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9. ABSTRACT

Contains results of a detailed report on the status of nutrition in Togo, particularly that of mothers and children. The study was designed to 1) provide the Togo Ministry of Rural Development with a reliable data base for use in planning and monitoring nutrition intervention programs, and 2) to help develop the capability of Togo personnel to conduct nutrition surveys in the future. The first section of this report details design and methodology of the survey, including data collection procedures and personnel training. Following this methodological information, the resulting study data is presented. Tables contain height, weight, and arm circumference measures, and indicate the percent of population (by region, sex, age, ethnic group, and income) suffering from acute and chronic malnutrition, anemia, and bilateral pedal edema. Specific instructions for taking measurements and obtaining blood samples are provided in the appendix.

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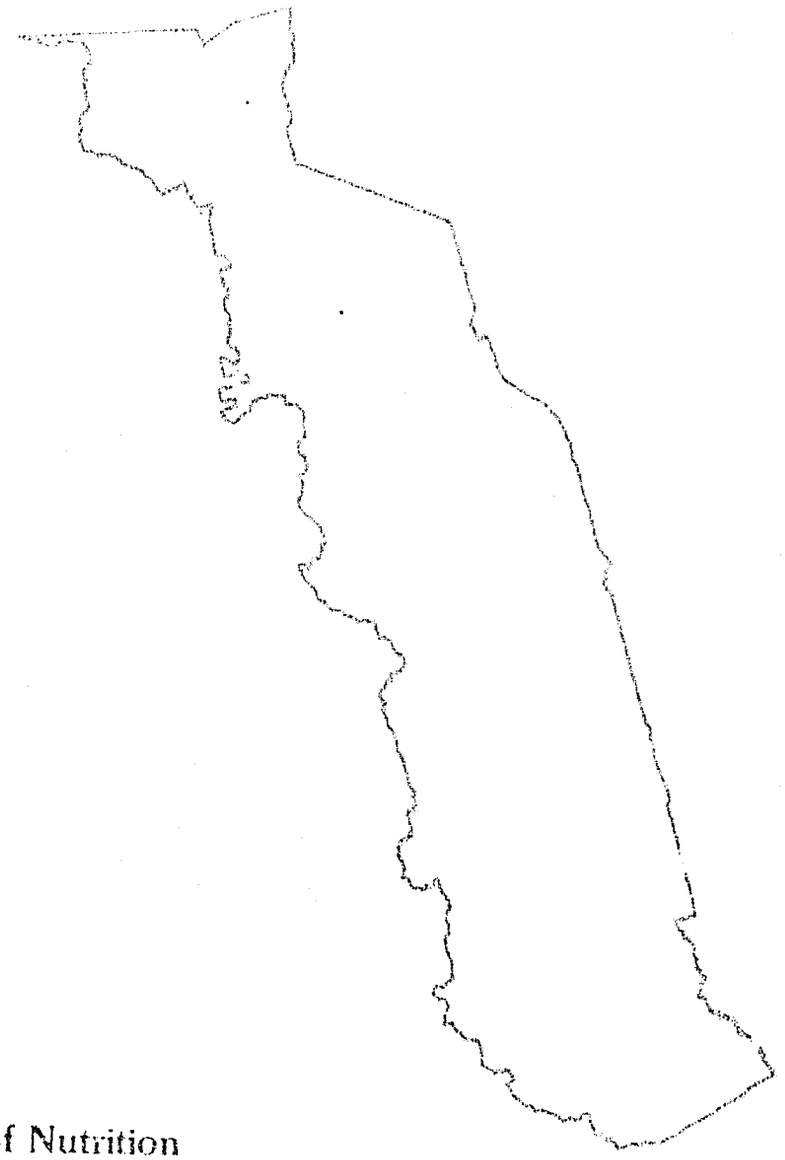

Office of Nutrition
Agency for International Development
Washington, D.C. 20523

TOGO NUTRITION STATUS SURVEY

OCTOBER 1976 - JANUARY 1977

CONDUCTED BY THE

MINISTRY OF RURAL DEVELOPMENT,

GOVERNMENT OF TOGO

WITH THE ASSISTANCE OF THE
CENTER FOR DISEASE CONTROL
PUBLIC HEALTH SERVICE
U.S. DEPARTMENT OF HEALTH EDUCATION AND WELFARE

IN COOPERATION WITH

THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

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AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C. 20523

"The aim of a nutrition status survey is to obtain the maximum of useful information, using a minimum of staff, inexpensive equipment and uncomplicated techniques that can be analyzed easily." (D.B. Jelliffe, The Assessment of the Nutritional Status of the Community, 1966, World Health Organization, Monograph Series, 53.)

CONTENTS

Contents (cont'd.)

TOGO NUTRITION STATUS REPORT

I. Objectives

There were seven objectives for the Togo Nutrition Status Survey:

1) The survey was to provide a statistically valid assessment of the nutritional status of the preschool population of the five administrative rural regions plus the one urban region of Togo. This was to be done by measuring certain crucial indicators of nutrition status in preschoolchildren 6-71 months of age selected by a generally accepted survey sampling technique. The data should allow for the estimation and comparison of undernutrition in preschoolchildren among the six regions, for variables based on all children within a region with prevalences of the variable of five percent or greater.

2) The survey was to provide statistically valid data on anemia in the preschool survey child plus his mother. This data was collected on a 20 percent subsample of the total population surveyed. This should allow for country-wide estimation and comparison of anemia in preschoolchildren by selected age groups and in mothers. It also should give an indication of the anemia prevalence in children and mothers among the six regions.

3) The survey was to collect information from the mother on her present status as regards pregnancy and lactation, and on the weaning history of the survey child. Such information should

aid in the interpretation of the undernutrition and anemia data, and give better descriptive information of these conditions and practices in Togo.

4) The survey was to collect limited socioeconomic data from the household head. Such information should help in nutrition data interpretation.

5) The survey was to collect a limited quantity of demographic information which should also aid in nutrition data interpretation.

6) The survey was to fulfill the need expressed by the Togo Ministry of Rural Development for a reliable reference data base to be used in planning intervention programs in nutrition and monitoring possible changes resulting from such programs.

7) The survey was to help develop the capability of Togo personnel, through training and field experience, to conduct a survey and make nutritional assessments by selected anthropometric, clinical and biochemical means. Such capabilities should be helpful in nutrition surveys and surveillance in the future in Togo.

Rationale

In the past, nutrition surveys have been complex undertakings. They collected an enormous amount of data which was often difficult to analyze. They were expensive, requiring a large, highly trained staff, much equipment and complicated techniques. A number of

years often passed before the final report was issued and could be used for planning of programs. Another problem has been the lack of standardization, and hence comparability of surveys. As a result, the Eighth Joint Expert Committee of FAO and WHO of 1971 (1) has emphasized the need for developing techniques to determine the worldwide prevalence of malnutrition and to make the results comparable from one country to another.

