 34.6 percent; the four urban governorates of Cairo, Alexandria, Port Said, and Suez, 21.4 percent; and the frontier governorates of Red Sea, New Valley (El-Wadi El-Gedid), Metrouh, and Sinai, 0.6 percent.

The 1976 Census classified 44 percent of the population as urban, an increase of 3.5 percent since the 1966 Census. Metropolitan Cairo, defined as Cairo governorate, plus the cities of Giza and Shubra El-Kheima, had a population of 6.7 million with population densities as high as 101,000 persons per square km.

Nutrition status surveys in several populations of Egyptian children from 0-72 months of age using the indices of weight for age, height for age, and, in one instance, weight for height, have been previously reported.[1,2,3,6,7] Abdou and associates have suggested that the Egyptian child is equal to or larger than the Western reference child for the first few months of life, but begins to lag in growth by 6 months of age. By 12 months these children show a marked deficit, in both weight and height, which increases with age up to approximately 36 months. A progressive weight for age increase occurs in the age groups from 36 to 72 months of age, while the height for age deficit stabilizes in these age groups. In the one study where weight for height has been analyzed, a low prevalence of wasting, defined as weight for height less than 80 percent of reference median, occurs in the 6-24 month age group.[2] Abdou's data suggest that rural children tend to be lighter and shorter than urban children. Female children also tend to be lighter and shorter.

Anemia has been shown to be a common health problem in all age groups in Egypt.[3,4,5] The prevalence of anemia (hemoglobin less than 11 gms/100 ml) in some rural and urban Cairo groups of children, adolescents, and pregnant and lactating women exceeded 90 percent.[3] Abdou observed a higher prevalence of anemia among the chronically undernourished.[4]

GOALS AND OBJECTIVES

The goal of the Egypt National Nutrition Status Survey was to provide baseline information concerning the nutrition status of young children that could be used for determining policy and priorities, for the planning and administration of applied nutrition activities, and for suggesting further nutrition research.

Toward this goal this report presents information regarding the:

*Prevalence and distributions of acute and chronic protein-energy undernutrition in children 6-71 months of age.

*Prevalences and distributions of anemia and clinical signs of selected micronutrient deficiencies.

*Duration of breast-feeding and patterns of weaning.

*Associations of children's nutrition status with certain characteristics of the household and child, including food intake patterns of groups of children.

The results of the survey's inquiries in greater detail into the food intake patterns of the preschool-age children and into contraceptive usage by their mothers will be presented in subsequent reports.

Another objective of the survey was to increase the in-country capability of the Nutrition Institute for designing and conducting future surveys that can aid in the evaluation of applied nutrition activities.

SURVEY METHODOLOGY

SELECTION OF SURVEY UNIVERSES AND SAMPLING METHODS

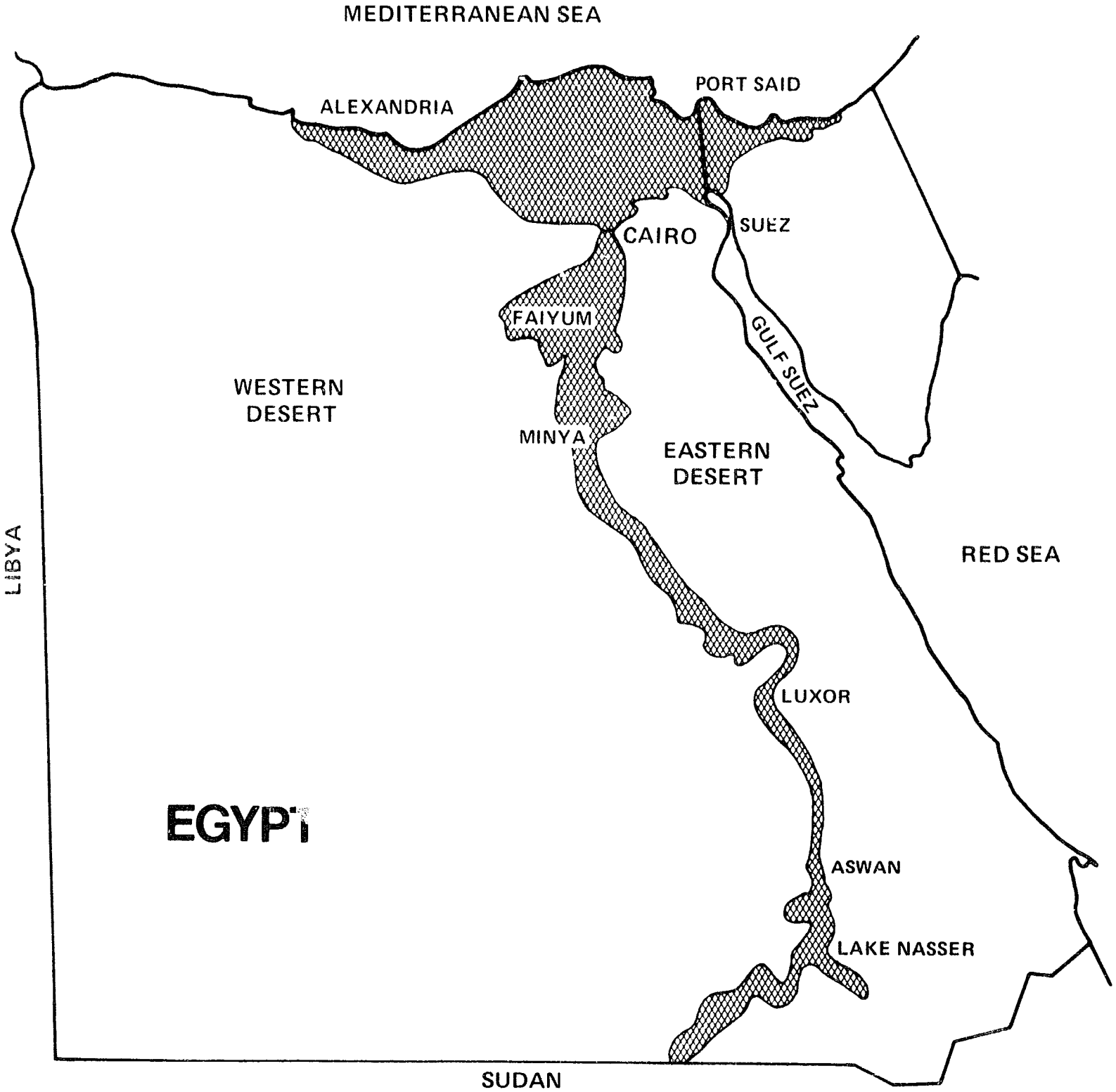
Survey Universes

Egypt is divided into 25 geopolitical units known as governorates. Convention designates Upper Egypt as composed of eight governorates designated as urban and four governorates are frontier governorates. (See map, Figure 1)

Due to the small percentage of the population present in the frontier governorates, these areas were excluded from the National Nutrition Status Survey. Eleven universes were constructed for the survey from the remaining 21 governorates using geopolitical and population criteria. Six rural universes (universes 1-6) were constructed from the 17 governorates in Upper and Lower Egypt from villages with populations less than 10,000.

The Ministry of Housing and Reconstruction have established criteria for differentiating small towns from large villages which include the presence of social and administrative services such as a police station, hospital, and other government service facilities. All villages with a population of 10,000-49,999 throughout the 17 governorates of Upper and Lower Egypt composed the large village universe (universe 7). The small town universe (universe 8) includes all towns with populations of 10,000-49,999 throughout the 17 governorates.

FIGURE 1. GEOGRAPHICAL AREAS, NUTRITION STATUS SURVEY: ARAB REPUBLIC OF EGYPT



The city universe (universe 9) includes all population units in Egypt of 50,000 or greater excluding Metropolitan Cairo and Alexandria City.

Universes 10 and 11 were defined to include only the most underprivileged urban population for Cairo-Giza and Alexandria, respectively. In each metropolitan area Central Agency for Public Mobilization and Statistics (CAPMAS) identified all the districts in which less than 10 percent of the population were "semi-educated" according to the 1976 census. Further details of universe composition is presented in Table 1 and Appendix 2.

Special Group

A [illegible] group of 1,883 children ages 6-71 months was obtained from private nursery schools and socio-economically advantaged families in Cairo. Values of anthropometric indices on all of these children, and hemoglobin determinations on 359 of them may provide reasonably valid estimates of the nutrition status potentially attainable by the general preschool-age population of Egypt.

Sampling Methods

Survey sample size determination methods considered resources available, both financial and physical, constraints such as time and field logistics, the prevalence of the sample attributes assumed to be applicable, and precision desired and the confidence level to be associated with it.

BEST AVAILABLE

Table 1. Description of Sample Universes for 1978 Egypt Nutrition Survey

Geographic Area	Universe	Urban/ Rural	Population Size	Population Total	Governorate
Total Representative Sample[a]					
Lower Rural Egypt	1	Rural	<10,000	970,405	Damietta, Kafr El Sheikh
	2	Rural	<10,000	1,611,958	El Ismalia, El Sharkieh
	3	Rural	<10,000	4,465,915	El Dakahlia, El Gharbia, El Menoufieh, El Qalyoubieh
	4	Rural	<10,000	1,490,313	El Beheira
Upper Rural Egypt	5	Rural	<10,000	3,242,975	El Giza, El Fayoum, Beni Suief, El Menia
	6	Rural	<10,000	3,190,003	Asyout, Souhag, Quena, Aswan
Large Villages (country-wide)	7	Rural	10,000-49,999	5,516,152	
Small Towns (country-wide)	8	Urban	10,000-49,999	2,761,724	
Small Cities (country-wide)	9	Urban	50,000+	4,492,427	
Non-Representative Sample[b]					
Cairo-Giza [c]	10	Urban		1,334,190	
Alexandria [c]	11	Urban		551,974	
Special Group		A group of socially advantaged children in Cairo			

[a] Population Proportional

[b] Selected Disadvantaged Areas

[c] The universe is composed of all districts in which the percent of population who are uneducated is more than 90 percent.

Sampling procedures for the survey used a two-stage method. For the first stage CAPMAS selected 30 sample sites in each universe from the total population of the universe, as found in the 1976 Census, by a procedure involving population unit cumulation and interval sampling so that the probability of inclusion of a population unit in the universe sampling was proportional to the population of the unit. Further details regarding sampling are presented in Appendix 3A and 3B.

The second stage of sampling relied on an independent listing and numbering of all households in a sample site. The initial household in a sample site was randomly selected from the list. After identifying the initial household the survey team collected data on 30 children in the age range of 6-71 months in a surrounding cluster of households moving, whenever possible, each time to the right to the next closest household.

This two-stage sampling methodology permits prevalence estimates of approximately the same precision in each universe and the use of significance testing to determine if significant differences in nutrition status exist between universes.

DATA COLLECTION AND PRESENTATION

A staff of 28 individuals received intensive training for 3 weeks prior to the field phase of the survey. The staff consisted of 10 health professionals at the doctoral level, 8 social workers, 8 dieticians, and 2 administrators. The training course included instruction in interviewing

and recording techniques, measuring children, and obtaining specimens. The staff was divided into eight 3-man survey teams, a laboratory team, and a supervisory team.

After instruction and practice in measuring height and weight, team performance was evaluated using a standardization exercise adapted from Habicht.[8] The teams obtained further practice in conducting interviews, measuring children, identifying clinical signs, and obtaining specimens during 3 days of field trials in selected villages (among subpopulations not included in the survey sample). Standardization of body measurements accuracy and precision was then repeated.

A sample questionnaire is presented in Appendix 4. Details for administering the questionnaire are available in the Egypt Nutrition Status Survey Field Manual.

Data collection took place from early January to mid-April 1978. On advice from government authorities, the survey field phase began in Upper Egypt. Advance preparations were made at each sample site by governorate and local health personnel.

All teams worked in the same region of Egypt at the same time and all of the selected sample sites were visited. Team members were usually lodged in previously arranged quarters. Teams worked for periods of up to 20 days and then returned to Cairo for 3-7 days for rest. Supplies were distributed, and forms and hemoglobin specimens were collected at central points in the governorates. All hemoglobin determinations were performed at these central points.

During the field work CDC and Nutrition Institute supervisors traveled with the teams to the sample sites, observing and correcting possible errors. Survey team leaders edited each questionnaire for accuracy and clarity. Survey supervisors then reviewed the forms.

CDC computer and statistical services processed the completed forms. Data analyses and tabulations utilized both a core system of basic routines for commonly used indicators of nutrition status as well as special programs for associations specific to the Egyptian survey.

DATA COLLECTED

The assessment of the nutrition status of a population requires both data collection and analysis. Direct measurements of weight, height, hemoglobin, and estimates of the age of children provide prevalence and distribution information on the nutrition status of these children. Hemoglobin measurements on their mothers also provide prevalence information on maternal anemia. Indirect methods using interview techniques provide information on certain demographic, dietary, health, and socio-economic factors associated with nutrition status.[9]

Direct Measurement Survey Items

1. Anthropometry

   Weight and height or length--measured in all survey children using a Salter spring scale and a portable standard measuring board. (See Appendix 5.)

2. Hemoglobin Determination

Hemoglobin value--determined on capillary blood for every fifth survey child and his or her mother using the cyanmethemoglobin method and a Fisher Model #74D hemophotometer. (See Appendix 6 for details of collection of blood sample and analysis technique.) On each of these children filter paper specimens were also obtained for determination of measles antibodies.

3. Clinical Signs

Signs suggestive of certain nutritional deficiencies were looked for in each child. These included bilateral pedal edema, six signs suggestive of vitamin D deficiency, and three signs suggestive of vitamin A deficiency, including Bitot's spots.

Indirect Measurement Survey Items

1. Household and Family Information

Survey teams obtained the following information about the household and family:

- Occupation of the household head
- Literacy and educational level of the household head
- Household size

- Water source and availability, presence or absence of electricity, and type of fuel used for cooking

- Presence of child less than 6 months of age

- Birth order of the index child

- Current pregnancy status of mother

2. Recent Sickness, Diarrhea, and Fever

Mothers of survey children were asked to answer three questions regarding recent illness in these children.

"In the past 7 days has this (sample) child:

a. been sick, that is, been unable to carry on normal daily activities such as playing, eating, etc.?

b. had diarrhea, that is, four or more watery stools per day for 3 or more days?

c. had a fever for 3 or more days?"

3. Breast-Feeding, Weaning, and Food Supplementation Practices

Mothers of survey children were asked to provide information regarding the age of complete weaning and the age at which supplementation to breast-feeding was first introduced.

4. Dietary Data

Each mother of a child in the one in five subsample who had hemoglobin determinations was questioned regarding the child's dietary intake, over the preceding 24-hour period, of foods from each of nine nutritional categories. These categories were milk foods, weaning foods, grains, legumes, tubers, animal proteins, vegetables, fats, and sugars. For each food category, a semi-quantitative consumption estimate, in roughly equivalent units of food, was made. Analyses of the dietary data, in relation to urban-rural regions and to categories of height for age, weight for height, and hemoglobin level are presented in tabular form in Appendix 9. In Appendices 9A-9E the data is analyzed by mean units of food consumed, from each food category, for each subgroup of the population. In 9F and 9G it is analyzed by mean number of food categories consumed (Variety Score) regardless of the number of food units consumed in each category.*

5. Family Planning Data

In addition to dietary questions, the same subsample of mothers was asked three questions regarding the use of modern child-spacing measures. These were (1) current use of contraception, (2) method used, and (3) source of contraception. Analysis of this data will be presented in a separate report.

*Further analysis of the dietary data is being done by the staff of the Nutrition Institute and will be presented in a separate report.

Age Determination

Age data for the survey children were obtained as date of birth from a birth registration form if the indicated date of birth could be verified from a historical calendar. A verified birth registration form was the source of age in 68.2 percent of the survey children. This percent varied among universes from 53.7 to 86.4, was higher in urban than rural areas, and was lower among children under 1 year of age. For the remaining children whose birth registration forms were not available or whose date of birth as shown on the birth registration form could not be verified, their ages were determined from a historical calendar exclusively.

Data from 9,794 preschool children were analyzed: questionnaires on 106 additional children were excluded because of obvious errors in age or anthropometric data. The age and sex distributions of the 9,794 children are shown in Table 2. Sampling procedures for the special group and the less advantaged metropolitan areas of Cairo-Giza and Alexandria were different from those used elsewhere in the survey. The population surveyed cannot be considered representative of the general population living in these areas. Data from these areas are shown separately and are not combined with the total representative sample.

Table 2. Percentage Distribution of Preschool Children by Age and Sex: Egypt 1978

TOTAL REPRESENTATIVE SAMPLE[a]

Age in Months	Male	Female	Total[b]
6-11	5.3%	4.8%	10.1% (809)
12-23	11.5%	11.0%	22.5% (1816)
24-35	10.5%	10.1%	20.7% (1657)
36-47	10.1%	7.5%	17.6% (1422)
48-59	8.7%	7.3%	16.0% (1267)
60-71	6.9%	6.3%	13.2% (1045)
Total	52.9%	47.1%	100.0% (8016)

CAIRO-GIZA AND ALEXANDRIA[a]

Age in Months	Male	Female	Total[b]
6-11	6.4%	7.2%	13.6% (225)
12-23	10.6%	10.0%	20.6% (369)
24-35	9.8%	9.5%	19.3% (345)
36-47	9.6%	8.0%	17.6% (314)
48-59	8.2%	7.8%	16.0% (294)
60-71	6.3%	6.7%	13.0% (231)
Total	50.8%	49.2%	100.0% (1778)

[a] See Table 1 for description of geographic areas.

[b] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

DATA PRESENTATION

Anthropometry

Measurements of linear growth and body mass are key indices for characterizing the nutrition status of children. The risk of undernutrition for a population increases as the prevalence of low anthropometric values increases. The use of anthropometric indices, based on use of an appropriate reference population and selected cutoff values for defining undernutrition, both acute and chronic, and overweight, permits a presentation of the magnitude and distribution of these common forms of malnutrition in a population.

The index of weight for height relates body mass to stature. Inadequate food intake of only a few weeks may lead to acute undernutrition or wasting, characterized by a low weight for height value.

Linear retardation in growth does not occur in a short-term episode of nutritional deficiency, but frequent episodes or a sustained period of inadequate nutrition may retard normal growth, resulting in an individual who is stunted or short for his age. Although improvement in nutrition may decrease the stature deficiency over a subsequent period of time, complete "catch-up," i.e., normal height for age, may not occur if the period of growth retardation has been prolonged.

In the past the most frequently used anthropometric index of nutrition status has been weight for age. Successive weight measurements of a child over a prolonged time interval provide a valid longitudinal indication of the nutritional status of a child. A single weight for age measurement of a child is less useful since a low weight for age value cannot distinguish a thin but tall child who is wasted from a well-proportioned, stunted child who may have been chronically undernourished.

Survey measurement comparisons with reference population values utilize percentile distributions and statistical parameters such as percent of median and Z-score (standard deviation) values. Percent of median is a useful parameter for expressing anthropometric data from developing countries in which substantially large numbers of children have values below the 5th or 3rd centile. Percent of median, by definition, has a fixed relation to the median at all values. However, it does not identify a fixed proportion of the distribution of values of a reference population. Standard deviation describes the approximate probability distribution of values and does not have a constant relation to the median value. Z-score derived values of the outer distributions may thus not conform to percent of median values but do conform to the actual distributions in the reference population.

In periods of rapid growth, the percent of median curve may be higher and rise less steeply than a curve based on standard deviation values and thus define a greater prevalence of persons with low value. In periods of slow growth these relationships may be in the opposite direction.

Reference Population

In the survey report, tabular presentations of prevalences and distributions of wasting and stunting are based upon computations using percentiles, S.D. scores and percentages of reference median values. The National Center for Health Statistics/Center for Disease Control reference data were utilized for anthropometry. Further details on reference populations and their use are found in Appendix 7 and Appendix 8.

Indices and Cutoff Levels

Severe wasting (acute undernutrition) is defined for survey purposes as a weight for height value less than 80 percent of the median value of the reference population. Moderate wasting is defined as a weight for height value between 80 and 85 percent, and overweight is defined as a weight for height value 120 percent or greater than the reference median.

To be useful as an index of stunting or chronic undernutrition, height for age requires an accurate estimation of children's age; often difficult to obtain in many societies. Stunting is defined

for survey purposes as a height for age value less than 90 percent of the median of the reference population. Stunting under 85 percent of median is considered severe, and between 85 and 90 percent, moderate.

Utilizing weight for height to identify wasting or the acute component of undernutrition, and height for age to identify stunting as the chronic component, Waterlow[10] and others[11] have suggested a classification of nutrition status in a population of children by four categories: "normal," "wasting," "stunting," and "concurrent wasting and stunting." Children below 80 percent of reference median weight for height, but over 90 percent of median height for age are considered to show wasting alone. Similarly, they show stunting alone if they are below 90 percent of reference median height for age, but are 80 percent or more of median weight for height. Children below these cutoff levels for both weight for height and height for age have concurrent wasting and stunting, and have been shown to be at increased risk of morbidity and mortality.

Weight for age data are presented using a classification similar to that proposed by Gomez to permit comparisons with previous survey data. In this classification, children 75-89.9 percent of reference median are considered to have first degree undernutrition; those 60-74.9 percent, second degree undernutrition, and those less than 60 percent, third degree. This classification groups all children with weight for age 90 percent or greater than reference median as normal, and does not separate overweight children from those of "normal" weight.

Prevalence data using arbitrarily established cutoff points for anthropometric indices do not of themselves provide an adequate description of the nutrition status of a population. The distribution patterns of the anthropometric values within a population provide further necessary and useful information. Substantial difference in distributions of nutritional index values among different population groups strongly influence interpretations regarding the nutritional status of that population, and are important in determining priorities for remedial intervention.

Figures comparing distributions between areas of Egypt use standard deviation scores derived from the NCHS/CDC reference population "normalized" distribution curves. For the interested reader, anthropometric tables in terms of standard deviation scores are found in Appendix 8.

Hemoglobin

The prevalences of low hemoglobin values and the distribution of hemoglobin values in different age groups and areas of Egypt describe the general problem of anemia in young children in Egypt. The survey also provides information on anemia among Egyptian women who have at least one child age 6-71 months.

Cutoff Levels

In general, the survey uses WHO criteria for anemia in the presentation of hemoglobin data. WHO defines anemia for children

6-71 months of age and for pregnant women as a hemoglobin value less than 11 gms/100 ml. For nonpregnant women a value less than 12 gms/100 ml is considered to indicate anemia.

SURVEY RESULTS AND DISCUSSION

Survey results for each nutrition index are generally presented as a written description and/or a table for one or more universe or universe aggregates. The tables indicate the prevalence of the indicated variable and the sample size. Results obtained from the special group are included in many tables to permit easy comparisons with survey results. A discussion follows each major section.

Data from the 11 universes of the Nutrition Status Survey were analyzed individually and as various aggregates. The universe aggregates and comparisons are as follows:

- Rural Universe 1-4 Aggregate (Lower Egypt)
- Rural Universe 5-6 Aggregate (Upper Egypt)
- Universe 7 (large villages: 10,000-49,999)
- Universe 8 (small towns: 10,000-49,999)
- Universe 9 (city universe - population units greater than 50,000 excluding Cairo-Giza, and Alexandria)

- Universes 10 and 11 (selected subpopulation of Cairo-Giza, and Alexandria)

- Universe 1-9 Aggregate to describe the total Egyptian universe from which a standardized population proportionate sample was drawn. Note that universes 10 and 11 are excluded from this aggregate as the sampling procedure and the universe criteria were defined on a different basis than were those of universes 1-9.

When universes are aggregated the stated prevalence values are based on weighted data to correct for the influence of unequal populations.

I. ANTHROPOMETRY - (BY GEOGRAPHIC AREAS)

A. Results

1. Weight for Height

Table 3 presents the distributions of weight for height values in the geographic areas and in the Special Group. For the total representative sample 0.6 percent of the children 6-71 months of age are wasted (acutely undernourished), 3.1 percent are overweight. The prevalences of wasting and overweight vary between geographical areas, but, due to low prevalences, these differences have little practical meaning.

Table 3. Percentage Distribution of Preschool Children by Weight for Height Classes and Geographic Area: Egypt 1978

	Percentage of Reference Median				
	Acute Undernutrition		Normal	Over-weight	
Geographic Area[a]	Severe <80.0	Moderate 80.0-84.9	85.0-119.9	120.0+	Total[b]
Lower Rural	0.7%	1.7%	94.2%	3.4%	100.0% (3552)
Upper Rural	0.8%	2.1%	94.7%	2.5%	100.0% (1784)
Large Villages	0.3%	1.6%	94.4%	3.7%	100.0% (889)
Small Towns	0.6%	1.9%	94.9%	2.7%	100.0% (894)
Small Cities	0.3%	1.0%	96.0%	2.7%	100.0% (897)
Total Representative Sample	0.6%	1.7%	94.7%	3.1%	100.0% (8016)
Cairo-Giza	0.8%	2.7%	94.0%	2.5%	100.0% (890)
Alexandria	0.2%	0.3%	95.9%	3.5%	100.0% (888)
Special Group	0.1%	1.0%	94.1%	4.8%	100.0% (1883)

[a] See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

The weight for height distribution curves for survey children, the special group, and the NCHS/CDC reference population are shown in Figure 2.

The weight for height distribution curves for Egyptian preschool-age children in the total representative sample are closely similar to those of the NCHS/CDC reference population. Among various universes the distribution varies somewhat from the aggregate distribution, but as stated above, the numbers of wasted children in any one universe are small, varying from only 2 to 9 children.

Among the special group children only 2 of 1,883 children showed anthropometric evidence of wasting.

2. Height for Age

The height for age distribution and prevalence of stunting (chronic undernutrition) in Egyptian children are shown in Table 4.

The prevalence of stunting ranges from 10.6 to 27.5 percent among areas. There is considerable variation among the rural universes both in prevalence of stunting and in distribution of height for age data, with Upper Rural Egypt having a significantly higher prevalence than Lower Rural Egypt. The prevalence of stunting among children from the

FIGURE 2. EGYPT NATIONAL NUTRITION ASSESSMENT SURVEY, 1978
WEIGHT FOR HEIGHT Z-SCORE DISTRIBUTION

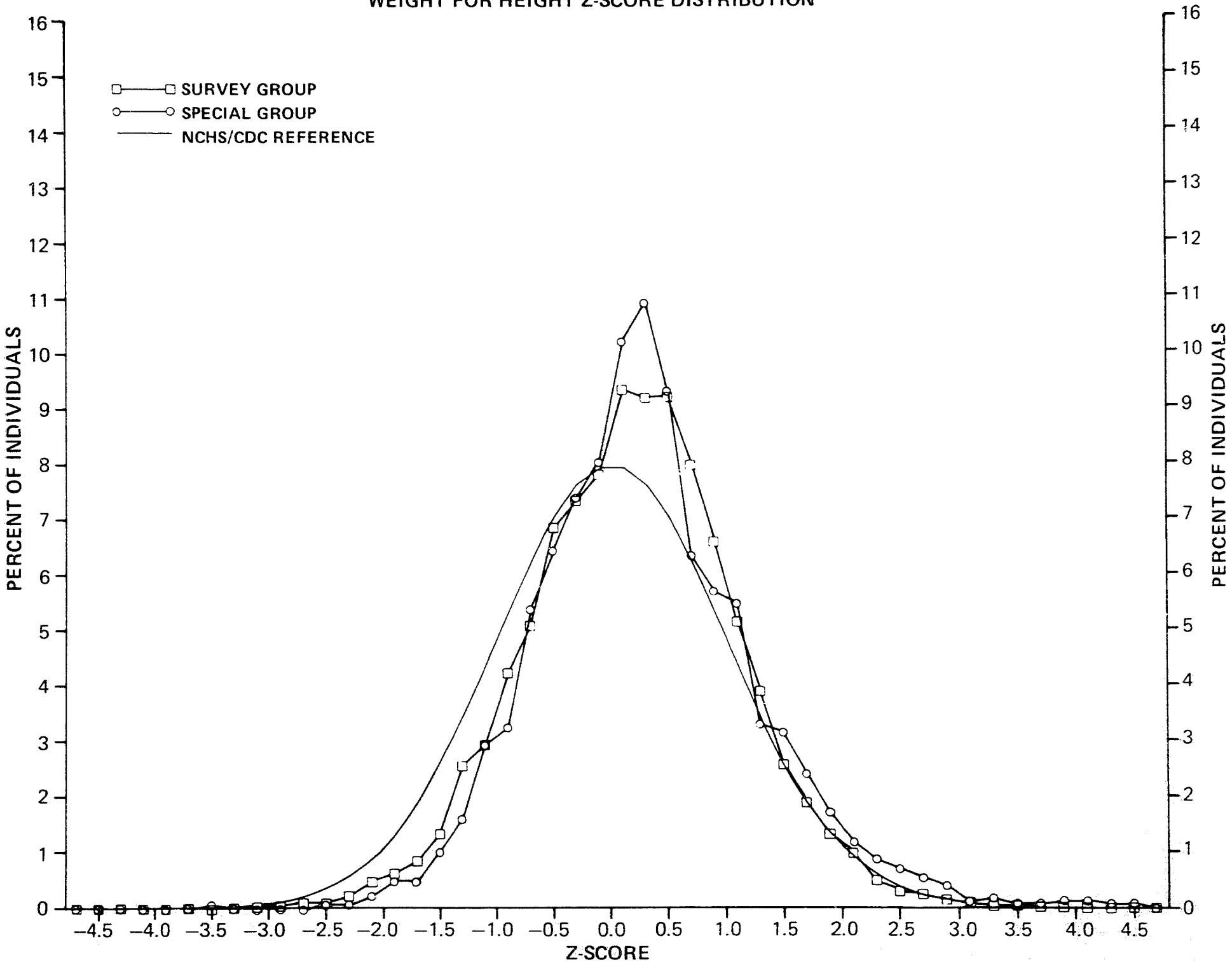


Table 4. Percentage Distribution of Preschool Children by Height for Age Classes and Geographic Area: Egypt 1978

Geographic Area[a]	Percentage of Reference Median				
	Chronic Undernutrition		Normal		
	Severe <85.0	Moderate 85.0-89.9	90.0-94.9	95.0+	Total[b]
Lower Rural	4.6%	17.2%	41.8%	36.4%	100.0% (3552)
Upper Rural	6.7%	20.8%	39.3%	33.1%	100.0% (1784)
Large Villages	4.6%	19.7%	44.7%	31.0%	100.0% (889)
Small Towns	2.9%	11.9%	41.4%	43.8%	100.0% (894)
Small Cities	1.7%	8.9%	33.2%	56.2%	100.0% (897)
Total Representative Sample	4.5%	16.7%	40.4%	38.5%	100.0% (8016)
Cairo-Giza	3.5%	15.5%	41.1%	39.9%	100.0% (890)
Alexandria	2.9%	12.8%	43.2%	41.0%	100.0% (888)
Special Group	0.1%	1.0%	9.7%	89.3%	100.0% (1883)

[a] See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

less-advantaged population of Cairo-Giza and Alexandria is midway between rural and the small city populations. The 1.1 percent prevalence of stunting in the special group is only 1/19 the prevalence found in universe 1-9 aggregate.

Figure 3 shows the distribution of height for age values for the survey group, the special group, and the NCHS/CDC reference population. The curve for the special group follows almost exactly that of the reference population, while that of the survey group indicates that they are shorter by about 1.5 standard deviations.

3. Weight for Age (Gomez-Classification)

The distribution of weight for age values of children 6-71 months of age is shown in Table 5 for universes, the total representative sample, and for the special group using the Gomez classification of malnutrition in relation to the NCHS/CDC reference population. The highest prevalences of combined second and third degree undernutrition are in the rural areas of Egypt followed by the less advantaged population of Cairo-Giza. No children in the special group showed third degree undernutrition, and only 0.5 percent showed second degree undernutrition.

FIGURE 3. EGYPT NATIONAL NUTRITION ASSESSMENT SURVEY, 1978
HEIGHT FOR AGE Z-SCORE DISTRIBUTION

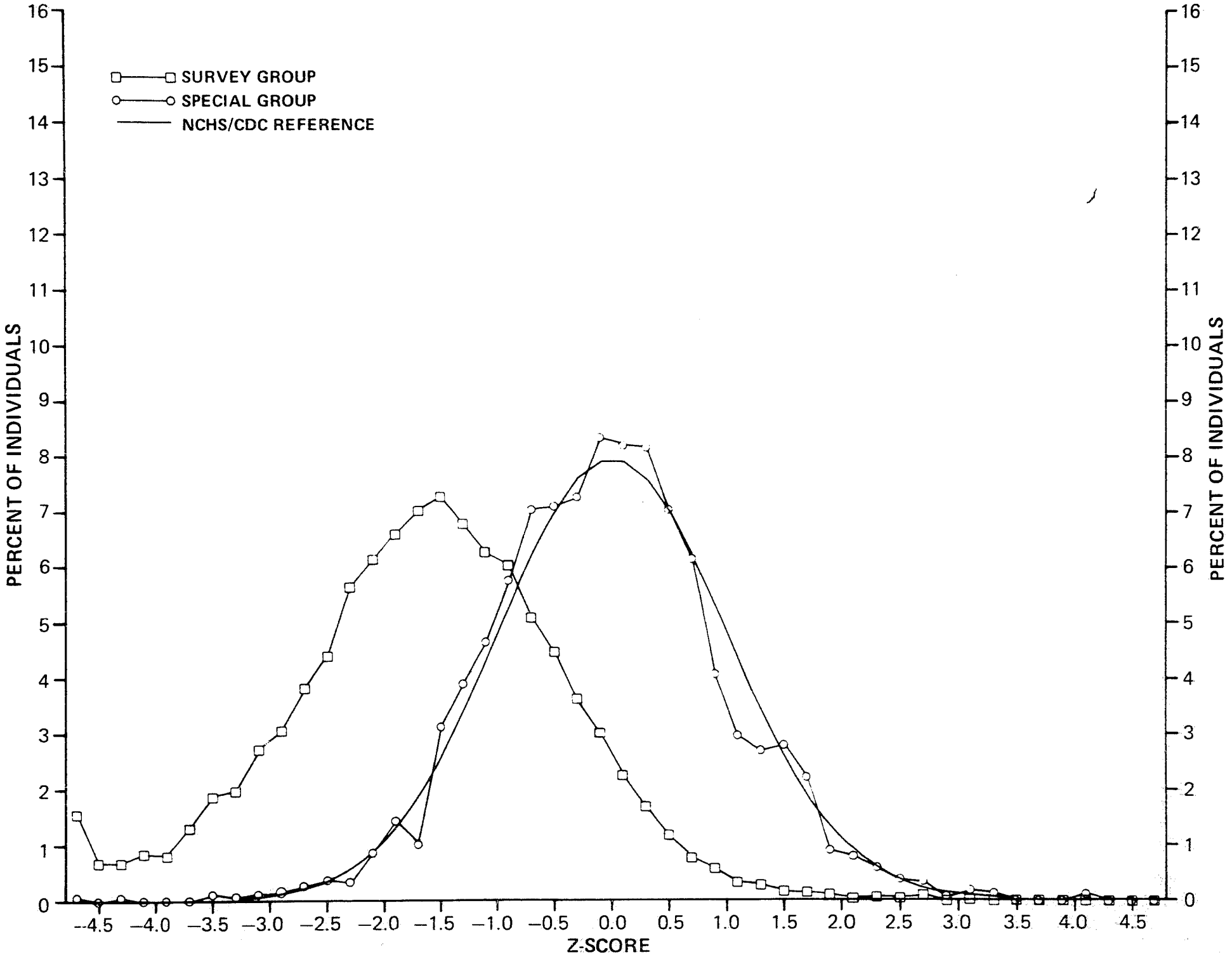


Table 5. Percentage Distribution of Preschool Children by Gomez Classes and Geographic Area: Egypt 1978

Geographic Area[a/]	Degree of Undernutrition[b/] 3° < 60.0	2° 60.0-74.9	1° 75.0-89.9	Normal 90.0+	Total[c/]
Lower Rural	0.6%	7.8%	37.4%	54.2%	100.0% (3552)
Upper Rural	1.0%	11.9%	41.9%	45.2%	100.0% (1784)
Large Villages	1.2%	8.5%	42.4%	47.8%	100.0% (889)
Small Towns	0.7%	6.0%	35.5%	57.8%	100.0% (894)
Small Cities	0.2%	3.6%	32.6%	63.7%	100.0% (897)
Total Representative Sample	0.8%	8.0%	38.5%	52.7%	100.0% (8016)
Cairo-Giza	0.7%	8.4%	41.7%	49.2%	100.0% (890)
Alexandria	0.5%	4.3%	38.3%	57.0%	100.0% (888)
Special Group	-	0.5%	14.0%	85.6%	100.0% (1883)

a/ See Table 1 for description of geographic areas and sample universes.

b/ Percentage of reference median weight for age.

c/ All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

4. Wasting, Stunting, and Concurrent Wasting and Stunting (Waterlow Classification)

The Waterlow cross-classification of height for age and weight for height which has been used to define nutritional status is presented in Table 6. Only 0.3 percent of children are in the critical category of combined wasting and stunting. None of the special group children were in the concurrent wasting and stunting category.

B. Discussion

The low prevalence of wasting, and the close approximation of the distribution of weight for height of the children of preschool-age in Egypt to that of the NCHS/CDC reference population suggest that for the 6-71 month age group, wasting is not a public health problem. On the other hand, 3.1 percent of the Egyptian preschool population are overweight as defined by a weight for height greater than 120 percent of the reference median. This three percent prevalence of overweight is similar to that seen in the NCHS/CDC reference population, which itself is probably overweight. Overweight in the presence of retarded linear growth suggests that adequate quantities of food are available presently but may not have been in the past, or that the nutrient quality of the food may have been or is presently inadequate.