During the past three years, the Center for Disease Control has developed a methodology for a simplified field assessment of nutritional status of populations in developing countries (2). From past experience the degree of undernutrition in the preschool-child (ages 6-71 months) is related to and can act as an indication of the level of the nutritional status of that child's community (2). It has also been found that certain anthropometric measurements, selected clinical data and hemoglobin levels can be used as the key indicators of nutritional status in this high risk group (4,5). Probability sampling techniques must then be used in the selection of the children to be surveyed so that statistically valid estimates of the nutritional status of regions and comparisons among them can be made (6). The above methodology has been applied in the Sahel (7), Nepal (8), Sri Lanka (9), and Liberia (10) over the past 2 years. Rapid assessments of the magnitude and geographical distribution of protein-calorie malnutrition and anemia have been obtained with a minimum of expense and within a short time (less than a year from inception to final report). It must be emphasized, however, that this methodology does not address the causes of the undernutrition

III. Background Information

A great deal of concern has been shown by the government of Togo over the nutritional problems of its people as evident by the emphasis placed on nutrition in their health education and preventive medicine programs (11). In 1964-1965, the Society for Studies on Economic and Social Development and the Government of Togo carried out a national study on the budgets and food consumption of Togolese families (12). This gave the government information on the composition of daily diets, providing the percentage of daily requirements of proteins, calories, minerals and vitamins consumed. This study was carried out on a sample of households in Lomé, smaller urban villages and the rural areas. In the rural areas, 23.2 percent of the households had diets with less than 80 percent of the recommended amounts of calories, while 35.2 percent of the households had diets with less than 80 percent of the recommended amounts of protein. The urban areas also showed deficits in calories and proteins, although Lomé households consumed more protein than other urban areas.

On looking at hospital admissions, one sees that severe cases of protein-calorie malnutrition do occur in Togo. For example in 1974 at the University Hospital of Lomé, 208 of the 1766 pediatric admissions (11.8 percent) were for a diagnosis of malnutrition (13). The most difficult period for the food supplies is May through June (14) and most cases of kwashiorkor and marasmus occur during the summer, peaking in August and September (15). Almost all

cases occur between one and three years of age, which corresponds with the weaning period of infants in Togo (13).

From the above, malnutrition is a problem in Togo and a priority of the government. Quantitative data to define the extent of nutritional problems, and their distribution among the population and geographical regions of the country did not exist. In the spring of 1976, the government of Togo accepted the U.S. Agency for International Development's offer of assistance in obtaining consultants to design and carry out a national nutrition survey to answer these questions.

IV. Survey Design and Methodology

A) Core Data Items

In a field survey, the data items should be easily measurable with acceptable accuracy and reliability, should adequately assess the nutritional conditions under consideration, and must remain within the practical constraints of time, money, equipment, and personnel. With these criteria in mind, data items were chosen which were thought by CDC, USAID and Togo officials to adequately reflect a child's status with regard to undernutrition and anemia.

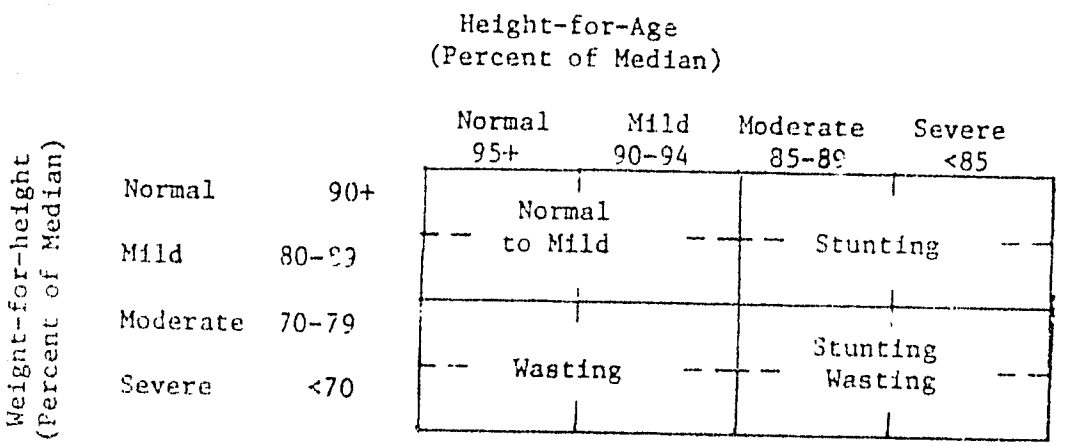
Anthropometry allows one to assess protein energy undernutrition by using the simple body measurements of weight and height (and perhaps arm circumference) (4,16). These measurements rely

on accompanying accurate age information for interpretation and to permit comparison with a reference population (17). In Togo a system of birth registration has been developed over the past decade, but it was realized before field work began that this registration was not very effective in some areas. Because of this, a series of historical calendars was developed and the Togolese field workers were trained in their use. The method of determining the age was recorded on each child's form so that the results could be analyzed according to the method of age determination. The contribution of ethnic differences in distorting anthropometric data comparisons between Togo and western reference populations is at a minimum within the age group 6-71 months (18) and is a minimal bias for comparisons between regions.

With accurate height, weight and age determinations and an acceptable reference population, the two major types of protein-calorie undernutrition can be distinguished: i.e., wasting which is a deficit in weight-for-height and a measurement of acute undernutrition, and stunting which is a deficit in height-for-age and a measurement of chronic undernutrition. Wasting requires a severe deficiency of both protein and calories of weeks to a few months. This is only seen in large numbers during a famine situation or other acute food shortage. Stunting requires a

mild to moderate deficiency of both protein and calories for greater than 6 months. The distribution of weight for age measurements will also be presented, but this does not distinguish between long-term stunting due to retarded linear growth of bones and short-term wasting of muscle and fat (19).

In the data analysis, in addition to standard distribution tables, stunting and wasting data will be combined in the Waterlow type of table (20). The format of such a table is given below.



The measurement of hemoglobin by the spectrophotometric determination of cyanmethemoglobin is preferred in the assessment of anemia since it is a direct reflection of the oxygen carrying capacity of the blood and can be performed with satisfactory accuracy (21). It offers the additional advantages that specimens can be relatively easily handled in the field and transported to a central location for spectrophotometric

determinations. The method used in the Togo survey involved the collection of specimens by the Becton-Dickinson Unopette system and their analysis by the Bausch and Lomb Minispec 20 TM Spectrophotometer.

In summary, the following core data items were selected for the two conditions under consideration:

a) undernutrition - weight, height and arm circumference

b) anemia - hemoglobin

These items meet the criteria of ease of measurability with acceptable accuracy and reliability, and of adequate assessment of the nutritional conditions under consideration, while remaining within practical resource constraints.

B) Other Data Items

Of the many clinical signs of undernutrition, only that of bilateral pedal edema was included in the survey. This is an objective and cardinal sign of severe protein deficiency or kwashiorkor in young children (5). Field personnel can be taught quickly to recognize it. However, it is difficult to quantitate and only its presence or absence was sought.

Mothers were asked, "Are you pregnant?" If they answered no or unknown, they were asked, "Are you presently breast feeding any child?" This information was necessary for the interpretation of the mother's hemoglobin values.

Mothers were asked, "Is the survey child presently breast feeding?" If they answered no, they were asked, "At what age did you wean him?" All mothers were then asked, "At what age did he first receive solid or semi-solid foods?" Answers to these questions aided in the interpretation of the child's nutritional status and provided some quantitative data on these practices in Togo.

The household head was asked, "How much money did your household spend during the preceding month?" The original questionnaire posed the same question "for the preceding year," but this was altered to its present form before field work began. A question to determine the amount of land cultivated was dropped when field testing revealed that quantification of land areas by rural farmers was unreliable. The household head was then asked, "Which, and how many, of the following items are owned by members of your household?" (See questionnaire in Appendix G for a list of these items - "goats" was dropped before survey work began.) The number of articles found were weighted and related to the household size. We attempted to correlate the answers to these two questions with the child's nutritional status.

Finally, a limited number of demographic facts were obtained. These included the mother's ethnic group, the child's sex, the size of the household and the birth order of the child examined. The determination of birth interval was eliminated after early field testing. Associations between these facts and the

nutritional status of the child were looked for.

C) Selection of Survey Universe

The survey universe and the geographical areas in which the survey would be conducted were delineated by Togo and CDC officials. The survey universe was defined as the entire population of Togo (1.9 million by the 1970 census). The country is divided into 5 administrative regions and these divisions were used for within country comparisons. A separate urban region (designated region 6), consisting of Lomé plus the 6 large communes located within the 5 administrative regions, was created. This results in an urban population of 298,000 or 15.7 percent of the total population and a rural population of 1.6 million or 84.3 percent of the total population. In summary, there were 6 sample areas or subuniverses in the survey, consisting of the 5 rural administrative regions and an urban region (Figure 1).

Samples were then drawn from each of the six regions so that the prevalence estimates for each region would have a precision above the predetermined minimally acceptable level, and would allow preliminary region comparisons from simple inspection of the data. Significance testing could then be directly performed with the F-test, t-test or chi-square test to determine if significant differences in nutritional status existed among the regions (22).

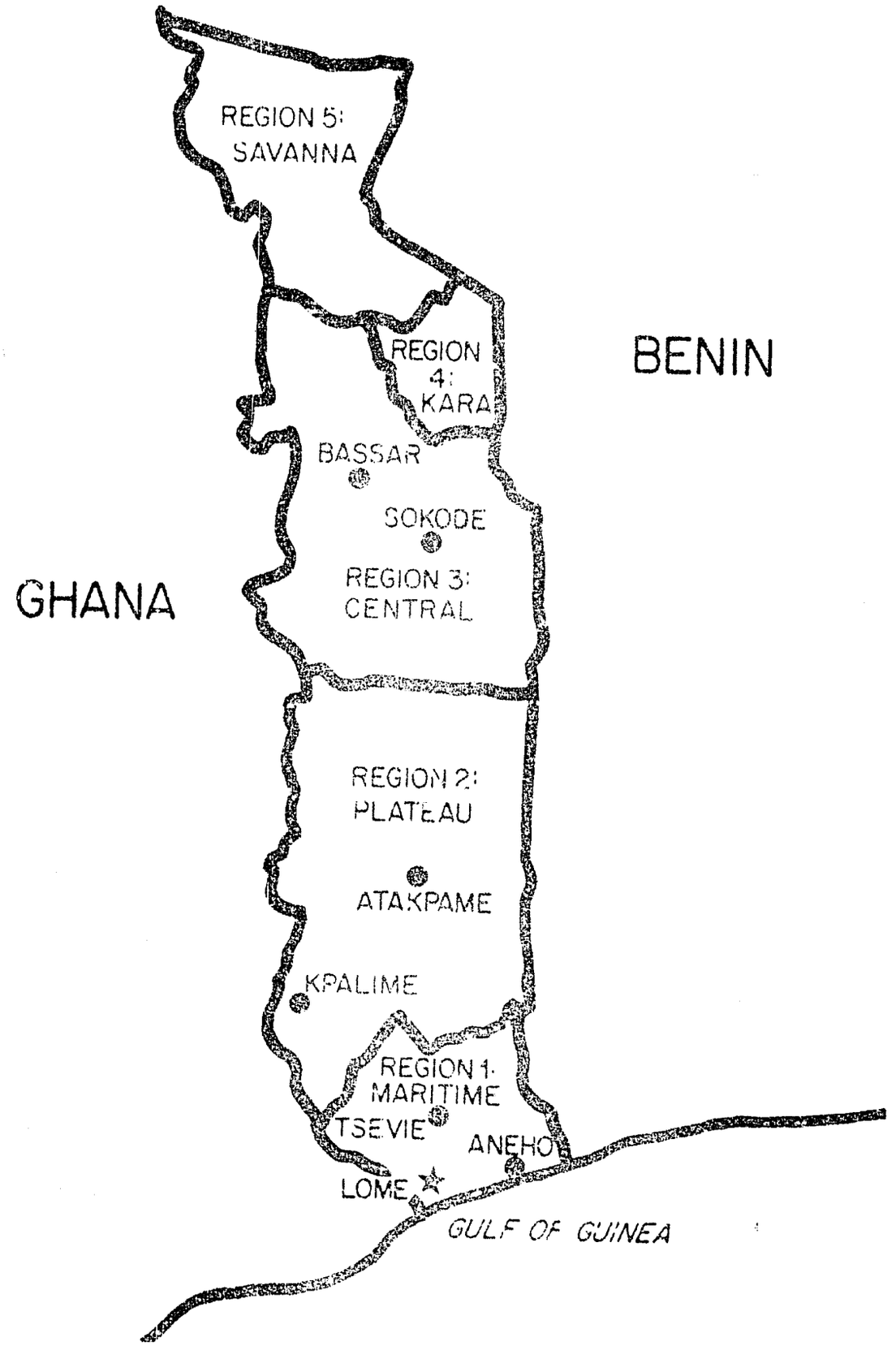

UPPER VOLTA
REGION 5: SAVANNA
REGION 4: KARA
BENIN
BASSAR
SOKODE
GHANA
REGION 3: CENTRAL
REGION 2: PLATEAU
ATAKPAME
KPALIME
REGION 1: MARITIME
TSEVIE
ANEHO
LOME
GULF OF GUINEA

FIGURE 1

D) Sampling Methods

Each region or sample area must consist of at least 30 clusters or sample sites to permit the estimation of protein-calorie undernutrition and anemia (as well as other parameters examined by the study) at the regional level (23). Statistical testing could then determine if significant differences in nutrition parameters existed between regions. (A detailed description of these calculations are given in Appendix C)

In the first stage of the sampling procedure, a minimum of 30 sample sites (villages or commune quarters) were selected within each region using the 1970 census data. The probability of inclusion of a village or commune quarter in the sample was proportional to its population. (Except in the Maritime and Plateau regions which were sampled at half the sampling rate as the rest of the country.)

The second stage of the sampling procedure was carried out in the field by the individual teams. In each sample site, the first household was randomly chosen as explained in Appendix D. Then the team proceeded to adjacent households until 30 children age 6-71 months were examined.

E) Special Group

An international reference population was used to standardize the Togo anthropometry data, to allow its comparison with other surveys and to facilitate the comparison of the data within the present survey. The NCHS/CDC (National Center for Health

Statistics/Center for Disease Control) reference population has been selected because it is based on measurements made by well-trained personnel using standardized methods and on a large sample of American children examined within the past few years (17).

Another aid in the analysis and interpretation of survey data is a nutrition status description of a socioeconomic elite population (termed the special group) of a country. The results for the special group are compared with results obtained for the survey population and with the NCHS/CDC references. The special group in Togo was drawn from the private day nurseries and the families of high ranking officers in both the armed forces and police force. Results obtained from these socioeconomically advantaged children are felt to represent the current highest levels of nutritional health in Togo. Therefore, they may be regarded as target values potentially obtainable by the same age groups of the entire Togolese population.

V. Field Methodology

A) Equipment

Stature or length was measured in centimeters using a sturdy portable wooden board, which allowed values to be read to the nearest 0.1 centimeter. Weight was measured in kilograms using a Salter hanging scale, which allowed values to be read to the nearest 0.1 kilogram. Boards and scales were checked periodically to assure their measurement accuracy.

Arm circumference was measured with a Zerfas slotted tape (24), which could be read to the nearest 0.1 centimeter.