Table 6. Percentage Distribution of Preschool Children by Waterlow Classes and Geographic Area: Egypt 1978

Geographic Area[a/]	Waterlow Class				
	Wasting	Stunting	Wasting & Stunting	Normal	Total[b/]
Lower Rural	0.5%	21.5%	0.3%	77.8%	100.0% (3552)
Upper Rural	0.2%	27.0%	0.6%	72.2%	100.0% (1784)
Large Villages	-	24.0%	0.3%	75.7%	100.0% (889)
Small Towns	0.3%	14.5%	0.2%	84.9%	100.0% (894)
Small Cities	0.3%	10.6%	-	89.1%	100.0% (897)
Total Representative Sample	0.3%	20.8%	0.3%	78.6%	100.0% (8016)
Cairo-Giza	0.6%	18.8%	0.2%	80.4%	100.0% (890)
Alexandria	0.1%	15.7%	0.1%	84.1%	100.0% (888)
Special Group	0.1%	1.1%	-	98.8%	100.0% (1883)

[a/] See Table 1 for description of geographic areas and sample universes.

[b/] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

[c/] Wasting: <80% weight-for-height.
Stunting: <90% height-for-age.

In general, stunting results from recurrent qualitative and/or quantitative long-term dietary inadequacy. The effects of dietary inadequacies on stature are subtle and may operate over long periods of time. Growth retardation in an individual or a group may represent a protective attempt to adapt to an inadequate supply of the necessary nutritional building blocks, since nutrient requirements in general are lower for children of shorter stature. Firm data on the nature of morbidity and mortality which may result from stunting is lacking.

II. ANTHROPOMETRY - (BY AGE GROUPS)

A. Results

1. Weight for Height

Table 7 displays the percent distribution weight for height in children by age groups. The prevalence of wasting is highest in the 6-11 and 12-23 month age group. The prevalence of overweight children is highest in the 36-47 month age group. Further analysis, not shown in the table, reveals a tendency for higher prevalences of overweight among girls than boys, in all age groups.

The age-related prevalences for acute undernutrition for children in the disadvantaged Cairo-Giza and Alexandria areas are essentially the same as in the total representative sample. A higher prevalence of overweight children is seen in the 36-47 month age group.

Table 7. Percentage Distribution of Preschool Children[a] by Weight for Height Classes and Age: Egypt 1978

Age in Months	Percentage of Reference Median				
	Acute Undernutrition		Normal	Over-weight	Total[b]
	< 80.0	80.0-84.9	85.0-119.9	120.0+	
6-11	1.5%	3.8%	91.5%	3.1%	100.0% (809)
12-23	1.2%	3.8%	94.0%	1.0%	100.0% (1816)
24-35	0.3%	1.2%	95.3%	3.2%	100.0% (1657)
36-47	0.2%	0.4%	93.3%	6.1%	100.0% (1422)
48-59	0.2%	0.2%	96.5%	3.1%	100.0% (1267)
60-71	0.2%	0.4%	97.2%	2.2%	100.0% (1045)
Total	0.6%	1.7%	94.7%	3.1%	100.0% (8016)

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

2. Height for Age

The prevalences of stunting for the total representative sample are shown in Table 8. The peak prevalence of stunting occurs in the 12-35 month age groups. Differences in age specific prevalences between the universes suggest that the prevalence of stunting is generally higher in the rural areas than in the urban ones.

3. Weight for Age (Gomez Classification)

A weight for age distribution by age groups by the Gomez classification, is shown in Table 9. The prevalence of third degree malnutrition is highest in the 6-11 month age group. The highest prevalence of combined second and third degree malnutrition is found in the 12-23 month age group.

4. Wasting, Stunting, and Concurrent Wasting and Stunting Waterlow Classes)

The Waterlow presentation of nutrition status of children in the total representative sample is shown in Table 10.

B. Discussion

As noted previously, wasting or acute undernutrition cannot be considered a public health problem among the total sample of children of preschool-age in any particular region of Egypt, but it does assume moderate proportions in the 6-23 month age group.

Table 8. Percentage Distribution of Preschool Children[a] by Height for Age Classes and Age: Egypt 1978

Age in Months	Percentage of Reference Median				
	Chronic Undernutrition		Normal		
	<85.0	85.0-89.9	90.0-94.9	95.0+	Total[b]
6-11	2.2%	8.0%	33.2%	56.6%	100.0% (809)
12-23	5.7%	20.5%	39.4%	34.4%	100.0% (1816)
24-35	6.1%	20.4%	40.0%	33.4%	100.0% (1657)
36-47	5.6%	17.0%	40.2%	37.2%	100.0% (1422)
48-59	3.5%	12.8%	43.0%	40.8%	100.0% (1267)
60-71	1.0%	15.0%	45.1%	38.9%	100.0% (1045)
Total	4.5%	16.7%	40.4%	38.5%	100.0% (8016)

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

Table 9. Percentage Distribution of Preschool Children[a] by Gomez Classes and Age: Egypt 1978

Age in Months	Degree of Undernutrition[b]				
	3°	2°	1°	Normal	
	<60.0	60.0-74.9	75.0-89.9	90.0+	Total[c]
6-11	2.5%	8.4%	38.6%	50.5%	100.0% (809)
12-23	1.8%	16.7%	46.0%	35.5%	100.0% (1816)
24-35	0.5%	7.9%	35.8%	55.8%	100.0% (1657)
36-47	-	4.5%	34.1%	61.3%	100.0% (1422)
48-59	-	3.5%	35.5%	61.1%	100.0% (1267)
60-71	-	3.5%	39.1%	57.4%	100.0% (1045)
Total	0.8%	8.0%	38.5%	52.7%	100.0% (8016)

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] Percentage of reference median weight for age.

[c] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

Table 10. Percentage Distribution of Preschool Children[a] by Waterlow Classes and Age: Egypt 1978

Age in Months	Waterlow Class				
	Normal	Wasting	Stunting	Wasting & Stunting	Total[b]
6-11	89.2%	0.6%	9.3%	0.9%	100.0% (809)
12-23	73.2%	0.5%	25.5%	0.7%	100.0% (1816)
24-35	73.4%	0.1%	26.3%	0.2%	100.0% (1657)
36-47	77.2%	0.2%	22.6%	-	100.0% (1422)
48-59	83.5%	0.2%	16.3%	-	100.0% (1267)
60-71	83.8%	0.2%	16.0%	-	100.0% (1045)
Total	78.6%	0.3%	10.6%	0.3%	100.0% (8016)

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

During this age period the nutritional needs of children are high and the source of food usually changes from breast milk alone, through breast milk plus supplemental foods, to complete cessation of breast-feeding. In addition, younger children are more susceptible to acute infections and to dehydration which may accompany these infections.

The prevalence of overweight children in Egypt is highest in the 36-47 month age group. The weight for height distribution of Egyptian children in this age group closely approximates that of the NCHS/CDC reference population, being in fact slightly heavier still.

Survey results suggest that further investigation or remedial programs be targeted to the 6-23 month age group in which the prevalence of low weight for height is highest.

In Egypt stunting (retardation in linear growth) begins during infancy. Available data suggests that mean birth weight of Egyptian infants is similar, even possibly slightly higher, than that of infants in the United States. As age increases, the long-term effects of inadequate nutrition become cumulative and more prominent. In Egypt the prevalence of stunting increases through 35 months, and then becomes substantially less among older children of preschool-age. This suggests a capability for

considerable catch-up growth in height, or the possibility of higher mortality among stunted children prior to 36 months. The question of possible differential mortality between shorter and taller children needs further research. This pattern also may reflect differential feeding habits and availability of food to different age groups. Usually by 3 years of age, and certainly by 4 years, most children no longer depend so directly on another person for food, and can compete more favorably in the family food chain.

The different implications of a tall, thin child and a short, well-proportioned child of the same weight for age are not considered in the Gomez classification of nutrition status. By their first birthday, approximately one out of nine Egyptian infants have fallen behind in weight for age, as measured by combined second and third degree Gomez classes. The portion of this group which results from low weight at birth is unknown. The increased number of children in the combined Gomez 2° and 3° classes in the 12-23 month age group suggests calorie protein, and possibly other nutritional inadequacies relative to demands. This inadequacy is reflected primarily in the increasing linear growth deficit noted at this age, and to a lesser degree, in the slight increase in wasting also seen. The Waterlow classification of survey results indicates that the 6-23 month age group is at the

greatest immediate nutritional risk, undoubtedly due to their high nutritional requirements for growth, marked changes in food sources and, in many instances, multiple episodes of acute infection.

In summary, among Egyptian children of preschool-age, wasting is of low prevalence, but is most common in the 6-23 month age group, and stunting, a condition of much greater prevalence, increases with age through 35 months and then decreases substantially in the older age groups. Concurrent wasting and stunting is of extremely low prevalence although it is most frequent in the 6-23 month age group. Overweight is most common among 36-47 month old children, but it occurs at approximately the same rate as in NCHS/CDC reference children.

III. HEMOGLOBIN STATUS (CHILDREN)

A. Results

Hemoglobin values were available on 1,964 children representing a 20 percent subsample of the survey children.

1. Geographic Area

Table 11 shows the percent distribution of hemoglobin values in preschool children by geographic area. A hemoglobin value of less than 11.0 gm/100 ml is defined as anemia, and a hemoglobin of less than 9.5 gm/100 ml is considered indicative of more severe anemia. In the nine universes sampled on a population-proportionate basis, anemia is most prevalent in rural populations and decreases with increasing urbanization

Table 11. Percentage Distribution of Preschool Children by Hemoglobin Values and Geographic Area: Egypt 1978

Geographic Area[a]	Hemoglobin Value (gms/100ml)[b] < 9.5	< 11.0	11.0+	Total[c]
Lower Rural	14.9%	44.6%	55.4%	100.0% (715)
Upper Rural	16.5%	43.4%	56.6%	100.0% (358)
Large Villages	11.9%	39.2%	60.8%	100.0% (176)
Small Towns	8.3%	30.5%	69.4%	100.0% (180)
Small Cities	3.3%	23.3%	76.7%	100.0% (180)
Total Representative Sample	12.2%	38.4%	61.6%	100.0% (1609)
Cairo-Giza	5.6%	35.5%	64.4%	100.0% (177)
Alexandria	11.8%	42.1%	57.9%	100.0% (178)
Special Group	1.9%	16.9%	83.0%	100.0% (359)

[a] See Table 1 for description of geographic areas and sample universes.

[b] Hemoglobin value less than 9.5 gm/100ml is indicative of severe anemia. Hemoglobin value less than 11 gm/100ml is defined by WHO as indicative of anemia.

[c] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

and population size. In the lower socio-economic subsamples of Cairo and Alexandria (universes 10 and 11), anemia is more prevalent.

2. Age

Table 12A shows the mean hemoglobin values for each age group in the total representative sample and the percent of each age group considered to be anemic (hemoglobin less than 11 grams/100 ml).

The highest prevalence of anemia and the lowest mean hemoglobin is seen in the 12-23 month age group.

3. Anemia and Stunting (Chronic Undernutrition)

The prevalence of stunting among children who were anemic is shown in Table 13A. Stunting is nearly two times as common in anemic than in non-anemic children. The prevalence of anemia among children who were stunted is shown in Table 13B.

B. Discussion

Since hemoglobin values normally increase from age 6 months to 6 years, the use of a single 11 gms/100 ml cutoff level for this age range results in relatively fewer older children and more younger children being identified as anemic. Using a more appropriate cutoff level of 10 gm/100 ml for children age 6 months to 2 years results in considerably lower prevalences of anemia in these children (Table 12B).

Table 12A. Mean Hemoglobin Values and Prevalence of Anemia among Preschool Children[a] by Age: Egypt 1978

Age in Months	Mean[b] Hemoglobin (±SD) gms/100ml	Percent Anemic (Hbg < 11gms/100ml)	Total Number Examined[c]
6-11	10.7 (1.4)	57.3%	169
12-23	10.4 (1.4)	59.4%	383
24-35	11.1 (1.5)	41.1%	338
36-47	11.5 (1.4)	31.9%	270
48-59	12.1 (1.4)	16.6%	234
60-71	12.2 (1.2)	12.8%	215
Total	11.2 (1.6)	38.4%	1609

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] Mean hemoglobin in gms/100ml blood; ±SD = plus or minus standard deviation from the mean.

[c] Total number of children for whom hemoglobin values were available. All percentages are weighted by universe population proportions.

Table 12B. Prevalence of Anemia[b] Among Preschool Children by Age and Geographic Area[a]: Egypt, 1978

Age in Months	Lower Rural	Upper Rural	Large Villages	Small Towns	Small Cities	Total Representative Sample
6-11						
% Anemic[c]	23.9	26.6	26.3	21.1	10.5	22.5
Number	78	34	19	19	19	169
12-23						
% Anemic	35.2	37.1	23.4	30.0	12.9	30.0
Number	176	89	47	40	31	383
24-35						
% Anemic	50.4	45.2	46.2	32.5	21.4	41.1
Number	146	71	39	40	42	338
36-47						
% Anemic	45.9	33.0	29.2	14.8	16.7	31.9
Number	116	73	24	27	30	270
48-59						
% Anemic	13.6	28.1	15.0	8.3	13.8	16.6
Number	111	50	20	24	29	234
60-71						
% Anemic	21.9	14.5	11.1	3.3	6.9	12.8
Number	88	41	27	30	29	215
Total						
% Anemic	33.5	33.0	26.7	20.0	14.4	27.6
Number	715	358	176	180	180	1609

[a] See Table 1 for description of geographic areas and sample universes.
[b] Anemia defined as hemoglobin value less than 10 gm/100 ml for ages 6-23 mos. and less than 11 gm/100 ml for ages 24-71 mos.
[c] All percentages are weighted by universe population proportions.

Table 13A. Prevalence of Chronic Undernutrition in Preschool Children[a] by Hemoglobin Value: Egypt 1978

	Chronic Undernutrition[c]	Normal	Total[d]
Anemic[b]	31.4% (194)	68.6% (443)	100.0% (637)
Non-Anemic	17.4% (162)	82.6% (810)	100.0% (972)
Total	22.8% (356)	77.2% (1253)	100.0% (1609)

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] Anemia defined by WHO as hemoglobin value less than 11 gm/100 ml.

[c] Height for age less than 90 percent of reference median.

[d] Total number of children in the Total Representative Sample for whom hemoglobin values were available. All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

Table 13B. Prevalence of Anemia in Preschool Age Children[a] by Height for Age Category: Egypt 1978

Height for Age	Hemoglobin Concentration <11.0g/100ml	11.0g/100ml and Greater	Total[c]
Stunted[b]	52.9% (194)	47.1% (162)	100.0% (356)
Normal	34.1% (443)	65.9% (810)	100.0% (1253)
Total	38.4% (637)	61.6% (972)	100.0% (1609)

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] Height for age less than 90% of reference median.

[c] Total number of children in the Total Representative Sample for whom hemoglobin values were available. All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

Schistosomiasis, a health problem of major proportions throughout much of rural Egypt is a significant cause of anemia in the general rural population, but is probably not a major cause of anemia in preschool-age children. Malaria also is not thought to be a significant cause of anemia in this age group. The remaining major contributors to anemia in the preschool-age group are probably nutritional deficiency of iron and possibly folate, and other chronic parasitic and microbial infections. The survey did not attempt to define the individual contributions of these factors to the anemia, but it is generally thought that a relative deficiency of absorbable dietary iron is the primary cause.

Anemia is an important problem in preschool-age children throughout Egypt. It is less prevalent in urban areas than rural areas. The highest prevalence of severe anemia and the lowest mean hemoglobin levels occur in the 12-23 month age group. This suggests that the availability of iron to the child during weaning and during the period of transition to the household diet is particularly inadequate.

Although inadequate numbers of hemoglobin values for special group children are available for detailed age group comparison with the general survey population, our results suggest much lower rates of anemia in these more advantaged Egyptian children.

IV. HEMOGLOBIN STATUS (MOTHERS)

The hemoglobin data available on mothers of survey children is not representative of the general population of women in Egypt since only those women with at least one child 6-71 months of age were included in the survey. Survey criteria for anemia in non-pregnant women, whether lactating or not, is a hemoglobin value less than 12 gm/100 ml. In pregnant women it is a value less than 10 gm/100 ml. A value less than 9.5 gm/100 ml is considered to indicate more severe anemia.

A. Results

The distribution of hemoglobin values among mothers of survey children in each geographic area is shown in Table 14. The prevalence of anemia in these women varies among rural universes, and is generally lower in the urban universes. In universe 11, however, the women from the lower socio-economic population of Alexandria have the highest prevalence of anemia. Table 15 shows the prevalence of anemia in survey mothers of different physiological status: non-pregnant, pregnant, and lactating. Except in universe 7, non-pregnant women, compared with pregnant or lactating women, have the lowest prevalence of anemia. Non-pregnant women in general have the highest mean hemoglobin value, 13.1 gm/100 ml.

The common observation of a greater occurrence of anemia among pregnant and lactating women holds true among Egyptian

Table 14. Percentage Distribution of Hemoglobin Values Among Mothers of Preschool Children by Geographic Area: Egypt 1978

Geographic Area[a]	Hemoglobin Value (gms/100ml)				
	<9.5	9.5-10.9	11.0-11.9	12.0+	Total[b]
Lower Rural	5.2%	7.6%	17.0%	70.2%	100.0% (642)
Upper Rural	2.4%	10.8%	11.1%	75.7%	100.0% (334)
Large Villages	8.6%	9.2%	17.2%	65.0%	100.0% (163)
Small Towns	4.2%	6.0%	15.5%	74.4%	100.0% (168)
Small Cities	0.6%	4.1%	15.8%	79.5%	100.0% (171)
Total Representative Sample	4.3%	7.9%	15.3%	72.5%	100.0% (1478)
Cairo-Giza	1.8%	8.5%	18.3%	71.3%	100.0% (164)
Alexandria	6.1%	10.9%	18.2%	64.8%	100.0% (165)

[a] See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions. The actual number of persons surveyed are given in parentheses.

Table 15: Mean Hemoglobin Values and Prevalence of Anemia among Survey Mothers[a] of Differing Physiological Status: Egypt 1978

Physiological Status	Mean Hemoglobin (±SD)[b] gms/100ml	Percent Anemic[c]	Total Number Examined[d]
Non-pregnant	13.1 (1.6)	17.0%	402
Lactating	12.8 (1.6)	25.3%	823
Pregnant	11.8 (1.5)	22.1%	253
Total	12.7 (1.7)	22.4%	1478

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] Mean hemoglobin in gms/100ml blood; ±SD = plus or minus standard deviation from the mean.

[c] Anemia is defined as a hemoglobin value of less than 12.0gm/100ml in non-pregnant and/or lactating women, and of less than 11.0gm/100ml in pregnant women.