Blood was collected by finger or heel stick on approximately every fifth child and his mother. Blood was drawn into capillary tubes which were calibrated to collect the same quantity on each subject, and the blood was then dissolved in Drabkin's solution of known concentration and quantity. These specimens were then taken to the designated headquarter site where the Survey Director and Operations Officer performed all assays by the cyanmethemoglobin method using a Bausch and Lomb Minispec 20 TM Spectrophotometer (25).

The detailed procedures followed in the survey for anthropometric measurements and collection of blood samples are provided in Appendices E and F.

B) Personnel

The administrative co-director was Mr. S.K. Amela (Le Directeur du Service de la Nutrition et de la Technologie Alimentaire, Ministère du Développement Rural) and the technical co-director was Mr. A. Ayéboua (Ingenieur, Charge de la Division de la Nutrition Appliquée et de l'Economie Alimentaire, Ministère du Développement Rural). A staff of 15 individuals (see list on page 84) received an intensive 3 week training course prior to the initiation of field work. The staff consisted of 4 civil servants attached to the nutrition unit of the Ministry of Rural Development and 11 recent Togolese high school graduates.

field conditions. The staff worked in teams consisting of 2 individuals each. While only 6 teams or 12 individuals were required for the field work, 3 additional men were trained to serve as replacements in the event that staff members became unavailable for field work.

Teams were carefully instructed in the measuring and recording of weight, height and arm circumference to insure acceptable accuracy and reliability. Team performance of these anthropometric measurements was evaluated at the end of the training session through the use of standardization tests adapted from those utilized by Habicht (26). All teams learned rapidly the technique of blood drawing by practice on one another. Teams were also instructed in the proper techniques of asking questions and obtaining responses necessary for completion of other items on the data form. The obtaining of accurate ages through the use of historical calendars and careful questionning was stressed at all stages of training.

Before beginning the field work, the teams worked for a day in a practice village under close supervision. During the field work, one Togolese Ministry of Rural Development and two CDC supervisors remained full time in the field, traveling with the teams, and observing and correcting team work in the sample sites. These supervisors edited the team's data forms each evening and discussed any problems found with the appropriate teams the next day.

C) Data Collection

The questionnaire is presented in Appendix G. Three items were deleted after they were found to be unsatisfactory for the survey: birth interval (item 36-38); amount of land cultivated (item 54-56); number of goats owned (73-74). The first socioeconomic question was altered to include only money spent by the household during the preceding month. Details for the proper administration of the questionnaire are included in the field manual for the Togo Nutrition Status Survey.

The survey design and sampling methodology were structured so that estimates could be made by region of the selected nutrition parameters. This survey was not designed to identify causal factors of these problems. The methodology does allow, however, estimates by region of demographic and descriptive factors collected in the survey. These factors are the size and location of the child's household, mother's ethnic group, child's sex, child's birth order, mother's physiological status, early infant feeding practices and socioeconomic data. These are considered auxiliary information to aid in interpretation of the nutrition data.

Completed questionnaires were edited for legibility, completeness, and accuracy at the sample site by the team, and then at headquarters by the supervisory personnel. The edited forms were airmailed to the Center for Disease Control

IBM 370/145 computer.

Field work began in October 1976 and was completed the last week of January 1977. Only one of the 205 survey sites was not visited. A total of 6,120 questionnaires were completed.

VI. Survey Results and Analysis

A) Analytic Methodology

A format for data presentation and analysis was chosen which allowed meaningful comparisons of regions on various nutrition indices as in the following categories suggested by Waterlow and Rutishauser (20):

Nutritional Status	Height-for-Age	Weight-for-Height
Normal Nutrition	normal	normal
Acute Undernutrition ("wasting")	normal	low*
Chronic Undernutrition ("stunting")	low**	normal
Concurrent acute and chronic undernutrition ("wasting and stunting")	low**	low*

*Defined as less than 80% of reference median weight-for-height[20].
**Defined as less than 90% of reference median height-for-age[20]

Three different categories of undernutrition are identified by the anthropometric parameters of height-for-age and weight-for-height. The percentage of preschoolchildren in each category was calculated for each region. The regions were compared by undernutrition category to determine

significant variation among all regions existed using the F-test or chi-square test (22). If significant variation existed, the t-test was performed (each region percentage was compared with the population-weighted average percentage of the entire country), to determine if the variation was accounted for by certain regions (22).

The above undernutrition categories have been used in other field surveys similar to this one in scope and purpose (7,8,9,10). One may object to the use of these somewhat arbitrary categories, and, for this reason, detailed distribution tables are presented in Appendix H which allows a closer inspection of the data. The use of a single cutoff value for acute and chronic undernutrition permits the presentation of straightforward analyses in the report and allows statistically meaningful, although simple, comparisons of regions.

Anemia has been defined as a hemoglobin of less than 11.0 g/100 ml for children 2 years of age and older and less than 10.0 g/100 ml for those under 2 years of age (27). Anemia in adult females has been defined as a hemoglobin of less than 12.0 g/100 ml if nonpregnant and less than 11.0 g/100 ml if pregnant (28). The percentage of anemic preschool-children and mothers was identified for each region, and the variations among regions tested using F-tests. If significant variation occurred, t-tests were performed to determine if certain regions accounted for it (22).

The sampling was done in such a way as to be proportional to the population. (See Appendix C). This resulted in the sample size being slightly different among the regions and slight variations in precision do occur from region to region. However, the minimum number of clusters for the smallest region was 30, which maintains precision above the predetermined level even for this region. Larger regions will of course have a slightly greater level of precision

B. Age and Sex Distribution

The sample distribution by sex and age is shown in Table 1. The age and sex distribution for the total survey population and the age and sex differences between regions are not likely to have biased the survey results. Only 11.3 percent of the total is distributed in the 60-71 month age group. This decrease in the expected number of children was due to the fact that many children begin school at 5 years of age and were therefore not present in the household when the team was there.

Table 1

Sample Distribution by Age and Sex

Age (Months)	Males		Females		Total	
	No.[a]	Percent[b]	No.	Percent	No.	Percent
6-11	335	5.6	373	6.3	708	11.8
12-23	703	11.6	641	10.7	1344	22.3
24-35	600	10.0	572	9.3	1172	19.3
36-47	601	9.7	551	9.0	1152	18.7
48-59	535	8.6	483	7.9	1018	16.6
60-71	385	6.2	315	5.1	700	11.3
Total	3159	51.7	2935	48.3	6094	100.0

[a]Actual number of children in age group.
[b]Weighted percentages to correct for the influence of undersampling in the Maritime and Plateau regions.

Of the 6,120 children selected for the survey, 26 were not included in the analysis because of omitted or erroneous age data. These deletions were not concentrated in any one region.

Of those selected for analysis, 68.0 percent (4,138) had a birth registration form as proof of date of birth. Among the regions, this value ranged from 54.8 percent to 88.1 percent of survey children. Later in this report, the age-dependent data will be compared according to the method of age determination.

C. Acute Undernutrition

Table 2 shows the percentage of children who had evidence of acute undernutrition ("wasting") in each region and the weighted average

Table 2

Acute Undernutrition* by Region

Region	Percent Acutely Undernourished
Savanna	5.1
Central	2.0
Maritime	1.8
Kara	1.7
Plateau	1.7
Urban	0.8
Weighted Average - Togo	2.0

*Weight-for-height <80 percent of reference median

The individual region prevalence figures show significant variation by the F-test ($p < .001$). It should be noted that the 5.1 percent figure for the Savanna region is significantly higher by the t-test ($p < .001$).

Table 3 shows the pattern of acute undernutrition by age groups for Togo.

Table 3

Acute Undernutrition by Age

Age (Months)	Percent Acutely Undernourished (weighted percent)
6-11	3.2
12-23	4.5
24-35	1.8
36-47	0.8
48-59	0.5

Acute undernutrition in Togo is age related and is significantly higher in the children from 6-35 months by the chi-square test ($p < .001$).

Figures 2-3 display the Togo median weight-for-height by sex as curves compared with the NCHS/CDC reference population median and 80 percent of median weight-for-height curves.

D. Chronic Undernutrition

Table 4 shows the percentage of children who had evidence of chronic undernutrition ("stunting") in each region and the weighted average percentage of such children for all of Togo.

Table 4

Chronic Undernutrition* by Region

Region	Percent Chronically Undernourished
Savanna	28.2
Kara	26.1
Central	20.3
Maritime	17.8
Plateau	16.2
Urban	11.4
Weighted Average - Togo	19.1

*Height-for-age <90 percent of reference median.

The total survey prevalence of stunting is high. Significant variation exists between the six regions by the F-test ($p < .001$).

COMPARISON OF TOGO SURVEY POPULATION MEDIAN WEIGHT-FOR-HEIGHT
WITH NCHS/CDC REFERENCE POPULATION (6-71 Months of Age)

Figure 2. BOYS

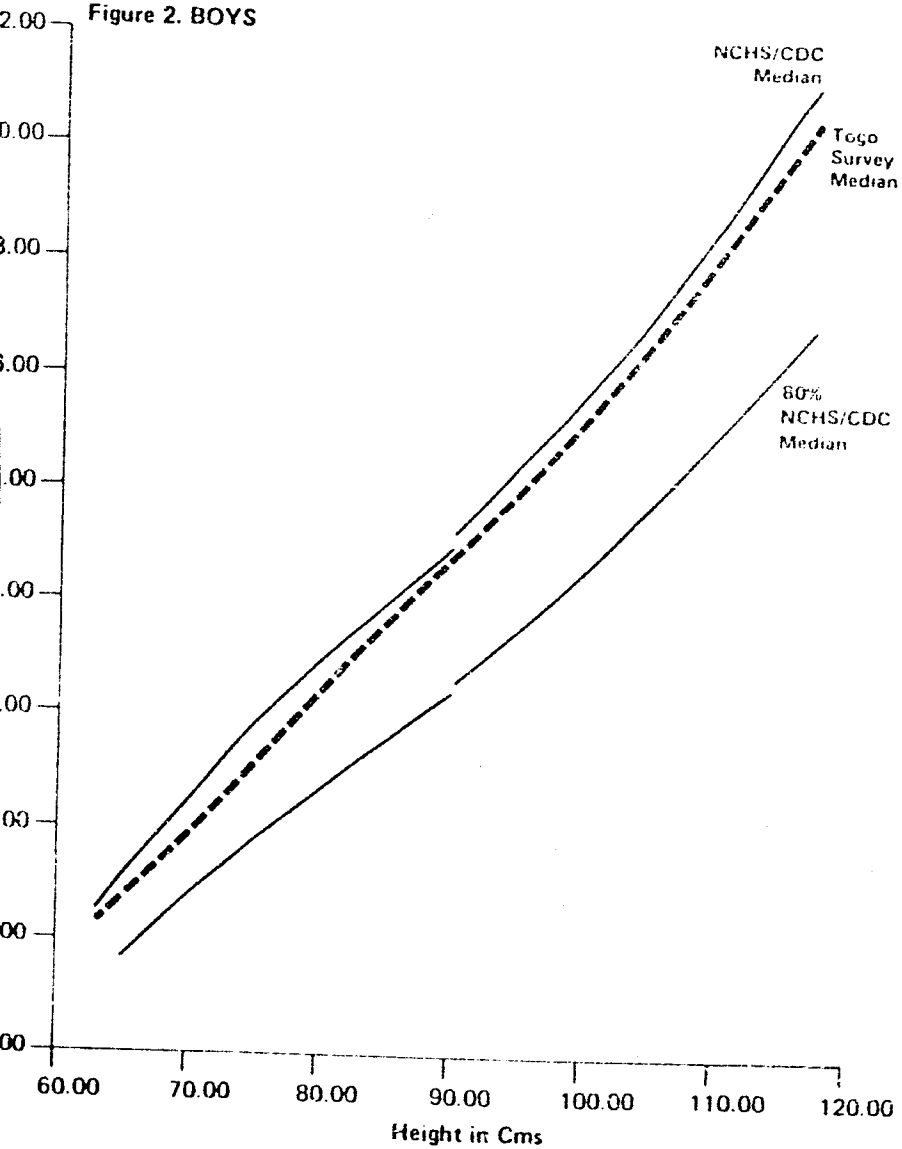
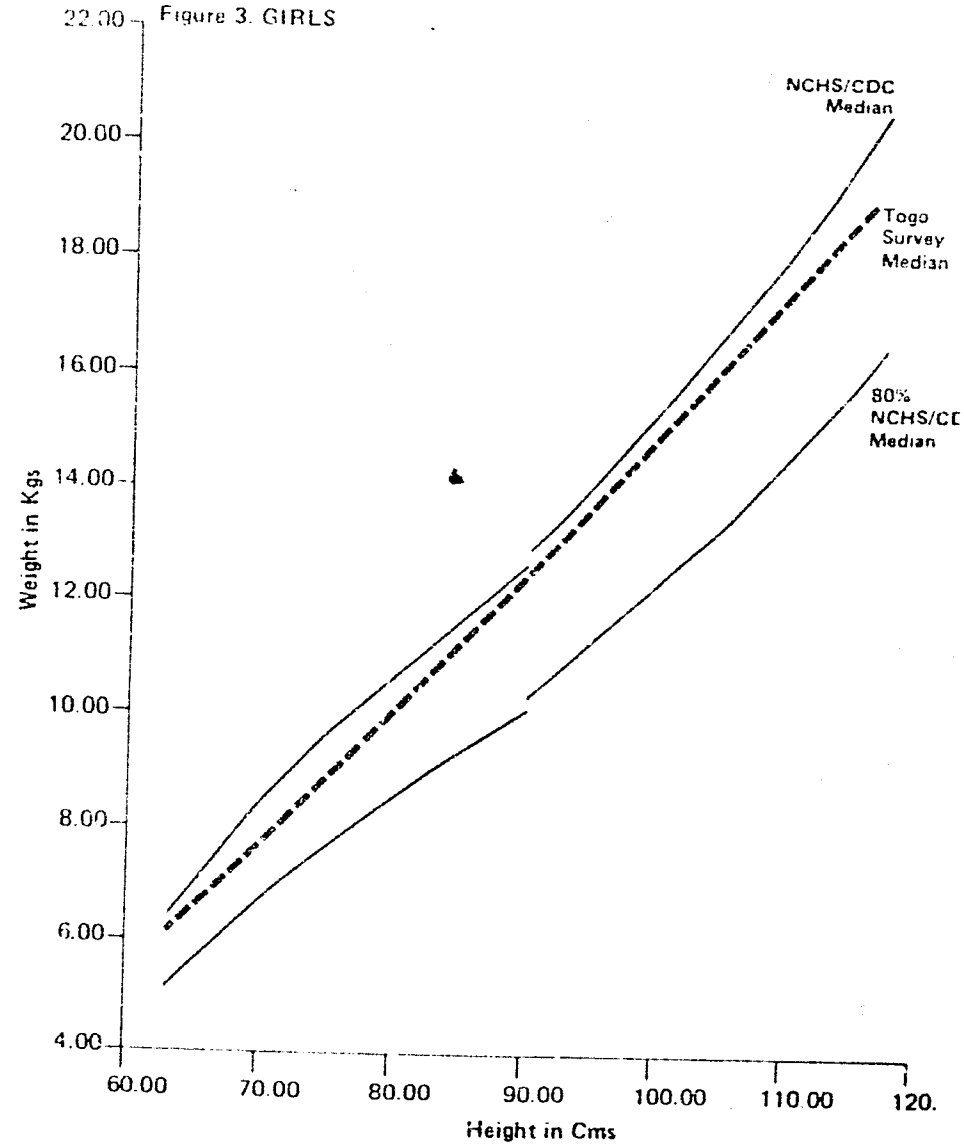


Figure 3. GIRLS



Based on major agricultural and food consumption patterns, one can regroup the regions into three categories: northern rural (Kara and Savanna), remaining rural (Maritime, Plateau, and Central) and urban. The northern rural area subsists on cereals as the food staple while the remaining rural area subsists on root crops (14). The urban population differs from both rural areas by dependence on a money economy with mixed food consumption patterns. The results are summarized in Table 5.