[d] Total number of mothers in the Total Representative Sample for whom hemoglobin values were available. All percentages are weighted by universe population proportions.

mothers. If anemia in lactating women is defined as a hemoglobin value less than 12 gms/100 ml, as defined in this survey and as recommended by WHO, then an anemia problem of major proportions exists among lactating mothers in Egypt. The demands of a breast-feeding child on a mother's iron stores increase maternal iron requirements. Prolonged breast-feeding with continued inadequate maternal dietary iron replacement thus leads to increasingly severe maternal anemia. Such an association in Egypt appears to be present among rural lactating mothers who tend to breast-feed longer, as compared to urban lactating mothers who tend to breast-feed a shorter period of time. Several confounding factors cloud this association, however, the most important being dietary differences between rural and urban mothers.

V. NUTRITION-RELATED CLINICAL SIGNS AND SYMPTOMS IN EGYPTIAN PRESCHOOL-AGE CHILDREN

A. Results

1. Pedal Edema

Seventeen children (0.2 percent) of the 9,794 examined children had bilateral pedal edema. How many of these children may have had kwashiorkor was not determined, but in any event the prevalence of this condition is quite low.

2. Bitot's Spots

Only four of the nearly 10,000 sample children were found to have a Bitot's spot.

3. Corneal Scars

Corneal scars were noted in 16 children of the total sample.

4. Night Blindness

A history of night blindness was obtained on 27 (0.4 percent) of the 6,575 sample children who were 24 months or older.

5. Angular Stomatitis

Angular stomatitis was observed in 286 (2.9 percent) of the total sample children. Among geographic areas the prevalence ranged from 0.8 percent to 4.7 percent. The prevalence increased with increasing age, reaching 5.0 percent in the 48-71 month age group.

6. Signs of Vitamin D Deficiency

The interviewers elicited the presence or absence of six clinical signs commonly associated with vitamin D deficiency, either present or in the past. These signs were (a) craniotabes, (b) frontal bossing, (c) rachitic rosary or deformed chest, (d) enlarged wrist or double malleoli, (e) leg deformity (bowing) in children 12 months or older, and (f) open anterior fontanelle in children 24 months or older.

Radiological and biochemical procedures were not performed.

No children with craniotabes were observed. Interviewers observed frontal bossing in 3 percent of the total sample children. Of these, more than two-thirds were 6-35 months of age. A rachitic rosary or deformed chest was noted in 1.0 percent of sample children. Three-fourths of these children were 6-35 months of age. Findings suggestive of an abnormally enlarged epiphysis of either wrist were noted in 45 (0.5 percent) of the sample children. Approximately 80 percent of these children were 6-35 months of age. Among sample children 12 months and older, 189 children had bilateral bowing of the legs. The prevalence decreased from 2.3 percent in the 12-23 month group to 1.9 percent in the 60-71 month group. Among 6,575 sample children 24 months or older, 114 (1.7 percent) had an open anterior fontanelle. Of these children 93 percent were 24-35 months of age.

The finding of a single of these signs in a child is insufficient to establish the diagnosis of vitamin D deficiency. The likelihood of deficiency increases with an increasing number of signs occurring in a child. The firm diagnosis of vitamin D deficiency requires radiological and biochemical procedures, which were not done. Table 16 analyses, by age groups, the

Table 16. Occurrence in Egyptian Preschool Children Vitamin D Deficiency Associated Signs by Number of Signs and Age: Egypt 1978

Age in Months	Vitamin D Signs[a] None	Any One	Any Two	Any three or More	Total[b]
6-11	96.1%	3.1%	0.5%	0.2%	100.0% (809)
12-23	91.6%	6.5%	1.5%	0.4%	100.0% (1816)
24-35	88.8%	8.4%	2.6%	0.2%	100.0% (1657)
36-47	95.3%	4.3%	0.1%	0.3%	100.0% (1422)
48-59	96.7%	2.6%	0.6%	0.1%	100.0% (1267)
60-71	96.8%	2.3%	0.9%	-	100.0% (1045)
Geographic Area[c]					
Total Representative Sample	93.5%	5.0%	1.2%	0.2%	100.0% (8016)
Cairo-Giza Total	94.7%	4.7%	0.4%	0.1%	100.0% (890)
Alexandria Total	93.6%	5.6%	0.6%	0.2%	100.0% (888)

[a] Craniotabes, enlarged wrists, frontal bossing, chest rachitic beading, leg deformity, open anterior fontanelles. All signs were considered for ages 24-71 months; all but open anterior fontanelles were considered for ages 12-23 months; all but open anterior fontanelles and leg deformity were considered for ages 6-11 months.

[b] All percentages are for the representative portion of the sample and are weighted by universe population proportions.

[c] See Table 1 for description of geographic areas and sample universes.

number of children with one, two, and three or more clinical signs consistent with vitamin D deficiency. Only 1.2 percent of the sample children had more than one of these signs.

B. Discussion

Information collected on a specific clinical sign or signs is difficult to evaluate as an indicator of a specific nutrient deficiency in an individual or a population. Important constraints are (1) the non-specificity for a single deficiency of a clinical sign, (2) the frequent occurrence of a deficiency state in the absence of the clinical sign, and (3) the difficulty of standardizing the recognition of clinical signs.

Signs suggestive of specific vitamin deficiencies were infrequently observed in the survey population. The probable prevalence of these nutritional deficiencies is thus quite low within the preschool-age population. Important foci of specific nutrient deficiencies may, however, exist in Egypt in other age groups which our sampling and survey design did not include.

VI. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF THE SURVEY POPULATION

A. Results

1. Live Birth Order of Sample Children

A child who cries at birth is considered, for survey purposes, a live birth. Among sample children 18.7 percent were the first live birth of the mother; 16.7 the second

live birth; 27.0 percent either the third or fourth live births, and 37.6 the fifth or greater live birth. Urban sample children have a lower live birth order than rural sample children. The distribution of live birth order of children in the semi-educated populations of Cairo-Giza and Alexandria was more comparable to that of rural children than to that of the other urban children.

2. Household Size in Sample

A household is defined, for this survey, as all people who eat their major meal together. In the rural sample, household size averages 7.2 persons; in the small town sample it averages 6.4 persons, and in the sample of cities greater than 50,000 the average household size is 6.2 persons. Our results suggest that, with the exception of the Alexandria sample, household size tends to become smaller as urbanization increases.

3. Father's Literacy

The father's stated ability to read or write was ascertained from the father himself, or if not present, from the mother of the sample child. The literacy rate among 6,368 sample fathers was 42.7 percent.

4. Father's Education Level

If the father was present and could read or write, the interviewer recorded the highest level certificate of education he had received. The responses of 2,684 fathers were so tabulated. Of these fathers 61.4 percent had received no certificate. For 12.9 percent, the primary certificate was the highest certificate obtained; for 20.3 percent either a preparatory or secondary certificate, and for 5.3 percent, a college certificate had been received. The distributions of father's education level appear in Table 17.

5. Father's Occupation

Father's occupation, if working, was obtained from the father himself or, in his absence, from the mother. Table 18A shows the original list of occupation categories used by the interviewers and the final revised categories used for data analyses. The distribution of working fathers by job categories and geographic areas appears in Table 18B. Of 5,228 fathers of children in the total representative sample, 0.8 percent were unemployed or retired. During the survey, inadequacies of the category definitions became obvious, resulting in 14.0 percent of the survey children's fathers being placed in category VII--other. Occupation categories I, II, and V are characteristic of the urban and metropolitan areas

Table 17. Percentage Distribution of Preschool Children by Literacy and Educational Status of Fathers by Geographic Area: Egypt 1978

Geographic Area[a]	Literacy Not Stated	Illiterate	Literate: Highest Education Received					Total[b]
			None	Primary	Preparatory or Secondary	College	Not Stated	
Lower Rural	1.8%	54.0%	28.7%	6.0%	7.5%	0.9%	1.1%	100% (2253)
Upper Rural	1.1%	68.1%	20.1%	4.2%	3.7%	0.4%	2.4%	100% (1201)
Large Villages	2.7%	58.2%	26.2%	3.7%	5.2%	1.6%	2.3%	100% (560)
Small Towns	1.5%	42.9%	22.6%	5.2%	17.5%	6.7%	3.5%	100% (594)
Small Cities	2.1%	26.8%	28.5%	10.8%	20.6%	7.7%	3.4%	100% (620)
Total Representative Sample	1.8%	52.4%	25.6%	5.9%	9.4%	2.7%	2.3%	100% (5228)
Cairo-Giza	2.7%	48.5%	29.6%	6.0%	9.4%	3.6%	0.3%	100% (588)
Alexandria	1.8%	55.4%	29.9%	5.1%	6.3%	0.7%	0.7%	100% (552)

a/ See Table 1 for description of geographic areas and sample universes.

b/ All percentages are weighted by universe population proportions. The actual number of persons surveyed, based on one record per family, are given in parentheses.

Table 18A. Definition of Occupation Categories

Occupation Categories for Data Analyses	Occupation Categories for Interviewers' Use	
I	01	Professional, technical, and administrative positions
	02	Large merchants and large trade or business owners
	03	Semi-professional, semi-technical, and managerial personnel
II	04	Clerical and secretarial personnel
	05	Small merchants and shopkeepers
	06	Skilled laborers and skilled craftsmen
III	08	Farm cultivators (10 or more feddans)*
	09	Farm cultivators (5 to less than 10 feddans)
IV	10	Farm cultivators (2 to less than 5 feddans)
	11	Farm cultivators (less than 2 feddans)
V	07	Semi-skilled and unskilled workers
VI	12	Landless agricultural laborers and share croppers
VII	13	Other occupations
VIII	14	Retired
	15	No occupation
IX		Not stated

*1 feddan = approximately 0.42 hectares, or 1.038 acres

Table 18B. Percentage Distribution of Preschool Children by Fathers' Occupational Category and by Geographic Area: Egypt 1978

Occupational Category[a]	Geographic Area[b]							
	Lower Rural	Upper Rural	Large Villages	Small Towns	Small Cities	Total Representative Sample	Cairo-Giza	Alexandria
I	2.9%	2.0%	3.9%	14.5%	17.4%	6.6%	7.8%	3.4%
II	15.2%	9.0%	14.5%	29.3%	36.9%	18.7%	29.9%	21.6%
III	1.9%	2.2%	1.4%	0.5%	0.5%	1.5%	-	4.3%
IV	27.1%	21.7%	18.6%	8.1%	0.5%	17.7%	1.2%	14.5%
V	14.1%	12.5%	16.8%	17.0%	14.7%	14.6%	25.7%	21.7%
VI	23.1%	32.8%	29.6%	8.8%	2.3%	21.6%	12.2%	7.6%
VII	11.5%	11.9%	10.4%	17.7%	23.4%	14.0%	12.8%	15.8%
VIII	0.4%	1.2%	0.9%	0.7%	1.1%	0.8%	6.1%	9.1%
IX	3.8%	6.8%	3.9%	3.5%	3.2%	4.4%	4.3%	2.0%
Total[c]	100% (2253)	100% (1201)	100% (560)	100% (594)	100% (620)	100% (5228)	100% (588)	100% (552)

[a] See Table 18a.

[b] See Table 1 for description of geographic areas and sample universes.

[c] All percentages are weighted by universe population proportions. The actual number of persons surveyed, based on one record per family, are given in parentheses.

and categories III, IV, and VI are characteristic of the rural. The small town universe tends more to the urban distribution of father's occupation.

6. Water Source and Availability

Either parent or guardian was asked about the household water source and proximity of the source to the household. Definitions of categories proved to be difficult to agree upon. The definitions differed for rural and urban universes. In rural areas the categories were (1) tap or well source in the house or in the immediate neighborhood of the house, (2) tap or well source outside the immediate neighborhood or house, and (3) water source other than tap or well. In urban areas the categories were (1) tap source within the house, (2) tap or well source within the immediate neighborhood, and (3) any distant source of water.

Table 19 displays water source and availability data for the rural areas, and for the areas which are urban in composition. With increasing urbanization, greater numbers of households have a household supply of water. Among the less educated population areas of Cairo-Giza and Alexandria, the percent of households with piped water in the household is probably limited by community availability and by economic constraints.

Table 19. Percentage Distribution of Preschool Children by Water Availability Category for Rural and Urban Universes: Egypt 1978

Geographic Area[a]	Piped or Well Water			Total[b]
	In House	In Neighborhood	Neither	
Rural				
Lower Rural	12.2%	83.8%	4.0%	100% (2062)
Upper Rural	17.2%	73.6%	9.3%	100% (1091)
Large Villages	26.9%	70.8%	2.3%	100% (517)
Urban				
Small Towns	48.7%	49.6%	1.8%	100% (569)
Small Cities	79.5%	20.5%	0.0%	100% (600)
Cairo-Giza	49.7%	49.9%	0.4%	100% (567)
Alexandria	49.7%	50.3%	-	100% (503)

[a] See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions. The actual number of households surveyed are given in parentheses.

7. Electricity

Electricity (at least one light which could be lit) was present in 46.4 percent of 5,909 households of sample children. Approximately 26.4 percent of the households of rural sample children had electricity; 69.6 percent of sample households in small towns; 90.3 percent in cities of 50,000 and greater; and 74.2 percent among the homes of the sample children in the semi-educated areas of Cairo-Giza and Alexandria.

8. Primary Source of Cooking

Overall the primary cooking source among the 5,909 households of sample children was open fire in 39.0 percent; kerosene cooker in 47.5 percent, and bottled gas cooker in 13.2 percent. In the rural areas, 59.3 percent of households used an open fire; 37.8 percent used kerosene, and 2.8 percent used bottled gas. In large cities 1.7 percent of sample households used an open fire; 49.7 percent used kerosene, and 48.5 percent used bottled gas.

B. Discussion

First-born children among all sample children are more common in the urban areas. This may indicate that urban mothers have fewer total pregnancies than rural mothers. The tendency for urban survey children to live in smaller households suggests that physical and economic differences of urban living promote changes in the traditional concepts of ideal family size.

Estimates of family size and birth order among survey children in the more disadvantaged urban population of Cairo-Giza and Alexandria fall between the general urban and rural values, suggesting that as a group they are in transition from the traditional structure of the rural population to the current realities imposed by life in large cities.

Data on father's literacy and the level of the father's education certificate undoubtedly reflects the lesser availability of educational opportunities in rural as compared with urban areas. Beyond this basic limiting factor, in each universe, father's literacy and, in particular, the educational level of literate fathers, are probably good indicators of socio-economic status within both rural and urban areas.

Basically, data results on water source and availability, presence of electricity, and cooking source reflect the differences in availability between rural and urban universes. Within rural universes or the rural aggregate, positive responses for one, two, or three of these factors reflect increasing socio-economic status for the household. This is considered to be true also in urban areas.

Of all the characteristics in this section, father's occupation appears to be most relevant as a socio-economic indicator. Rural and urban differences in occupation categories of fathers of the survey children strongly reflect the occupational opportunities

of each area. Within each of the rural and urban areas, occupation categories probably have different socio-economic values and therefore rank differently. In urban areas the important categories are I, II, and V, in decreasing socio-economic order. In rural areas, categories III, IV, and VI have a similar rank of importance. In universes where rural to urban transition is occurring, a greater mixture of occupations is found, and socio-economic ranking of categories becomes more complex.

VII. BREAST FEEDING AND FOOD SUPPLEMENTATION PRACTICES

A. Results

Figure 4 shows the percentage of survey children by age group in each geographic area who are completely weaned. Table 20A shows the percentage of survey children by food source for various age groups.

Information regarding the age at which food supplementation is given to children is derived from two separate groups of sample children in Egypt. The first group consists of 2,026 sample children 6-35 months of age who were still breast-feeding at the time of the survey interview, and who had begun to receive a food supplement. For these children, the age at which the food supplement was introduced was determined (Table 20B). The second group consists of 4,861 sample children age 24-71 months

FIGURE 4, PERCENT OF CHILDREN IN SPECIFIC AGE GROUPS COMPLETELY WEANED IN SELECTED GEOGRAPHIC AREAS: EGYPT, 1978

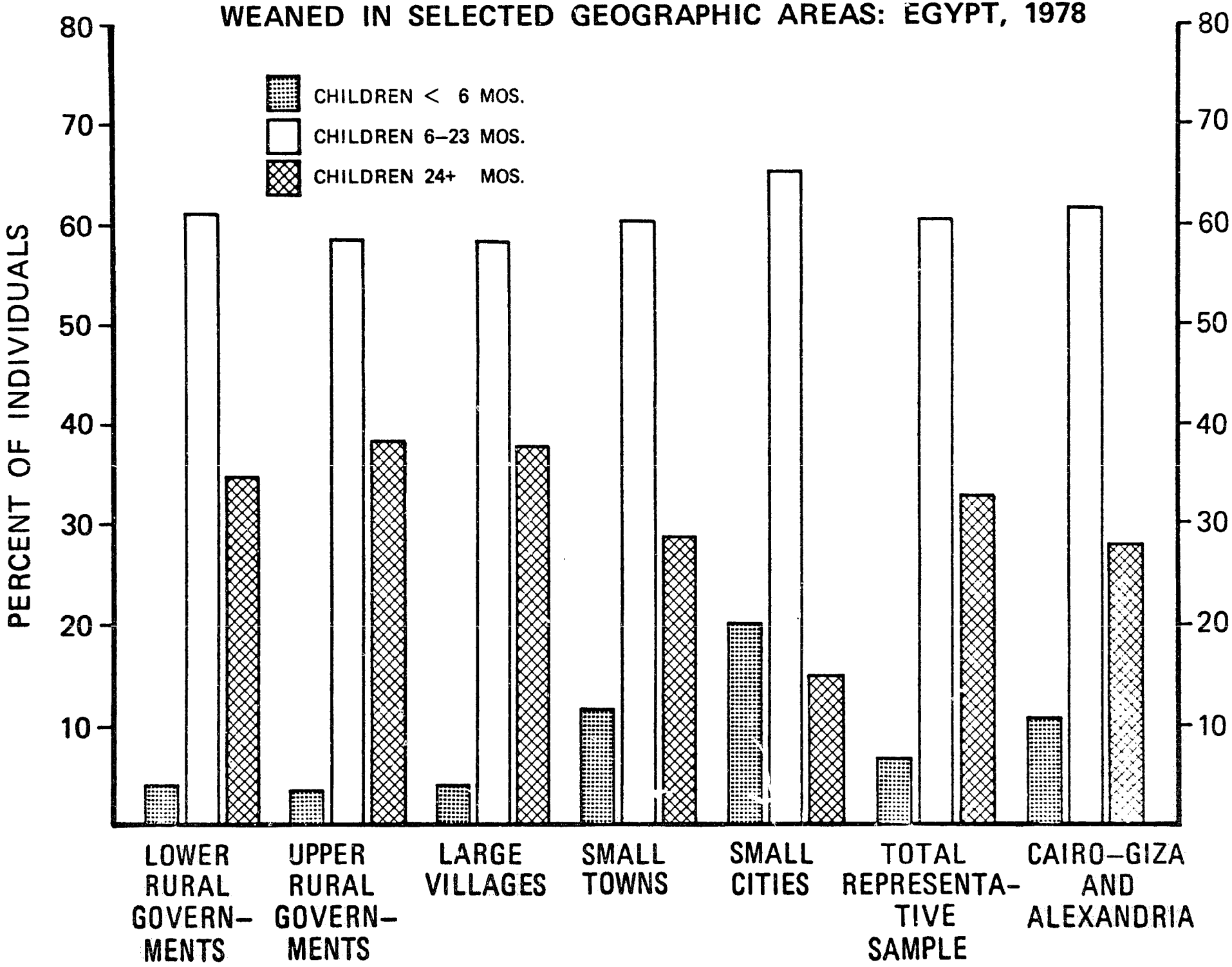


Table 20A. Percent of Sample Children[a] Breast-Feeding Only, Breast-Feeding with Food Supplement, and not Breast-Feeding

Food Source	Age Groups 6-11 Months	12-23 Months	24-35 Months
Breast-Feeding Only	23.8%	3.3%	0.1%
Breast-Feeding with Food Supplement	68.0%	62.6%	9.9%
Not Breast-Feeding	8.2%	34.1%	90.0%
Total	100.0%	100.0%	100.0%
(Number of Children)[b]	781	1749	1572

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] Number of children in the Total Representative Sample for whom breast-feeding/food supplementation data was available.