Table 5

Chronic Undernutrition by Regrouped Regions

Regrouped Regions	Percent Chronically Undernourished (weighted percent)
Northern Rural (Savanna + Kara)	27.1
Remaining Rural	17.8
Urban	11.4
Average - Togo	19.1

Significant variation exists between these three groupings by the F-test ($p < .001$).

Finally, comparing the five rural regions to the urban region, one finds that 20.4 percent of rural children are chronically undernourished and 11.4 percent of urban children are chronically undernourished. The difference is statistically significant by the F-test ($p < .001$).

In summary, one-fifth of all Togo's preschoolchildren are stunted and the rural children have twice the prevalence of stunting

over their urban cohorts. Planning for nutrition intervention should consider this geographical distribution of the problem.

Table 6 shows the pattern of chronic undernutrition, by age, for Togo as a whole.

Table 6

Chronic Undernutrition by Age

Age (Months)	Percent Chronically Undernourished (weighted percent)
6-11	6.5
12-23	15.1
24-35	18.6
36-47	24.4
48-59	23.9
60-71	24.8
Average - Togo	19.1

The prevalence of stunting in Togo increases with age through the first three years of life, and thereafter levels off to a prevalence of about 25 percent. This may be explained by the fact that by age three weaning has been completed and children can obtain their food independently. However, the leveling off indicates that little catch up growth is occurring in Togo preschoolchildren after weaning and before age six.

Figures 4-5 compare for each sex the Togo median height-for-age curve with the NCHS/CDC reference population median and 90 percent of median height-for-age curves.

COMPARISON OF TOGO SURVEY POPULATION MEDIAN HEIGHT-FOR-AGE WITH NCHS/CDC REFERENCE POPULATION (6-71 Months of Age)

Figure 4. BOYS

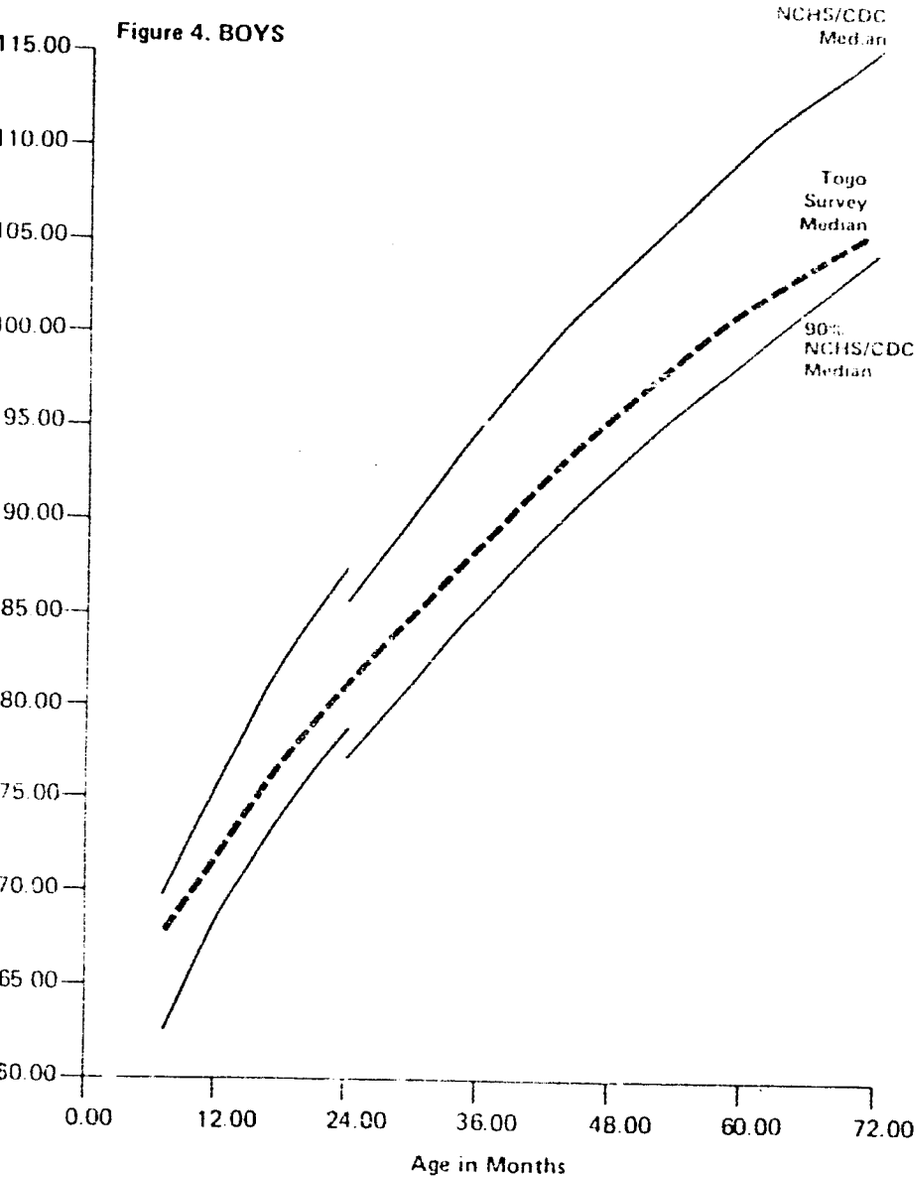
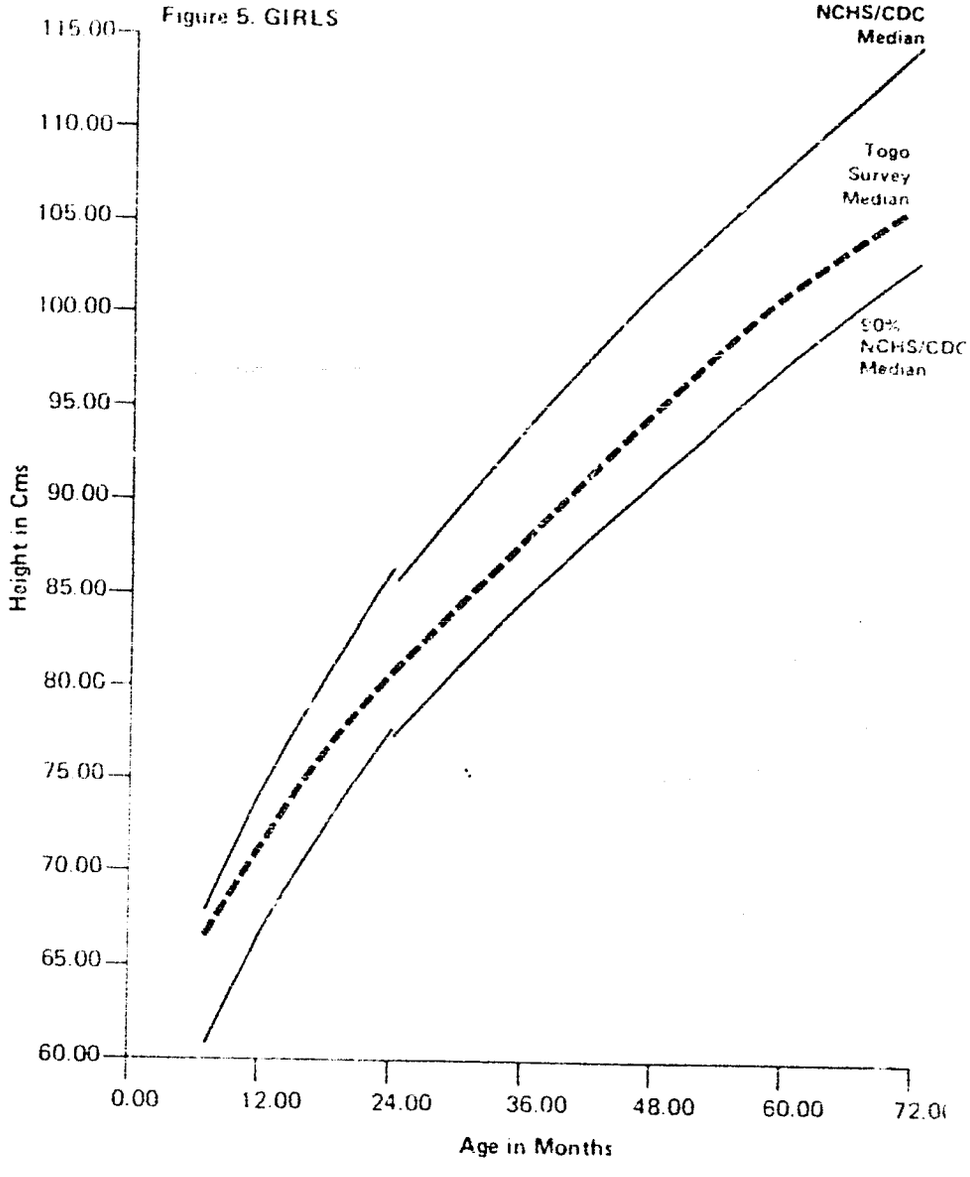