Table 20B. Age When Food Supplementation Introduced in Preschool Children[a] Breast-Feeding at Time of Interview: Egypt 1978

Age Nutrition Supplement Introduced	Age in Months of Survey Child		
	6-11	12-23	24-35
< 3 Months	7.6%	3.5%	1.2%
3-5 Months	16.8%	9.1%	6.0%
6-11 Months	49.9%	52.9%	35.1%
12-17 Months	-	28.6%	53.3%
18+ Months	-	0.6%	3.2%
Still Breast-Feeding, Only	25.6%	5.2%	1.2%
Total Children Breast-Feeding[b]	717	1152	157

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] Number of children in the Total Representative Sample for whom breast-feeding/food supplementation data was available.

who had stopped breast-feeding at the time of survey interview (Table 21). The mother of the child was asked to recall at what age the child first received a food supplement.

The age patterns of introduction of food supplements derived from the two sources are somewhat different, perhaps because of the inaccurate recall of mothers. Among children still breast-feeding at the time of interview, food supplementation had begun at an older age than in children for whom breast-feeding had been completely stopped before the time of interview.

Table 22 shows the percentages of sample children completely weaned from breast milk whose weaning had been completed at various ages by geographic region.

B. Discussion

There are important differences in feeding practices for children under 2 years of age between rural and urban populations and between general urban populations and the lesser privileged urban population of Cairo-Giza and Alexandria.

Children in rural areas are exclusively breast-fed longer and completely weaned at a later age than the general population of urban children. The pattern of feeding in early childhood in the less privileged urban areas is closer to the rural pattern than the general urban pattern. These differences suggest that,

Table 21. Age When Food Supplementation Introduced, by Mother's Recall, in Preschool Children[a] Age 24-71 Months Not Breast-Feeding at Time of Interview: Egypt 1978

Age Nutrition Supplement Introduced	Age in Months of Survey Child	
	24-35	36-71
< 3 Months	8.5%	7.2%
3-5 Months	10.0%	9.7%
6-11 Months	43.2%	43.3%
12-17 Months	35.0%	35.3%
18+ Months	3.0%	4.5%
Number of Children not Breast-Feeding[b]	1412	3449

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] Number of children in the Total Representative Sample for whom breast-feeding/food supplementation data was available.

Table 22. Age Patterns of Completed Weaning in Preschool Children 6-71 Months of Age by Geographic Area: Egypt 1978

Geographic Area[a]	Age in Months of Completed Weaning				Total[b]
	<6	6-11	12-23	24+	
Lower Rural	4.1%	6.0%	55.3%	34.6%	100.0% (2404)
Upper Rural	3.5%	5.3%	53.0%	38.1%	100.0% (1161)
Large Villages	4.1%	4.9%	53.2%	37.8%	100.0% (609)
Small Towns	11.7%	8.6%	51.5%	28.3%	100.0% (643)
Small Cities	20.0%	10.9%	54.3%	14.8%	100.0% (689)
Cairo-Giza & Alexandria	10.8%	8.6%	53.0%	27.6%	100.0% (1300)

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions and are based on children for whom data was available. The actual number of persons with known age of completed weaning are given in parentheses.

among rural and less privileged urban mothers, traditional patterns remain influential or that the availability of weaning foods, either actual or in terms of cost, is less.

VIII. RECENT SICKNESS, DIARRHEA, AND FEVER

A. Results

For the 9,406 sample children in which the mother's responses to these questions were available, approximately one-sixth gave a positive response for at least one of the questions. Approximately one-third of the affected sample children had only one symptom; one-third had two symptoms, and one-third had all three symptoms.

1. Sickness

The prevalence of perceived recent non-specific sickness in sample children is presented by age groups in Table 23 for geographic areas.

Survey results suggest that the frequency of perceived sickness decreases with increasing age of the sample child. Also, the frequency is highest among the sample children from the least educated population of Cairo-Giza and Alexandria.

2. Diarrhea

The prevalence of recent diarrhea in sample children is presented for selected age groups, universes, and universe aggregates in Table 24.

Table 23. Percentage of Preschool Children with General Sickness in the Seven Days Preceding Survey Interview by Age and Geographic Area: Egypt 1978

Geographic Area[a]	Age in Months 6-11 Percent Sick	6-11 Number	12-23 Percent Sick	12-23 Number	24-35 Percent Sick	24-35 Number	36-71 Percent Sick	36-71 Number	Total Percent Sick	Total Number[b]
Lower Rural	24.5%	346	25.5%	794	20.4%	685	11.8%	1552	18.1%	3377 (3552)
Upper Rural	21.3%	175	16.5%	413	14.3%	371	8.0%	773	12.7%	1732 (1784)
Large Villages	22.0%	82	17.9%	195	15.9%	170	10.8%	407	14.5%	854 (889)
Small Towns	18.8%	85	21.2%	194	9.2%	174	8.5%	411	12.5%	864 (894)
Small Cities	18.8%	96	19.8%	167	20.1%	194	11.1%	406	15.7%	863 (897)
Total Representative Sample	21.7%	784	20.5%	1763	16.9%	1594	10.3%	3549	15.2%	7690 (8016)
Cairo-Giza	33.8%	130	27.4%	175	20.6%	166	12.3%	391	20.2%	862 (890)
Alexandria	37.0%	92	30.7%	180	32.9%	170	23.4%	412	28.3%	854 (888)

[a] See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions and are based on children for whom data was available. The numbers in parentheses are the total number of survey children in the specific age group.

Table 24. Percentage of Preschool Children with Recent Diarrhea History by Age and Geographic Area: Egypt 1978

Geographic Area[a]	Age in Months 6-11 Percent Diarrhea	6-11 Number	12-23 Percent Diarrhea	12-23 Number	24-35 Percent Diarrhea	24-35 Number	36-71 Percent Diarrhea	36-71 Number	Total Percent Diarrhea	Total Number[b]
Lower Rural	19.1%	346	13.9%	794	9.5%	685	3.3%	1552	8.7%	3377 (3552)
Upper Rural	19.0%	175	16.2%	413	12.4%	371	5.2%	773	10.8%	1732 (1784)
Large Villages	25.6%	82	9.2%	195	12.9%	170	6.0%	407	10.0%	854 (889)
Small Towns	18.8%	85	14.0%	194	6.9%	174	2.9%	411	7.8%	864 (894)
Small Cities	17.7%	96	16.8%	167	9.3%	194	4.4%	406	9.4%	863 (897)
Total Representative Sample	20.0%	784	14.0%	1763	10.6%	1594	4.4%	3549	9.5%	7690 (8016)
Cairo-Giza	30.8%	130	21.1%	175	12.7%	166	5.7%	391	14.0%	862 (890)
Alexandria	32.6%	92	27.9%	180	21.9%	170	14.1%	412	20.6%	854 (888)

[a] See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions and are based on children for whom data was available. The numbers in parentheses are the total number of survey children in the specific age group.

The frequency of recent diarrhea decreases with increasing age in all groups of sample children. The highest frequencies for each age group are found in sample children from the least educated population of Alexandria.

3. Fever

The prevalence of recent fever in sample children is presented for selected age groups, universes, and universe aggregates in Table 25.

The frequency of recent fever among sample children decreases with increasing age throughout Egypt. Frequencies are higher in rural universes than in the more urban universes but are again highest in Alexandria.

B. Discussion

The highest prevalences of acute illness are seen in infants and children under 2 years of age in both rural and urban areas. The differences in prevalence of acute illness between the general urban children and the less privileged urban and rural children may be a result of differences in availability of public health services, in curative services, and in the health awareness of mothers in each sector.

IX. ASSOCIATIONS OF SAMPLE CHILDREN'S NUTRITIONAL STATUS WITH RELEVANT INDIVIDUAL AND HOUSEHOLD CHARACTERISTICS

A. Results

Table 25. Percentage of Preschool Children with Recent Fever History by Age and Geographic Area: Egypt 1978

Geographic Area[a]	Age in Months: 6-11 Percent Fever	6-11 Number	12-23 Percent Fever	12-23 Number	24-35 Percent Fever	24-35 Number	36-71 Percent Fever	36-71 Number	Total Percent Fever	Total Number[b]
Lower Rural	20.5%	346	24.7%	794	18.5%	685	12.3%	1552	17.3%	3377 (3552)
Upper Rural	23.0%	175	16.3%	413	16.1%	371	11.9%	773	15.0%	1732 (1784)
Large Villages	25.6%	82	20.5%	195	17.1%	170	12.8%	407	16.6	854 (889)
Small Towns	17.6%	85	17.0%	194	10.9%	174	7.8%	411	11.5%	864 (894)
Small Cities	16.7%	96	18.0%	167	19.1%	194	12.1%	406	15.3%	863 (897)
Total Representative Sample	21.1%	784	20.1%	1763	17.0%	1594	11.8%	3549	15.7%	7690 (8016)
Cairo-Giza	30.0%	130	24.0%	175	17.6%	166	10.0%	391	17.3%	862 (890)
Alexandria	42.4%	92	35.8%	180	35.3%	170	23.8%	412	30.6%	854 (888)

[a] See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions and are based on children for whom data was available. The numbers in parentheses are the total number of survey children in the specific age group.

1. Age and Sex of Child

Wasting (acute undernutrition)in the age group 6-11 months is more common in girls than in boys. In all other preschool-age groups, the prevalence is not appreciably different between sample girls and boys (Table 26). Overweight in the age group 36-71 months is twice as common among sample girls as boys. There is no appreciable difference in the prevalence of stunting (chronic undernutrition) in sample boys and girls.

2. Household Size

Among sample children from households of various sizes, the prevalence of wasting and stunting is approximately the same.

3. Live Birth Order of Sample Child

As the live birth order of a sample child increases, there is a gradual but small increase in the prevalence of both wasting and stunting (Table 27).

4. Breast-Feeding

The prevalences of wasting, overweight, and stunting among sample children who at the time of interview were breast-feeding only, breast-feeding with food supplementation, or not breast-feeding at all are compared in Table 28 for the age groups 6-11, 12-23, and 24-35. In the 6-11 month age age group, children breast-feeding only have the lowest

Table 26. Nutrition Status of Preschool Children, by Age and Sex: Egypt 1978

Age in Months	Sex	Percentage of Reference Median: Weight/Height, Acute Undernutrition < 80.0	Weight/Height, Over-Weight 120.0+	Height/Age, Chronic Undernutrition < 90.0	Number in Age Group[a]
6-11	Male	0.9%	3.6%	9.6%	419
	Female	2.2%	2.6%	10.9%	390
12-23	Male	1.3%	0.9%	24.4%	924
	Female	1.2%	1.0%	28.2%	892
24-35	Male	0.1%	2.5%	23.2%	852
	Female	0.5%	4.0%	30.0%	805
36-47	Male	0.4%	4.2%	22.9%	814
	Female	-	8.6%	22.3%	608
48-59	Male	0.1%	2.3%	17.5%	677
	Female	0.2%	4.1%	14.8%	590
60-71	Male	-	1.4%	19.4%	541
	Female	0.4%	3.1%	12.2%	504
Total Representative Sample[b]	Male	0.5%	2.4%	20.6%	4227
	Female	0.7%	3.8%	21.7%	3789
Cairo-Giza & Alexandria[b]	Male	0.5%	2.6%	18.1%	888
	Female	0.7%	3.0%	18.0%	890

[a] All percentages are weighted by universe population proportions. The actual number of persons surveyed is given.

[b] See Table 1 for description of geographic areas and sample universes.

Table 27. Nutrition Status of Preschool Children[a/] by Live Birth Order: Egypt 1978

Birth Order	Percentage of Reference Median: Weight/Height: Acute Undernutrition <80.0	Weight/Height: Over-Weight 120.0+	Height/Age: Chronic Undernutrition <90.0	Number of Children[b/]
1	0.3%	3.0%	19.3%	1470
2	0.3%	3.0%	20.5%	1341
3-4	0.7%	3.6%	20.3%	2182
5+	0.8%	2.8%	22.9%	3015

[a/] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b/] All percentages are weighted by universe population proportions. The actual number of persons with birth order stated is given.

Table 28. Nutrition Status of Preschool Children[a/]
6-35 Months of Age by Food Source: Egypt 1978

Food Source	Age in Months	Weight for Height: Acute Undernutrition <80.0	Weight for Height: Over-Weight 120.0+	Height for Age: Chronic Undernutrition <90.0	Number
Breast-Feeding Only	6-11	0.6%	4.1%	10.8%	186
	12-23	2.6%	-	29.6%	58
	24-35	-	-	-	2
Breast-Feeding with Supplement	6-11	1.5%	3.0%	10.0%	531
	12-23	1.2%	0.6%	26.8%	1094
	24-35	0.7%	0.3%	38.2%	155
Completed Weaning	6-11	3.7%	2.3%	12.0%	64
	12-23	1.2%	1.5%	25.2%	597
	24-35	0.3%	3.7%	25.5%	1412
Total Number[b/]	6-11				781 (809)
	12-23				1749 (1816)
	24-35				1572 (1657)

[a/] Total Representative Sample. See Table 1 for description of geographic areas.

[b/] All percentages are weighted by universe population proportions and are based on children for whom data was available. The numbers in parentheses are the total number of survey children in the specific age group.

prevalence of wasting and the highest prevalence of overweight. In contrast, in the 12-23 month old group, the prevalences of wasting and stunting are highest among children breast-feeding only. In children over 12 months of age, the prevalences of overweight are highest in completely weaned children. In children 24-35 months of age, only two were breast-feeding only. Among the rest of the children of this age, wasting and stunting is much more common in children receiving breast-milk plus a food supplement than in children who are completely weaned. In completely weaned children 24-35 months of age, overweight is ten times more common (3.7 percent) than among those still taking some breast milk (0.3 percent).

5. Age of Completed Weaning from Breast Milk

The prevalence of short stature among 4,867 completely weaned sample children ages 24-71 months is presented in Table 29 by survey age groups and age when weaned. Complete weaning between 3 and 6 months of age is generally associated with a lower prevalence of short stature, with this prevalence increasing with increasing age of complete weaning.

6. History of Recent Sickness, Diarrhea, and Fever

The prevalence of wasting among sample children with a history of one of the following--recent sickness, diarrhea, or fever--is 0.9 percent. Among those with a history of

Table 29. Prevalence of Chronic Undernutrition in Preschool Children[a] 24-71 Months of Age by Age at Which Weaning Completed: Egypt 1978

Age Weaning Completed	Age in Months of Survey Child			
	24-35	36-47	48-59	60-71
< 3	24.0% (59)	9.6% (46)	14.5% (42)	11.0% (27)
3-5	7.0% (18)	8.7% (19)	5.5% (16)	13.8% (12)
6-11	30.8% (92)	17.7% (66)	9.5% (54)	9.9% (54)
12-17	28.0% (363)	22.6% (255)	14.7% (239)	12.3% (185)
18-23	22.0% (503)	21.2% (395)	15.9% (343)	15.4% (270)
24+	27.8% (381)	25.8% (518)	18.7% (489)	19.6% (421)
Total[b]	1416	1299	1183	969

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions and are based on children for whom data was available. The actual number of children in the Total Representative Sample for whom weaning information was available are given in parentheses.

two of these symptoms it is 1.2 percent, and with a history of three symptoms, 1.4 percent. The prevalence among sample children with no history of any of the three symptoms was 0.5 percent.

7. Father's Occupation

Among children whose father's occupations were predominantly urban, the prevalences of wasting and stunting increase as the father's occupational category decreases socio-economically (I, II, V). In children of predominantly rural fathers, a similar gradient is seen (III, IV, VI). For overweight, no consistent gradient is noted (Table 30).

8. Literacy and Education Level of Father

Among sample children whose fathers could read or write and in those whose fathers were illiterate there is no appreciable difference in the prevalence of wasting, but in the first group there is considerably less stunting. As the level of education of the fathers increases, the prevalence of stunting in their children decreases (Table 31).

B. Discussion

The factors found to be associated with wasting, stunting, and overweight in Egyptian children of preschool-age are presented in the following outline.

Table 30. Nutrition Status Among Preschool Children[a] by Occupation Category of Father: Egypt 1978

Occupation Category	Acute Undernutrition Weight/Height < 80.0	Overweight Weight/Height 120.0+	Chronic Undernutrition Height/Age < 90.0	Number[b]
I	0.5%	4.4%	3.8%	458
II	0.3%	2.5%	16.5%	1319
V	0.6%	3.5%	20.4%	1206
III	-	1.1%	22.4%	148
IV	0.7%	4.4%	24.1%	1651
VI	0.9%	2.5%	26.6%	1767
VII	0.5%	1.8%	21.7%	1099
Total[b]	0.6%	3.0%	20.8%	7648

[a] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b] All percentages are weighted by universe population proportions and are based on children for whom data was available. The actual number of children in the Total Representative Sample for whom father's occupation was available.

Table 31. Nutrition Status of Preschool Children[a/] by Literacy and Education Level of Father: Egypt 1978

Father's Literacy Education Status	Acute Undernutrition Weight/Height <80.0	Overweight Weight/Height 120.0+	Chronic Undernutrition Height/Age <90.0	Number[b/] of Fathers
Illiterate	0.7%	2.8%	24.0%	4391
Literate	0.5%	3.3%	17.7%	3501
No Certificate	0.5%	3.5%	20.9%	2023
Primary Certificate	0.7%	2.0%	19.3%	446
Preparatory or Secondary Certificate	0.2%	3.2%	12.6%	697
College Certificate	0.7%	6.2%	1.4%	165

[a/] Total Representative Sample. See Table 1 for description of geographic areas and sample universes.

[b/] All percentages are weighted by universe population proportions and are based on children for whom data was available. The actual number of fathers whose literacy and education level was known.

1. Associations with Wasting:

   a. Complete cessation of breast-feeding in children 6-11 months of age.

   b. Continued breast-feeding without supplemental feeding in children 12-23 months of age.

   c. A recent episode of any of three types of acute illness in all age groups.

   d. A father who farms less than two feddans of land, or who is semi-skilled or unskilled worker.

   e. A father who is illiterate or does not have at least a secondary school certificate.

   f. Higher birth order.

2. Associations with Stunting:

   a. Living in rural areas or in less privileged areas of large cities.

   b. Breast-feeding with delay in the introduction of a food supplemental feeding in children 12-23 months of age.

   c. History of breast-feeding for less than 3 months, or of delay in completing the weaning process beyond 18 months of age in children 24-71 months of age.

d. A father with a low occupation status.

e. A father who is illiterate or does not have at least a primary school certificate.

f. Higher birth order.

3. Associations with Overweight

a. Exclusive breast-feeding in children 6-11 months of age.

b. Completed weaning in children 12-23 months of age.

c. Female children 36-71 months of age.

NOTE

The presence of an association does not of itself indicate a causal relation between a given characteristic and an indicator of malnutrition. A cross-sectional survey of this nature cannot provide the type of information necessary to establish causal relationships. Information on the magnitude and location of major nutrition problems, plus certain associations of moderate or greater degree can, however, provide guidance in selecting areas for further inquiry into causality for planning nutrition intervention programs and for evaluating their effectiveness.

SUMMARY

The Nutrition Institute of the Ministry of Health, Arab Republic of Egypt, with the assistance of the Center for Disease Control, Atlanta, Georgia, U.S.A., conducted a national nutrition survey in early 1978 among Egyptian children 6 months to 6 years of age. Its primary purpose was to provide data on the prevalence of stunted physical growth, wasted body mass (signs of protein-energy malnutrition) and anemia, and on certain demographic, socio-economic, dietary and other correlates of these nutritionally-related conditions.

Using population-proportionate, (representative) two-stage sampling methods, 900 children were studied in each of nine geographically or demographically defined subpopulations (universes) in 17 Egyptian governorates along the Nile Valley or in the Nile Delta, permitting valid comparisons between urban and rural populations, and between the rural populations of Upper and Lower Egypt. In two additional universes, and four governorates, children were similarly studied in the most severely socio-economically disadvantaged subpopulations of greater Cairo and of Alexandria, with a total of 9,794 children in all. In addition, for purposes of comparison, a special group of 1,883 children of the same age range from socio-economically advantaged families of Cairo was studied.

The most common nutritionally-related condition found is stunted linear growth, defined as children who are less than 90 percent of their expected height for age, consistent with chronic or recurrent

undernutrition of calories and protein. Extrapolating from the observed prevalence rates to the estimated total populations of preschool-age children in each of the nine representatively survey universes (Table 32), some 1.1 million Egyptian children in these 17 governorates are so affected. Wasting, defined as children less than 80 percent of their expected weight for height, and consistent with severe, acute protein-calorie undernutrition, although considerably less prevalent; slightly lower even than among the U.S. reference population, is estimated to affect some 29,000 children. Of these, about half are concurrently stunted and wasted, a condition with much more serious health consequences, and more common in Upper than in Lower Egypt. Anemia, defined as a hemoglobin concentration of less than 10 grams per 100 ml for ages 6-23 months and 11 grams per 100 ml for ages 24-71 months, and for the most part probably due to iron deficiency, is estimated to affect some 1.4 million children.

The prevalence of each of these conditions is considerably greater in the rural populations, particularly those of Upper Egypt, than in the urban, in the representatively surveyed populations. Among the most disadvantaged children of Cairo and Alexandria however these prevalences are more similar to the rural than to urban levels, especially for anemia. Their prevalences also show great variation with children's age. Wasting becomes increasingly more common after 6 months of age, reaching a peak between 12 and 24 months and then decreasing. Stunting does not appreciably affect these Egyptian children until after 12 months of age, but then becomes much more common up to 36 months, after which its

Table 32. Estimated Numbers of Wasted, Stunted and Anemic Children of Preschool Age by Region in Total Representative Sample: Egypt 1978

Geographic Region[a]	Estimated Total Number of Children 6-71 Months	95% Confidence Limits for Number of Children Affected[b]								
		Wasting[1]			Stunting[2]			Anemia[3]		
		Lower	Mean	Upper	Lower	Mean	Upper	Lower	Mean	Upper
Lower Rural	1,527.0[d]	4.5	11.0	17.5	294.9	332.4	370.0	439.0	512.2	585.3
Upper Rural	1,174.0	4.1	9.3	14.5	291.3	324.1	356.9	342.8	389.6	436.3
Large Villages	1,020.5	(c)	3.4	7.2	210.9	248.5	286.0	203.9	280.6	358.4
Small Towns	497.0	0.5	2.8	5.1	52.1	73.8	95.5	61.8	99.4	137.0
Small Cities	786.0	(c)	2.6	5.6	55.9	83.2	110.5	74.4	113.6	152.8
Total Representative Sample	5,005.5	19.2	29.1	39.0	990.5	1,062.0	1,133.5	1,267.5	1,395.4	1,532.4

[a] See Table 1 for description of geographic regions and sample universes.

[b] Precision is based upon distribution of sampling cluster means.

[c] Estimate is unreliable due to diverse distribution of cluster means. If computed literally these figures would be negative.

[d] All numbers are in (1,000's) thousands.

[1] <80% Median Weight for Height
[2] <90% Median Height for Age
[3] <10g/100ml for ages 6-23 months, and <11g/100ml for ages 24-71 months.

frequency also decreases. The prevalence of anemia is greatest between 6 and 24 months of age; gradually decreasing thereafter. Among the special group in Cairo these conditions were far less common, with the distribution of height for age values of these more advantaged children following nearly exactly that of the U.S. reference population.

Within both the rural and urban representatively surveyed populations, each of these conditions is generally more common in children from families of less favorable socio-economic status, as indicated by usage of water, electricity, and cooking fuel, and by the father's educational level or occupational category. Another correlate of malnutrition is child feeding practice, particularly the age of weaning from breast milk. Cessation of breast feeding before 12 months of age is associated both with acute undernutrition and anemia, and these conditions become generally more common with delay of supplemental feeding beyond 12 months. In addition, as evidenced by the mother's recall of her child's recent dietary intake, there is a modest correlation between amount and variety of foods consumed and the indicators of childhood malnutrition. Since strong urban-rural differences are evident in infant feeding practices as well as in the prevalence of undernutrition, the relative strengths of the effects of too early weaning or too late or inappropriate food supplementation versus those inherent in the rural condition and poverty are difficult to assess. Among the many operative factors in malnutrition, infectious disease is clearly and powerfully prominent. Among survey children with a recent history of fever or of diarrhea, acute undernutrition is measurably more common, even at the more moderate level of 85 percent, rather than 80 percent, of expected weight for height.

The mother of each child on whom a hemoglobin determination was performed also had a hemoglobin determination. Anemia was widely prevalent among mothers, particularly those who were pregnant or lactating, again with higher rates in rural populations, and in the disadvantaged populations of the two great cities.

RECOMMENDATIONS

The two most common forms of malnutrition identified by the survey, stunted linear growth and anemia, affect probably up to 2 million children in the 6 to 72 month age range in the 17 representatively survey governorates of Egypt. While it is certain that environmental factors, chief among which are marginal intake of nutritious food and recurrent infections, are responsible for a relative failure to thrive beyond infancy in many children who appear to have thrived well until their first birthday, it is less certain that this failure does, in fact, have severe health consequences. In the absence of adequate knowledge, however, stunting and anemia must be presumed to be undesirable, and when practical preventive measures are possible, to be unacceptable.

Although the prevalence of wasted body mass among the survey children is generally low, it is considerably high in the 6 to 24 month age group, and since this condition clearly presents a serious health problem these severely undernourished toddlers are a top priority group in which nutrition and health services should be targeted. The same can be said for pregnant and lactating women.

By what means maternal and child services should be improved must be decided by those who have responsibility for these services. Certainly nutrition education which teaches the unequalled value of adequate breast feeding for at least the first year of life, and of

initiating progressive and appropriate supplemental feeding by at least the first birthday, is of prime importance. Malnutrition being so intimately interwoven in the whole complex of poverty, poor sanitation, and lack of education, it may well be that programs to improve socio-economic conditions may, in the long run, exert the greatest effect in ameliorating malnutrition.

Among suggestions for further research arising from this survey are these two: (1) To compare morbidity and mortality experience of children with normal stature and children who are stunted; also of children with normal hemoglobin and children who are anemic, to better delineate the health risks of these conditions. (2) To compare what has been called "mothering" in equally disadvantaged women, one group of which has healthy children and the other, malnourished children, in an attempt to discover how it is that some women manage to "cope" successfully despite their poverty and poor living conditions.

REFERENCES

1. Abdou, I.A., Shaker, F.M., Bishara, F.F., and El-Megharbel, M.K.

A comparative study of the nutritional status of infants and preschool children in different types of villages, urban sector and MCH centers of Beheira Governorate. Bulletin of the Nutrition Institute, UAR 3:5-40, 1967.

2. Abdou, I.A., Bishara, F.F., and Riad, A.

The use of Western anthropometric reference standards for the assessment of nutritional status of preschool children in rural communities. Bulletin of the Nutrition Institute, UAR 4:5-52, 1968.

3. Abdou, I.A., Ali, H.E., and Lebshtein, A.K.

A study of the nutritional status of mothers, infants, and young children attending maternity and child health centers in Cairo. I. The nutritional status of infants and young children. Bulletin of the Nutrition Institute, UAR 1:9-21, 1965.

4. Abdou, I.A., Dakroury and Tadros, N.N.

A comparative study of nutritional anemia in the oases of the New Valley and the villages of the Nile Valley. Bulletin of the Nutrition Institute, UAR 2:153-174, 1966.

5. Abdou, I.A., Farrag, F.M., and Guindi, A.F.

Prevalence of nutritional anemias among rural, urban, and industrial communities of Beheira Governorate. Bulletin of the Nutrition Institute, UAR, 4:107-126, 1968.

6. Aly, H.E., Mansour, A.M., Dakroury, A.M., El-Hay, A., and Ghoneim, F.

Investigations on bladder stone diseases of early childhood in Upper Egypt. I. The nutritional status of preschool children in Edfou. Bulletin of the Nutrition Institute A.R.E., 5:13-26, 1975.

7. Shukry, A.S., Barakat, M.R., El-Gammel, R., and Kamel, L.M.

An epidemiological study of protein-calorie malnutrition among rural population in Egypt. Gazette of the Egyptian Paediatric Association, 20:151-167, 1972.

8. Habicht, J-P (personal communication)

9. Miller, D.C., Nichaman, M.Z., and Lane, J.M.

Simplified field assessment of nutritional status in early childhood: practical suggestions for developing countries. Bull WHO 55:79-86, 1977.

10. Waterlow, J.C., and Rutishauser, I.H.E.

Malnutrition in Man. In: Early malnutrition and mental development. Symposium of the Swedish Nutrition Foundation, Uppsala, Sweden. Eds. Cravioto, J., Hambraeus, L., Vahlquist, B. Almqvist and Wiksell, No. XII:13-26, 1974.

11. Seone, N., and Latham, M.C.

Nutritional anthropometry in the identification of malnutrition in childhood. J. Trop. Pediat. and Environ. Child Health, 17:98-104, September 1971.

APPENDIX 1

Schedules, Survey Preparation Training, Logistic, Participating Organizations and Personnel

Survey Schedule

August 1976	Dr. Akkad, Undersecretary of Health, ARE, visited CDC with a proposal for a National Nutrition Status Survey
November 1976	USAID/TA/N-Washington and the AID/Cairo mission requested CDC to discuss technical assistance for a nutrition survey with AID/Cairo and the Government of Egypt.
November 23-30	Initial CDC technician visit to Egypt leading to decision to proceed with AID technical and fiscal assistance for the National Nutrition Status Survey.
April 1977	CDC technician visit to Cairo for questionnaire design, budget discussions, and personnel and logistic planning.
December 1 - January 5, 1978	Survey preparation in Cairo and training of survey personnel and measurement standardization.
January 8 - April 8, 1978	Field data collection phase.

The rural universes were completed in reverse order, 6 through 1, during January, February and March. The larger population centers in universes 7, 8, and 9 were completed concurrently with the rural universes. Universe 10 was completed in late March, and universe 11 in early April.

Personnel

The following personnel participated in the Nutrition Status Survey and are from the Nutrition Institute, Ministry of Health, Cairo.

Directors of Survey

Dr. Ahmed El Akkad, Undersecretary of Health, Preventive Medicine Sector, Chief Consultant
Dr. Hekmat El-Sayed Aly, Director, Nutrition Institute

Survey Supervisors

Dr. Ahmad M. Dakroury
Dr. Amin K. Said

Team Leaders

Dr. Ismail El-Azzazy
Mr. El-Hady Mohamad Gabr
Dr. Farouk Ghoneme
Dr. Mohamad Amr Hussein
Dr. Morsi Hassanein Morsi
Dr. Amin Kamel Said
Dr. Farouk Salib
Dr. Farouk Shaheen

Social Workers

Mr. Abdel Moneim Darwish
Mr. Ragaei Hassanein El-Fiki
Mr. Sabry El-Hakim
Mr. Hamed Abd El-Naby
Miss Kadria El-Shourbagy
Mrs. Alice Ibrahim Ghaly
Mrs. Angel Hanna
Mr. Brince Mohamed Ibrahim

Dieticians

Miss Sana El-Bindary
Miss Laila Farghaly
Mrs. Iftikhar Hafez
Mrs. Afaf Hamdi
Miss Seham Khidr
Mrs. Soraya Mosallam
Miss Amal Rakha
Miss Salwa Sabit

Field Laboratory Staff

Dr. Ahmad M. Dakroury
Dr. Mohamad El-Ghorab

Drivers

Mr. Abdel-Hadi Abd-Elaal
Mr. Youssef Attia
Mr. Ahmad Abdulla Mousa
Mr. El-Sayed El-Hadrari
Mr. Ali Abrahim
Mr. Abdel Raof Sayed Moustapha

Advance Preparation Staff

Dr. Ibrahim El-Ammary
Mr. Sayed El-Battat

APPENDIX 2

Description of Universe Composition

The 1976 Census of ARE provided current population data for the selection of the survey sample. The staff of the Nutrition Institute decided on a total of 11 universes to adequately describe and compare nutrition status in Egypt. Geographical and/or population parameters were used to define each universe. Statistical requirements for reliable analyses of a universe are 30 sample sites in each universe. For each universe a method of population proportionate sampling identified the 30 sample sites. The geographic and population composition of the universes are described below. Each governorate was assigned an identification number.

A. Rural Universes

1. Population Parameters

For each of the six rural universes listed below, CAPMAS line listed all villages of population size 1,999 by governorate, district, village name, population and cumulated population. CAPMAS selected 30 villages for sample sites in each universe and provided this information in the following format.

Rural Universe #__ Sample Site Villages - Population 1-9999

Governorate	Governorate #	District	Village	Sample Site#	Population

2. Geographic Composition

	Governorate(s)	Governorate Number
a. Universe one -	Damietta	01
	Kafr El Sheikh	02
b. Universe two -	El Ismalia	03
	El Sharkieh	04

	Governorate(s)	Governorate Number
c. Universe three -	El Dakahlia	05
	El Gharbia	06
	El Menourieh	07
	El Qalyoubieh	08
d. Universe four -	El Beheira	09
e. Universe five -	El Giza	10
	El Fayoum	11
	Beni Suief	12
	El Menia	13
f. Universe six -	Asyout	14
	Souhag	15
	Quena	16
	Aswan	17

B. Large Village Universe - Universe 7

CAPMAS using the Ministry of Housing and Reconstruction criteria categorizing a population grouping of 10,000 to 49,999 as a large village or a small town line listed all large villages throughout Egypt by village. CAPMAS selected 30 large villages for sample sites and provided a list in the following format. The large villages selected are located in 15 governorates.

Universe 7 - Large Villages 10,000-49,999

Governorate	Governorate #	District	Large Village	Sample Site #	Population

C. Small Town Universe - Universe 8

CAPMAS using the Ministry of Housing and Reconstruction criteria categorizing a population grouping of 10,000 to 49,999 as a large village or small town line listed all small towns throughout Egypt by town. CAPMAS selected 30 small towns for sample sites and provided a list in the following format. The small towns selected are located in 17 governorates.

Universe 8 - Small Towns 10,000-49,999

Governorate	Governorate #	District	Small Towns	Sample Site #	Population

D. Urban Universe - Universe 9

CAPMAS utilized as a sampling base population units (cities in Egypt of 50,000 or greater population) excluding the cities of Cairo-Giza, and Alexandria. The 30 cities selected by CAPMAS were listed using the following format. Where possible CAPMAS identified by name the city district in which the sample site was located.

Universe 9 - Urban Populations 50,000 Plus

Governorate	Governorate #	City Name	City District Name	Population

E. Cairo-Giza and Alexandria - Universes 10 and 11

For purposes of the 1976 Census CAPMAS had created specific socio-economic and demographic indicators to be used in describing the Egyptian population. In the large metropolitan areas of Cairo-Giza and Alexandria one of the indicators was education level of the household head. Several categories were used. For the Nutrition Status Survey CAPMAS drew a sample of 30 sites from the city districts in which no more than 10 percent of the population had received any formal education. First a list of city districts which met this definition was made. Without regard to the population, 30 sample sites were drawn so that no more than one site was located in any one district. Therefore, the Cairo-Giza and Alexandria samples represent universes which are subpopulations of the metropolitan areas with a socio-educational boundary as well as a geographical boundary. Because different sampling procedures were used, universes 10 and 11 are not strictly comparable to the other nine universes.

APPENDIX 3A

Determination of Survey Sample Size

Separate samples were drawn for each universe to allow comparison of these areas on various nutrition parameters. Thirty sample sites or clusters in each sample area allowed the use of normal parametric statistical procedures in the estimation of population characteristics* of a universe and in testing for a significant statistical difference among universes. For survey purposes Egypt was divided into 11 universes. With 30 sample sites in each universe, the total number of sample sites for the entire country was 330.

To determine the appropriate survey sample size for a geographic area the applicability of binomial theory was assumed. Using binomial theory modified for cluster sampling there were four variables affecting sample size, ('n').

Z = normal deviate for confidence level desired (1.96 for 95% confidence and 1.64 for 90% confidence).

p = proportion of population having the attribute measured.

D = deviation from 'p' due to sampling with confidence level chosen; the confidence limits for p would be p $\pm$ D.

K = adjustment for "clustering effect."

The formula for 'n' is:

$$n = \frac{K\ Z}{D2} \quad (p) \quad (1-p)$$

Past experience with NCHS/CDC percent of standard weight for height has shown that K = 2 should provide at least the desired precision. The Z score is generally chosen for 95% confidence (Z = 1.96).

While the value of D can be predetermined, it depends on the value of 'p' and may or may not be acceptable; for example, 50% $\pm$ 5% might be considered acceptable but 10% $\pm$ 5% might not.

The value of 'p' yielding the largest 'n' is 0.5; therefore, if a number of different proportions are to be measured for the universe, it is safest to assume p = 0.5. After fixing K, Z, and p, n and D were the only values not determined.

*Provided the characteristic is not rare (<5% prevalence).