Figure 5. GIRLS



E. Concurrent Acute and Chronic Undernutrition

Table 7 shows the percentage of children with evidence of concurrent acute and chronic undernutrition ("wasting and stunting") in each region and the average percentage of such children for all of Togo.

Table 7

Concurrent Acute and Chronic Undernutrition* by Region

Region	Percent Acutely and Chronically Undernourished
Savanna	2.6
Maritime	0.6
Kara	0.4
Plateau	0.3
Urban	0.3
Central	0.2
Weighted Average - Togo	0.7

*Weight-for-height <80 percent of reference median and height-for-age <90 percent of reference median.

There is significant variation between regions by the F-test ($p < .001$).

The Savanna region has a rate of concurrent acute and chronic undernutrition significantly higher than the country-wide average by the t-test ($p < .001$). Overall in Togo the rate of concurrent undernutrition is low.

Table 8 shows the pattern of concurrent acute and chronic undernutrition by age groups for Togo.

Table 8

Concurrent Acute and Chronic Undernutrition by Age

Age (Months)	Percent Acutely and Chronically Undernourished (weighted percent)
6-11	0.4
12-23	1.8
24-35	0.6
36-47	0.4
48-59	0.1
60-71	0.1
Average - Togo	0.7

The pattern is that of low prevalence among all age groups but with a significant increase during the second year of life by the chi-square test ($p < .001$).

F. Gomez Classification

While the Gomez classification (19), a weight-for-age index, does not allow one to distinguish between acute and chronic undernutrition, analyses based on weight-for-age are presented here since they may prove useful for comparison with existing data in other countries. Table 9 presents the percent of children in combined second and third degree malnutrition by region according to the Gomez classification.

Table 9

Gomez Classification: Combined Second and Third-Degree Malnutrition* by Region

Region	Percent Gomez Second and Third-Degree (Combined)
Savanna	27.2
Kara	18.8
Central	15.5
Plateau	13.7
Maritime	13.1
Urban	8.9
Weighted Average - Togo	15.3

*Weight-for-age <75 percent of reference median.

There is a significant variation among region prevalences by the F-test ($p < .001$).

Table 10 shows the age distribution of children with second and third-degree malnutrition on a weight-for-age basis.

Table 10

Gomez Classification: Combined Second and Third Degree Malnutrition* by Age

Age (Months)	Percent Gomez Second and Third-Degree (Combined) (weighted percent)
6-11	15.2
12-23	19.4
24-35	15.1
36-47	12.5
48-59	13.7
60-71	14.6
Average - Togo	15.3

*Weight-for-age <75 percent of reference median.

A moderate prevalence of underweight children exists in all age groups with a significant increase during the second year of life by the chi-square test ($p < .001$).

A more detailed presentation of the Gomez classification of the weight-for-age data is presented in Appendix H. Even though variations among regions can be demonstrated, the interpretation of the results does not allow the same objective targeted program planning as do weight-for-height and height-for-age data. These latter two indices help separate acute and chronic undernutrition, and help to determine whether long or short-term intervention programs are indicated.

G. Arm Circumference-for-Height Data

Table 11 presents by region the distribution of the Togo preschool population by percent above and below 82.5 percent of the reference median. Those below 82.5 are considered to have acute undernutrition.

Table 11

Arm Circumference-for-Height by Region

(Percent above and below 82.5 percent of median of Ten-State Nutrition Survey Data as a Reference)

Region	Percent of Ten-State Nutrition Survey Reference Median	
	<82.5	>82.5
Savanna	8.1	91.9
Kara	1.9	98.1
Plateau	1.9	98.1
Urban	1.4	98.6
Central	1.2	98.8
Maritime	1.2	98.8
Weighted Average - Togo	2.3	97.7

There is significant variation among regions by the F-test ($p < .001$). The Savanna region has the greatest prevalence of acute undernutrition while the remaining regions have a similar low prevalence.

Table 12 presents the age distribution of the Togo preschool population by percent above and below 82.5 percent of the reference median.

Table 12

Arm Circumference-for-Height by Age

(Percent Above and Below 82.5 Percent of Median of Ten-State Nutrition Survey Data as a Reference)

Age (Months)	Percent of Ten-State Nutrition Survey Reference Median (weighted percent)	
	<82.5	>82.5
6-11	2.8	97.2
12-23	4.1	95.9
24-35	3.4	96.6
36-47	1.3	98.7
48-59	0.5	99.5
60-71	0.9	99.1
Average - Togo	2.3	97.7

Acute undernutrition in the 6-35 month old age group is more prevalent than in those children over 3 years of age by the chi-square test ($p < .001$).

In Togo, the prevalence and distribution of acute undernutrition using the arm circumference-for-height index parallels that found by weight-for-height. However, the reliability of arm circumference measurements is less than measurements of weight. In addition, acceptable arm circumference reference data are not available.

H. Pedal Edema

Table 13 presents the percent of children with bilateral pedal edema by region.