By determining maximum deviation tolerable (D), 'n' for any sample area was solved for as follows:

K = 2 (cluster effect)

Z = 1.96 (95% confidence)

p = 0.5 (50%)

D = .046 (4.6%)

$$n = \frac{2\ (1.96)^2}{(.046)^2}\ (.5)\ (.5)$$

n = 900

Thirty children were drawn using a random start technique within each universe. A total sample of 900 children (30 sample units x 30 children) was drawn for each of the 11 universes, giving a total of 9,900 sample children for the entire country. A universe sample of 900 children with proportions having a characteristic varying as follows would have the following approximate precisions:

% Having Characteristics (p)	95% Confidence Limits (d)	Difference Required for Significance with 95% Confidence Level (p_1-p_2)
50.0%	±4.6%	6.5%
20.0%	±3.8%	5.4%
10.0%	±2.8%	3.9%
5.0%	±2.0%	2.8%

If two universes have a statistically significant difference with respect to a given characteristic, then they must differ on that characteristic at least to the extent shown in the last column (p_1- p_2).

In general, predetermination of the sample size does not predetermine the precision of survey estimates. Some parameters had greater precision than predicted and others had less. Computation of precision estimates for every tabulation provided in the report and appendices would have required substantial computer time and was not done.

APPENDIX 3B

Selection of Sample Sites and Survey Children

1. The Egypt survey included 11 universes. The population and geographic definitions of each universe were determined by the Nutrition Institute.

2. Survey design required 30 sites in each universe to permit the required estimates and to allow comparisons among universes to be made.

3. Using the 1976 Egypt Census a fixed interval method of population proportionate sampling was applied to each rural universe (universes 1-6), the large village universe (universe 7), the small town universe (universe 8), and the city universe (universe 9).

   a. For each universe a listing was drawn up of the smallest primary sampling units (usually villages) for which population figures were available. These populations were cumulated for each PSU. Each PSU was represented by its range in the cumulative total.

Example	Population	Cumulated Population	Sampling Range
Village A	1000	1000	1-1000
Village B	400	1400	1001-1400
Village C	1400	2800	1401-2800
Village D	800	3600	2801-3600

   b. The cumulated total population was divided by 30 to obtain a sampling site interval.

   c. A starting number within the bounds of the sampling site interval was randomly selected.

d. The population unit whose range included this number was identified as the first sample site.

e. The sample site interval was added consecutively to the starting number 29 times.

f. With each addition the population unit with the number in its cumulated population was identified as a sample site.

g. This procedure was repeated in each of the 9 universes, giving a total of 270 sample sites.

4. In the sample site the first household was selected randomly from a household listing prepared by governorate or local health personnel.

5. The first child and all subsequent children included in the survey had to be:

   a. A permanent resident of the household.

   b. Between the ages of 6 and 71 months.

   c. Made available to the survey team for completion of survey measurements.

   d. Allowed to participate in the survey through the consent of a parent or household head.

6. When more than one child in the 6-71 month age group lived in a household, a survey form was completed on each of these children.

7. The second and subsequent households included in the survey were the next geographically closest houses. This procedure was followed until 30 children had been surveyed in each sample site.

8. No household number was assigned to an abandoned or temporarily vacant household, or to a household without children in the 6-71 month age group.

U. S. GOVERNMENT PRINTING OFFICE: 1977—742-933

ARE Nutritional Status Survey

FORM 1

I.D. INFORMATION

Universe (1-2) | Governate (3-4) | Sample Site # (5-7) | House Hold (8-9) | I.D. (10-11) | Mother (12) | Team (13) | Date of Visit Month Day Year (14-19)

HOUSEHOLD INFORMATION

Child Name _____ Sex (20) 1 M 2 F

H.H. Head Name _____

Household Size (21-22)

Child 6 mos. (23) 1 yes 2 no

AGE DATA

Date of Birth Month Day Year (24-29)

Age in Mos. (30-31)

Source for age data (32) 1 Verified Record 2 Estimate

Birth Order (33-34)

MOTHER DATA (35)

1 Present
2 Absent

Mother only — ask

"Are you pregnant?" (36) 1 yes 2 no 9 unknown

"Are you breast feeding any child?" (37) 1 yes 2 no 9 unknown

"Is this child presently breast feeding at all?" (38) 1 yes 2 no 9 unknown

If no: "At what age did this child last take any breast milk?"

(39) 1 < 3 mos. 2 3-5 mos. 3 6-11 mos. 4 12-17 mos. 5 18-23 mos. 6 24+ mos. 9 unk.

"At what age did you first introduce 'other' foods to this child?"

(40) 1 3 mos. 2 3-5 mos. 3 6-11 mos. 4 12-17 mos. 8 not yet given 9 unk.

Mother only: "In the past seven (7) days has this child

a) been sick, that is, has been unable to carry on normal daily activities such as playing, eating, etc?" (41) 1 yes 2 no 9 unk

b) had diarrhea, that is, 4 or more watery stools per day for more than 2 days?" (42) 1 yes 2 no 9 unk

c) had fever for more than 2 days?" (43) 1 yes 2 no 9 unk

FATHER DATA (44)

1 Present
2 Absent

"Can you read and/or write?" (45) 1 yes 2 no

If "yes"

"What is the highest certificate you hold?"

(46) 1 none 2 primary or equiv. 3 preparatory or equiv. 4 secondary or equiv. 5 college or higher

"What is your present full time occupation?" (see manual) (47-48)

EITHER PARENT

"Do you have (49) 1 piped or well water in your house?"
2 piped or well water in your neighborhood?"
3 neither

"Do you have electricity in your house?" (50) 1 yes 2 no

"Do you usually cook with" (51) 1 open fire 2 kerosene 3 bottled gas 4 other

MEASUREMENTS

Weight (52-54) ___.___ kg

Height (55-58) ___.___ cm.

Bilateral Pedal Edema (59) 1 yes 2 no 9 unknown

EYE EXAMINATION

Spots (either eye) (60) 1 yes 2 no 9 unknown

Corneal Scar (either eye) (61) 1 yes 2 no 9 unknown

Total Sight Loss (either eye) (62) 1 yes 2 no 9 unknown

Conjunctivitis (either eye) (63) 1 1+ 2 2+ 3 3+ 4 None 9 unknown

EYE HISTORY

History of Total Loss of Sight (one or both eyes) (64) yes → If "yes" cause: 2 congenital 4 infection 3 trauma 9 unknown
1 no
8 unk

If child is 2 years or greater ask:
"Does this child have night blindness?" (65) 1 yes 2 no 9 unknown

CLINICAL SIGNS

Does the child have Angular Stomatitis?

(66) 1 yes 2 no

Does the child have:

Craniotabes (67) 1 yes 2 no

Frontal Bossing (68) 1 yes 2 no

Chest Rachitic Beading (69) 1 yes 2 no

Enlarged Wrists (70) 1 yes 2 no

Open Ant Fontanelles (71) 1 yes 2 no

Leg Deformity (72) 1 yes 2 no

TEETH

How many teeth has this child? (73-74) ___ (99=unknown)

LAB WORK

Child's blood drawn (75) 1 yes 2 no

Child's Hemoglobin (76-78) ___.___ gms.

Filter papers taken (79) 8 none 1 one 2 two

Mother's blood drawn (80) 1 yes 2 no

Mother's Hemoglobin (81-83) ___.___ gms.

Trachoma Slide (84)

1 yes
2 no

APPENDIX 5

Procedures for Anthropometric Measurements

Principles

Since physical growth is one of the best indicators of the nutritional status of children, its careful measurement is essential for adequate assessment of their nutritional status. Of the many measures of growth, total body length or height, and weight are the measurements most frequently carried out to provide useful information. In practice, however, the accuracy and precision of these measurements is often unsatisfactory, so that anthropometric data commonly fail to attain their potential usefulness. Small between-group differences are immensely important but this significance may be obscured if the measurements have not been made with sufficient accuracy or precision.

There is a deceptive simplicity about making height and weight measurements. It seems to some that the recording of height and weight is so straight-forward that it can readily be done with little attention or care. Adherence to the procedures which follow will appreciably minimize the most common sources of error.

A. Equipment

1. Measuring Board

A combination height/length board with metric scale to 0.1 cm that has been custom made

2. Scale

Salter hanging scale 25 or 50 kgm scale with 0.1 and 0.2 kgm divisions, respectively

Salter pants or seat

B. Procedures

The measurements will be done in the following order:

1. Length/height
2. Weight

1. Length or Height

For a child less than 2 years of age length is measured.

For a child 2 years of age or older height is measured.

a. Length measurements

(1) The measuring board is laid horizontally on the ground or on a table.

(2) With the help of a minimum of two assistants, the baby, barefoot, is placed on the board with the head against the fixed end of the board.

(3) An assistant holds the baby's head in the Frankfort plane and applies gentle traction to bring the top of the head into contact with the fixed end.

(4) The measurer, with the help of another assistant, holds the child's knees together and the legs extended fully. The measurer uses one hand to insure that the child's feet are perpendicular to the board and brings the moveable footboard to rest firmly against the child's heels.

(5) The measurer reads the value of the length to the nearest 0.1 cm reading to the next higher 0.1 cm when the length falls at or above the midway point of a 0.1 cm graduation.

(6) The measurer then records the length clearly in the appropriate blocks on the questionnaire.

b. Height measurement

(1) The measuring board is in a vertical position.

(2) With the help of a minimum of two assistants the child is positioned barefoot on the horizontal platform with his feet together.

(3) One assistant insures that the child stands flat foot with the knees fully extended. The shoulders and buttocks should be in line with the heels and these should all touch the vertical surface of the measuring board.

(4) The moveable headboard is then brought to rest firmly on the crown of the child's head. The head is held in the Frankfort plane.

(5) As in (a) (5) except substitute "height" for "length."

(6) As in (a) (6) except substitute "height" for "length."

2. Weight

a. The Salter scale is suspended from a tripod, quadripod, or a pole held by two assistants.

b. The child is undressed by the parent or guardian.

c. The parent holds the child; the measurer reaches his arms through the leg holes of the Salter pants and draws the legs of the child through the leg holes. He then attaches the Salter pants to the scale.

d. The child in Salter pants hangs freely from the scale. The scale face is read to the nearest 0.1 kgms, reading up to the next higher 0.1 kgm when the pointer tip is at or beyond the midway point of an 0.1 kgm graduation. The reading is made after the child is reasonably still and the needle is stationary.

e. The measurer then records clearly the weight in the appropriate blocks on the questionnaire.

f. The child is then removed from the Salter pants and partially reclothed.

C. Precautions

1. Assistants are necessary--in measuring children their strength and mobility cannot be overstated.

2. The Frankfort plane is a plane perpendicular to the body constructed in profile by a line between the lowest point on the margin of the orbit of the eye and the highest point on the opening of the ear. As much as 2 cm variation in height or length can be produced by flexing or extending the head out of the Frankfort plane.

3. Children, especially infants, have a tendency to extend their feet while lying or standing. Accurate height or length depends on a measurement from the heel.

APPENDIX 6

Procedures for Collecting Blood Samples

A. Fingerstick Method

1. Take one unopette container from the sealed plastic bag which has been premarked with the sample site ID code. Write ID# of child and the mark of "C" for child on the label.

2. Clean index finger or middle finger of child's hand by rubbing with alcohol swab. Allow area to dry. Turn hand palm upward.

3. If you are right-handed, use the thumb and forefinger of your left hand to grip the patient's finger. Make a quick, but firm jab to the fleshy part of the fingertip. (Be prepared for a sudden, instinctive withdrawal movement by the child.)

4. If necessary, use a gentle "milking" motion of your fingers to stimulate flow of blood. Be careful to avoid too much pressure; this will cause tissue juices to be mixed with the blood and introduce error.

5. Using a dry gauze swab, wipe away the first two drops of blood.

6. Remove the unopette pipet from its shield. Use the shield to pierce the plastic cover of the bottle containing the diluting solution.

7. Allow a drop of blood to form on the fingertip. Holding the pipet horizontally, touch the pipet to, but not into, this drop, and allow the pipet to fill by capillary action.

8. Contents of the pipet must be mixed thoroughly and quickly with the diluting solution to avoid clotting of the blood (and therefore loss of the sample). After the pipet is filled, wipe off any excess blood on the outside of the pipet, being careful not to touch the tip which would draw blood out.

9. Loosely insert pipet into the opening of the unopette bottle. Gently squeeze and hold the sides of the container, using your finger to cover the opening of the pipet and then push the pipet down into the neck until it clicks. Release the pressure and remove your finger from the opening. The blood will then be drawn into the container. Squeeze the container several times in order to rinse the pipet thoroughly, being careful not to let the liquid overflow the neck.

10. Placing your finger over the opening in the top of the bottle (leaving pipet in container), invert the bottle several times to mix the blood with the diluting solution. After mixing, place Critoseal in the opening to avoid leakage.

11. Make sure patient's hand is wiped off, and if desired, apply bandaid.

12. Check "yes" on questionnaire in block, next to "blood specimen collected."

B. Heel Stick Procedure (exterior lower lateral side of the sole)

Heel sticks are essentially the same as fingersticks; a rubbing motion from the toes to the heel on the bottom of the foot will help stimulate the blood flow especially if the baby's foot is cold. Babies may also be stuck in the big toe. Get a firm grasp on the infant's foot with your hand; babies can display great amounts of resistance. Follow the same procedure for cleaning area and collecting sample. Be particularly careful to observe cleanliness and when finished be certain that bleeding has completely stopped. Apply a bandaid when finished.

C. Handling of Unopette

The premarked plastic bag containing the used and identified unopettes is kept in a pack unexposed to light and delivered to the operations officer or project director.

APPENDIX 7

Reference Population for Anthropometry

Reference populations used in anthropometry are frequently criticized as not being applicable to developing areas of the world. In preschool-age growth studies, the influences of environment, such as nutrition and infectious disease, are of much greater importance than those of race or ethnicity. The differences in growth of preschool children associated with social class are many times those attributable to ethnic factors alone. The probable degrees of the genetic effect on height for age and weight for age growth indices are approximately 3 percent and 6 percent, respectively, among children from different ethnic backgrounds but similar socio-economic class. In pre-pubertal children, weight for height indices are relatively independent of age and race and chiefly reflect nutritional status.

Waterlow suggests that a reference be used as a basis for a value judgment . The reference population values are correctly used as a basis for the interpretation of survey results and are not to be used as a standard or target to be sought after by a country.

Two or more studied populations or repeated studies on one population can be compared if a reference population is decided on and if the criteria for subject inclusion, age determination and measurement methodology are the same. Although several reference populations are available for anthropometry, the so-called Stuart-Meredith populations, based on data collected on a relatively small number of children in Iowa and Boston during the 1930's and early 1940's, are most commonly utilized as a reference.

Specific limitations of the Stuart-Meredith data base are the small numbers of children involved, the longitudinal rather than cross-sectional gathering of data, the limited socio-economic and ethnic representation, and the age of the data itself. The 10th and 90th percentile were based on such a small number of people as to severely limit statistical precision in these ranges. In developing areas, a great majority of individuals may fall below the 10th percentile, the very area where the Stuart-Meredith data base is statistically the weakest.

The recent availability of data from large-scale and more representative studies in the U.S. has resulted in more appropriate references for use in population comparisons, known as the National Center for Health Statistics/Center for Disease Control (NCHS/CDC) reference populations for anthropometry. Specifically, the larger number of individuals characterizing the NCHS/CDC reference population improves the statistical precision of outlying percentiles.

The general acceptance of a reference population for anthropometry is an international need. The choice of which reference to use for a single survey is probably unimportant. However, if multiple surveys are to be compared, it would seem reasonable that a single reference be agreed upon.

APPENDIX 8

Anthropometric Distributions in Terms of Z-Scores (Standard Deviations): Egypt, 1978

Weight for Height Z-Score	Geographic Area: Lower Rural		Upper Rural		Large Villages		Small Towns		Small Cities		Total Representative Sample		Cairo-Giza and Alexandria	
<-4.00	0.1%	(1)	0.1%	(2)	-	(0)	-	(0)	-	(0)	0.0%	(3)	0.1%	(1)
-3.00 to -3.99	0.1%	(2)	0.1%	(1)	-	(0)	0.2%	(2)	-	(0)	0.1%	(5)	0.2%	(2)
-2.00 to -2.99	0.8%	(29)	1.5%	(27)	0.9%	(8)	0.7%	(6)	0.6%	(5)	0.9%	(75)	0.8%	(12)
-1.00 to -1.99	8.4%	(290)	9.0%	(161)	8.2%	(73)	9.2%	(82)	7.6%	(68)	8.4%	(674)	10.1%	(150)
0 to -.99	29.4%	(1042)	36.6%	(654)	29.5%	(262)	29.2%	(261)	31.0%	(278)	31.3%	(2497)	33.5%	(581)
0 to +.99	43.6%	(1561)	38.6%	(688)	43.8%	(389)	42.5%	(380)	41.1%	(369)	42.0%	(3387)	39.5%	(730)
1.00 to 1.99	15.1%	(538)	12.1%	(215)	15.2%	(135)	15.8%	(141)	17.5%	(157)	14.9%	(1186)	13.6%	(258)
2.00 to 2.99	2.2%	(77)	1.9%	(33)	2.2%	(20)	2.5%	(22)	2.0%	(18)	2.1%	(170)	1.9%	(37)
3.00 to 3.99	0.2%	(9)	0.2%	(3)	0.2%	(2)	-	(0)	0.2%	(2)	0.2%	(16)	0.4%	(6)
4.00+	0.1%	(3)	-	(0)	-	(0)	-	(0)	-	(0)	0.0%	(3)	0.0%	(1)
Total	100%	(3552)	100%	(1784)	100%	(889)	100%	(894)	100%	(897)	100%	(8016)	100%	(1778)

APPENDIX 8

Anthropometric Distributions in Terms of Z-Scores (Standard Deviations): Egypt, 1978

Height for Age Z-Score	Geographic Area: Lower Rural	Upper Rural	Large Villages	Small Towns	Small Cities	Total Representative Sample	Cairo-Giza and Alexandria
<-4.00	3.9% (129)	5.9% (105)	4.0% (36)	2.5% (22)	1.4% (13)	3.8% (305)	2.9% (51)
-3.00 to -3.99	9.5% (312)	12.0% (214)	10.9% (97)	6.4% (57)	3.8% (34)	9.1% (714)	7.4% (126)
-2.00 to -2.99	24.2% (847)	24.8% (442)	27.6% (245)	20.5% (183)	16.4% (147)	23.4% (1864)	22.6% (406)
-1.00 to -1.99	35.1% (1262)	31.0% (553)	34.2% (304)	35.8% (320)	32.1% (288)	33.5% (2727)	37.2% (654)
0 to -.99	21.1% (762)	20.0% (358)	17.3% (154)	24.4% (218)	31.3% (281)	22.1% (1773)	22.6% (413)
0 to +.99	5.3% (207)	5.0% (90)	5.2% (46)	8.5% (76)	11.6% (104)	6.6% (523)	6.6% (114)
1.00 to 1.99	0.7% (28)	0.8% (14)	0.8% (7)	1.2% (11)	2.7% (24)	1.1% (84)	0.6% (12)
2.00 to 2.99	0.1% (4)	0.3% (6)	- (0)	0.6% (5)	0.7% (6)	0.3% (21)	0.1% (1)
3.00 to 3.99	0.0% (1)	0.1% (2)	- (0)	0.2% (2)	- (0)	0.1% (5)	0.0% (1)
Total	100% (3552)	100% (1784)	100% (889)	100% (894)	100% (897)	100% (8016)	100% (1778)

APPENDIX 8

Anthropometric Distributions in Terms of Z-Scores (Standard Deviations): Egypt, 1978

Weight for Age Z-Score	Geographic Area: Lower Rural		Upper Rural		Large Villages		Small Towns		Small Cities		Total Representative Sample		Cairo-Giza and Alexandria	
<-4.00	0.5%	(14)	0.8%	(15)	1.0%	(9)	0.3%	(3)	0.1%	(1)	0.6%	(42)	0.3%	(6)
-3.00 to -3.99	2.6%	(89)	3.9%	(70)	2.6%	(23)	1.2%	(11)	0.8%	(7)	2.5%	(200)	2.1%	(31)
-2.00 to -2.99	11.4%	(397)	15.2%	(271)	11.4%	(101)	10.0%	(89)	7.5%	(67)	11.5%	(925)	10.8%	(171)
-1.00 to -1.99	28.7%	(1016)	32.6%	(581)	33.2%	(295)	28.1%	(251)	25.3%	(227)	29.9%	(2370)	31.7%	(563)
0 to -.99	37.5%	(1315)	30.1%	(537)	33.0%	(293)	36.1%	(323)	35.9%	(322)	34.5%	(2790)	34.7%	(631)
0 to +.99	16.4%	(614)	14.7%	(263)	16.2%	(144)	18.9%	(169)	22.4%	(201)	17.2%	(1391)	17.4%	(318)
1.00 to 1.99	2.6%	(96)	2.2%	(40)	2.4%	(21)	4.6%	(41)	6.7%	(60)	3.3%	(258)	2.5%	(51)
2.00 to 2.99	0.3%	(10)	0.4%	(7)	0.3%	(3)	0.8%	(7)	1.2%	(11)	0.5%	(38)	0.4%	(7)
3.00 to 3.99	-	(0)	-	(0)	-	(0)	-	(0)	0.1%	(1)	0.0%	(1)	-	(0)
4.00+	0.0%	(1)	-	(0)	-	(0)	-	(0)	-	(0)	0.0%	(1)	-	(0)
Total	100%	(3552)	100%	(1784)	100%	(889)	100%	(894)	100%	(897)	100%	(8016)	100%	(1778)

APPENDIX 9A

Prevalence of Low Height for Age in Children with Dietary Data, by Region

Universe	<90%		90%+		Total	
	#	%	#	%	#	%
1-6	261	24.3	812	75.7	1,073	100.0
7-8	75	21.1	281	78.9	356	100.0
9	21	11.7	159	88.3	180	100.0
1-9	357	22.2	1,252	77.8	1,609	100.0

Mean Daily Food Unit Consumption of Nine Food Groups,[Δ] by Region and by Height for Age Category

Food Group	Universe	<90%	90%+	Total
1	1-6	3.04	3.65	3.50
	7-8	3.95	3.20	3.36
	9	1.62	2.54	2.43
	1-9	3.15	3.41	3.35
2	1-6	0.11	0.19	0.17
	7-8	0.08	0.13	0.12
	9	0.05	0.38	0.34
	1-9	0.10	0.20	0.18
3	1-6	6.47	6.69	6.63
	7-8	5.44	5.85	5.76
	9	6.00	6.40	6.35
	1-9	6.22	6.46	6.41
4	1-6	0.80	0.73	0.75
	7-8	0.79	1.24	1.13
	9	1.43	1.36	1.37
	1-9	0.83	0.93	0.90
5	1-6	0.87	0.83	0.84
	7-8	0.69	0.65	0.66
	9	0.33	0.86	0.80
	1-9	0.80	0.80	0.80
6	1-6	0.95	1.20	1.14
	7-8	1.13	1.27	1.24
	9	1.43	1.97	1.91
	1-9	1.02	1.31	1.25
7	1-6	2.43	2.33	2.36
	7-8	1.60	2.11	2.00
	9	2.38	2.23	2.24
	1-9	2.25	2.27	2.26
8	1-6	0.85	0.98	0.95
	7-8	0.56	0.77	0.73
	9	1.14	1.00	1.02
	1-9	0.81	0.94	0.91
9	1-6	2.76	3.18	3.08
	7-8	3.00	3.42	3.33
	9	2.71	3.24	3.18
	1-9	2.81	3.24	3.14

Δ1. Milk Group
2. Weaning Food Group
3. Grain Group
4. Legume Group
5. Tuber Group
6. Egg/Meat Group
7. Vegetable Group
8. Oil/Fat Group
9. Sugar/Beverage Group

APPENDIX 9B

Prevalence of Low and High Weight for Height
in Children with Dietary Data, by Region

Universe	<85%		85-119%		120%+		Total	
	#	%	#	%	#	%	#	%
1-6	31	2.9	1,018	94.9	24	2.2	1,073	100.0
7-8	7	2.0	343	96.4	6	1.7	356	100.0
9	1	0.6	175	97.2	4	2.2	180	100.0
1-9	39	2.4	1,536	95.5	34	2.1	1,609	100.0

Mean Daily Food Unit Consumption of Nine Food Groups,[Δ]
by Region and by Weight for Height Category

Food Group	Universe	<85%	85-119%	120%+	Total
1	1-6	5.10	3.50	1.38	3.50
	7-8	7.43	3.31	1.00	3.36
	9	7.00	2.37	4.00	2.43
	1-9	5.56	3.33	3.40	3.35
2	1-6	0.26	0.17	0.29	0.17
	7-8	0.00	0.12	0.00	0.12
	9	0.00	0.35	0.25	0.34
	1-9	0.21	0.18	0.24	0.18
3	1-6	3.00	6.69	8.88	6.63
	7-8	2.57	5.78	8.50	5.76
	9	7.00	6.35	6.25	6.35
	1-9	3.03	6.45	8.50	6.41
4	1-6	0.58	0.73	1.75	0.75
	7-8	0.14	1.15	2.00	1.13
	9	0.00	1.39	0.75	1.37
	1-9	0.49	0.90	1.68	0.90
5	1-6	0.42	0.85	0.96	0.84
	7-8	0.00	0.68	0.17	0.66
	9	0.00	0.81	1.00	0.80
	1-9	0.33	0.81	0.76	0.80
6	1-6	0.71	1.15	1.21	1.14
	7-8	0.00	1.26	1.67	1.24
	9	0.00	1.93	1.75	1.91
	1-9	0.56	1.26	1.35	1.25
7	1-6	1.06	2.37	3.46	2.36
	7-8	0.00	2.05	1.50	2.00
	9	0.00	2.27	1.50	2.24
	1-9	0.85	2.29	2.88	2.26
8	1-6	0.45	0.94	1.79	0.95
	7-8	0.00	0.73	1.33	0.73
	9	0.00	1.03	0.75	1.02
	1-9	0.36	0.91	1.59	0.91
9	1-6	2.03	3.09	3.79	3.08
	7-8	2.00	3.38	2.17	3.38
	9	7.00	3.21	1.00	3.18
	1-9	2.15	3.17	3.18	3.14

[Δ]1. Milk Group
2. Weaning Food Group
3. Grain Group
4. Legume Group
5. Tuber Group
6. Egg/Meat Group
7. Vegetable Group
8. Oil/Fat Group
9. Sugar/Beverage Group

APPENDIX 9C

Prevalence of Low Hemoglobin* in Children with Dietary Data, by Region

Universe	Low		Normal		Total	
	#	%	#	%	#	%
1-6	353	32.9	720	67.1	1,073	100.0
7-8	83	23.3	273	72.7	356	100.0
9	26	14.4	154	85.6	180	100.0
1-9	462	28.7	1,147	71.3	1,609	100.0

*6-23 Months, <10g, 24-71 Months, <11g

Mean Daily Food Unit Consumption of Nine Food Groups,Δ by Region and by Hemoglobin Category

Food Group	Universe	Low	Normal	Total
1	1-6	3.72	3.40	3.50
	7-8	4.13	3.14	3.36
	9	2.19	2.48	2.43
	1-9	3.70	3.21	3.35
2	1-6	0.20	0.16	0.17
	7-8	0.04	0.14	0.12
	9	0.46	0.31	0.34
	1-9	0.18	0.18	0.18
3	1-6	6.48	6.72	6.63
	7-8	5.68	5.80	5.76
	9	6.81	6.27	6.35
	1-9	6.36	6.44	6.41
4	1-6	0.56	0.84	0.75
	7-8	1.13	1.13	1.13
	9	1.73	1.30	1.37
	1-9	0.73	0.97	0.90
5	1-6	0.93	0.80	0.84
	7-8	0.74	0.64	0.66
	9	1.12	0.75	0.80
	1-9	0.91	0.76	0.80
6	1-6	1.06	1.17	1.14
	7-8	0.85	1.35	1.24
	9	2.19	1.36	1.91
	1-9	1.08	1.30	1.25
7	1-6	2.26	2.41	2.36
	7-8	1.88	2.04	2.00
	9	2.46	2.22	2.24
	1-9	2.20	2.29	2.26
8	1-6	0.81	1.02	0.95
	7-8	0.67	0.75	0.73
	9	1.19	0.99	1.02
	1-9	0.80	0.95	0.91
9	1-6	2.98	3.12	3.08
	7-8	2.82	3.46	3.33
	9	2.73	3.26	3.18
	1-9	2.94	3.22	3.14

Δ1. Milk Group
2. Weaning Food Group
3. Grain Group
4. Legume Group
5. Tuber Group
6. Eggs/Meat Group
7. Vegetable Group
8. Oil/Fat Group
9. Sugar/Beverage Group

APPENDIX 9D

Mean, Standard Deviation, and Coefficient of Variation of Food Units Consumed, for Nine Food Groups[Δ] (Total Egypt Data)

Food Groups	Mean	S.D.	C.V.
1	3.35	4.48	133%
2	0.18	0.72	400%
3	6.41	4.02	63%
4	0.91	1.64	180%
5	0.80	1.51	189%
6	1.25	1.45	116%
7	2.26	2.52	112%
8	0.91	1.23	135%
9	3.14	2.74	87%

Δ1. Milk Group
2. Weaning Food Group
3. Grain Group
4. Legume Group
5. Tuber Group
6. Egg/Meat Group
7. Vegetable Group
8. Oil/Fat Group
9. Sugar/Beverage Group

APPENDIX 9E

Prevalence of Wasting and Overweight, by Age (Universe 1-6)

Age in Months	<85%		85-119%		120%+		Total	
6-11	2.7%	(112)	95.5%	(107)	1.8%	(2)	100%	(112)
12-23	6.4%	(17)	93.6%	(247)	0	(0)	100%	(264)
24-35	4.1%	(9)	93.6%	(204)	2.3%	(5)	100%	(218)
36-47	0.5%	(1)	93.7%	(177)	5.8%	(11)	100%	(189)
48-59	0.6%	(1)	96.3%	(154)	3.1%	(5)	100%	(160)
60-71	0	(0)	99.2%	(128)	0.8%	(1)	100%	(129)
6-71	2.9%	(31)	94.9%	(1,017)	2.2%	(24)	100%	(1,072)

Mean Number of Food Units Consumed in Each of Nine Food Groups[Δ] by Age and Weight for Height Category (Universe 1-6)

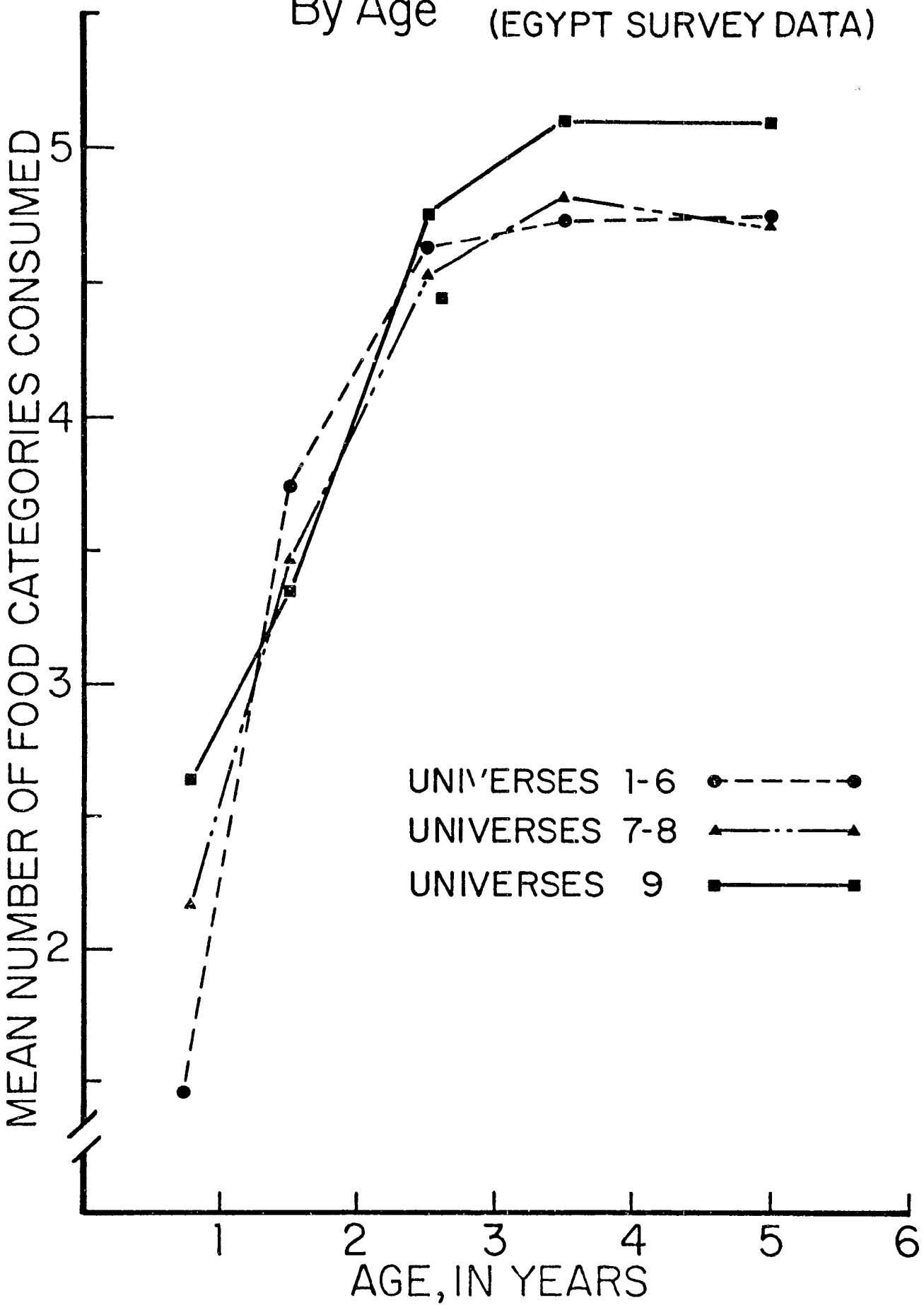
Food Group	Age in Months	<85%	85-119%	Total
1	6-23	12.00	9.96	10.04
	12-23	5.76	7.49	7.38
	24-35	2.67	1.27	1.31
	36-47	0.00	0.27	0.81
	48-59	0.00	0.78	0.79
	6-71	5.10	3.50	3.50
2	6-11	0.00	0.15	0.14
	12-23	0.35	0.11	0.13
	24-35	0.22	0.16	0.16
	36-47	0.00	0.19	0.21
	48-59	0.00	0.26	0.25
	6-71	0.26	0.17	0.17
3	6-11	2.33	1.45	1.45
	12-23	3.00	4.36	4.28
	24-35	3.44	8.13	7.98
	36-47	2.00	8.56	8.60
	48-59	2.00	8.12	8.13
	6-71	3.00	6.69	6.63
4	6-11	0.00	0.07	0.07
	12-23	0.71	0.39	0.41
	24-35	0.67	0.84	0.83
	36-47	0.00	1.02	1.11
	48-59	0.00	1.07	1.08
	6-71	0.58	0.73	0.75
5	6-11	0.33	0.10	0.11
	12-23	0.41	0.68	0.67
	24-35	0.22	1.13	1.11
	36-47	3.00	0.86	0.85
	48-59	0.00	0.96	0.95
	6-71	0.42	0.85	0.84

Food Group	<85%	85-119%	Total
6	0.33	0.06	0.06
	0.53	0.66	0.65
	1.10	1.22	1.24
	2.00	1.59	1.54
	1.00	1.69	1.68
	0.71	1.15	1.14
7	0.00	0.18	0.17
	0.59	1.49	1.43
	1.44	2.81	2.80
	6.00	3.15	3.19
	4.00	2.92	2.94
	1.06	2.37	2.36
8	0.00	0.09	0.09
	0.29	0.61	0.59
	0.56	1.13	1.12
	2.00	1.25	1.51
	2.00	1.16	1.19
	0.45	0.94	0.95
9	0.67	1.18	1.15
	1.82	2.36	2.33
	2.67	3.69	3.68
	1.00	3.90	3.86
	5.00	3.82	3.84
	2.03	3.09	3.08

[Δ]1. Milk Group
2. Weaning Food Group
3. Grain Group
4. Legume Group
5. Tuber Group
6. Egg/Meat Group
7. Vegetable Group
8. Oil/Fat Group
9. Sugar/Beverage Group

APPENDIX 9F

Median Number Of Food Categories Consumed (Variety Score) In 3 Regions (Universes 1-6, 7-8, 9) By Age (EGYPT SURVEY DATA)



APPENDIX 9G

Prevalence of Stunting, Wasting, and Anemia
by Region (Universes 1-6, 7-8, and 9)

Universe	<90% Height for Age	<85% Weight for Height	<11g/de Hgb
1-6	24.3% (261/1072)	2.9% (31/1072)	43.6% 466/1068
7-8	21.1% (75/356)	2.0% (7/356)	34.8% 123/354
9	11.7% (21/180)	0.6% (1/180)	23.5% 42/179
1-9	22.2% (357/1608)	2.4% (39/1608)	39.4% 631/1601

"Variety Score" (Median Number of Food Categories Consumed)
by Region and by Nutritional Status Category

Universe	Height for Age, % of Median <90%	90%+	Total
1-6	4.28	4.40	4.36
7-8	3.85	4.40	4.30
9	4.40	4.74	4.69
1-9	4.23	4.44	4.38

Universe	Weight for Height, % of Median <85%	85%+	Total
1-6	2.83	4.39	4.36
7-8	1.75	4.34	4.30
9	2.00	4.69	4.69
1-9	2.62	4.41	4.38

Universe	Hemoglobin, g/100 ml <11g	11g+	Total
1-6	4.13	4.51	4.37
7-8	3.56	4.55	4.30
9	4.50	4.70	4.67
1-9	4.04	4.55	4.38