Table 13

Bilateral Pedal Edema by Region

Region	Percent Prevalence of Pedal Edema*
Kara	0.9
Plateau	0.5
Savanna	0.4
Central	0.3
Maritime	0.2
Urban	0.2
Weighted Average - Togo	0.4

*Data from one team was rejected.

During editing of the forms and supervision of the survey, it was found that one of the teams was identifying edema much more frequently than any of the others, even though all teams were working in the same region. It was felt after observing and questioning this team, that they had called positive many children with a trace of edema (by a survey convention, these should have been negative). When the findings of this team for edema were excluded, the total number of children with edema decreased from 64 to 20.

Only 0.4 percent of all survey children were found to have bilateral pedal edema. For practical purposes there is no difference between regions. If one compares the rate of edema in normal children (weight-for-height >80 percent of reference median and height-for-age >90 percent of reference median) to the remainder, one finds a 12 fold increase in prevalence in the latter. In other words, those children with acute or chronic undernutrition by anthropometry are at a much higher risk of having edema.

In spite of the above correlations with undernutrition, some of these edema cases represent the background presence of chronic renal and heart disease, thus lowering further the small number of suspected kwashiorkor children. To place this low prevalence in perspective it should be underlined that the season of severe protein-calorie undernutrition is in the summer, while our survey took place in the late fall (15).

I. Anemia in Preschoolchildren

It was noted early in the survey that hemoglobin levels from a few villages were very high and that the samples from these villages had a much darker color. Further checking revealed that these samples were collected by the same team member. Elimination of this person from blood collection solved the problem. The problem recurred near the end of the survey, was traced again to a single individual and disappeared when this person no longer drew the blood samples. The manufacturers of the Unopette system felt that most likely the problem was hemoconcentration in the finger

occurred in 12 of the 204 completed sample sites and these hemoglobin values have been deleted from all the analyses of anemia.

Anemia in children is defined as a hemoglobin <10.0 g/100 ml if under 2 years of age and <11.0 g/100ml if 2 years of age or older (28).

Table 14 presents the mean hemoglobin value by region for Togolese children 6-71 months of age. No correction was necessary for altitude, as all villages were at or only slightly above sea level.

Table 14

Mean Hemoglobin Values by Region
(Children 6-71 Months of Age)

Region	Mean Hemoglobin Value
Plateau	10.4
Urban	10.3
Maritime	10.2
Kara	9.9
Central	9.8
Savanna	9.8
Weighted Average - Togo	10.1

Use of the F-test shows a significant difference in the distribution of the mean hemoglobin values among the regions ($p < .005$).

Table 15 presents the percent of Togolese preschoolchildren with

Table 15

Percent of Children with Anemia by Region

Region	Percent Anemia
Savanna	68.9
Kara	65.6
Central	65.0
Maritime	56.0
Urban	55.7
Plateau	50.3
Weighted Average - Togo	58.6

A chi-square test on this distribution reveals no statistically significant variation among regions. However, if one compares the average prevalence of anemia in the three northern regions of Savanna, Kara and Central (66.5%) to the remainder of the country (53.7%), the north has a significantly higher prevalence by the chi-square test ($p < .005$). This might be due to dietary differences between north and south (14), or to higher rates of malaria in the north. The latter is probably not the explanation as malaria surveys in Togo have shown the prevalence to be highest in the south and central areas (29). Malaria though is highly endemic in Togo and accounts for an unknown portion of the overall anemia rate.

Severe anemia demanding urgent clinical attention (defined as a hemoglobin of <8.0 g/100 ml), has a country-wide prevalence of 10.1 percent. This is a disturbingly high prevalence and further studies to determine its cause should be undertaken.

Table 16 presents the percent of Togolese preschoolchildren who are anemic by age group.

Table 16

Percent of Children with Anemia by Age Groups

Age (Months)	Percent Anemic (weighted percent)
6-11	61.2
12-23	49.3
24-35	70.7
36-47	65.7
48-59	53.4
60-71	49.2
Average - Togo	58.6

The pattern shows a high prevalence of anemia in all age groups. The sudden rise in anemia at 2 years of age is partially accounted for by the change in the cutoff point for anemia from <10.0 g/100 ml to <11.0 g/100 ml. A better analysis of these data requires a curve showing a continuous distribution of hemoglobin by age in a reference population and comparison of survey values by percent of median reference values. Such reference curves are not yet available.

J. Anemia in Mothers

Table 17 presents the mean hemoglobin value by region for Togolese mothers.

Table 17

Mean Hemoglobin Values by Region

(Mothers)

Region	Mean Hemoglobin Value
Central	12.7
Savanna	12.6
Plateau	12.5
Kara	12.4
Maritime	12.1
Urban	12.1
Weighted Average - Togo	12.4

Use of the F-test shows a significant difference in the distribution of the mean hemoglobin values among the regions ($p < .001$).

For the purpose of this report we have utilized the WHO criteria for anemia in adult females (28). Anemia is thus defined as a hemoglobin of <12g/100 ml in nonpregnant and lactating women, and <11g/100 ml in pregnant women. The maternal plasma volume and hematological indices return to prepregnant values within two months of parturition. Also, maternal physiological characteristics

during lactation do not differ significantly from those of the nonpregnant state (30). Therefore, we have utilized the same criteria of anemia for both lactating and nonpregnant women.

Table 18 presents the percent of anemic mothers by region.

Table 18

Percent of Mothers with Anemia by Region

Region	% Anemic
Urban	38.5
Kara	35.0
Maritime	31.5
Plateau	31.3
Savanna	29.1
Central	27.6
Weighted Average - Togo	32.1

Applying the chi-square test to this distribution shows no statistically significant variation among regions. There is also no evident pattern that appears by logical regrouping of the regions. In other words, there is a uniform 30 to 35 percent prevalence of anemia in Togolese women of child bearing age.

Table 19 presents the distribution of hemoglobins by the physiological status of the mother.

Table 19

Hemoglobin Distribution by Physiological Status of Mothers

Hemoglobin Value	Pregnant		Non-pregnant and Lactating		Non-pregnant and Non-lactating		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
<10.0	26	24.2	36	4.8	15	7.7	77	7.1
10.0-10.9	23	22.7	57	7.0	15	7.4	95	8.5
11.0-11.9	27	28.9	147	17.8	49	19.4	223	19.1
>12.0	25	24.2	578	70.4	143	65.5	746	65.4
Total	101	100.0	818	100.0	222	100.0	1141	100.0

By combining the appropriate parts of this table, 46.9 percent of pregnant women and 30.7 percent of the remaining women are anemic. This difference could be due to insufficient diet and lack of vitamin and mineral supplementation during pregnancy.

If one looks at mothers with severe anemia (defined as a hemoglobin of <8.0g/100 ml), there is a prevalence of only 0.7 percent. This is a relatively low incidence in a country with highly endemic malaria.

K. Influence of the Method of Age Determination on the Results

The determination of the survey child's age is the most important single factor in the validity of a nutrition status survey based on anthropometry and anemia. Only the measure of acute undernutrition or weight-for-height is age independent. All others require the comparison of the measured parameter to the subject's age.

Throughout the training period, the paramount need for accurate age determination of the children was stressed to the field workers. A verifiable record such as a birth registration document was to be sought. If this was not available, the field workers were to employ historical calendars to relate the child's birth to local well known events. The first step was to determine in which month the birth occurred by use of recurring events such as harvests, plantings, etc. Then the year of birth was determined by use of well known important local events such as the plane accident of the president. Children without a verifiable record were not excluded from the survey except when the field workers felt that they could not arrive at the child's age within 3 months by the historical calendar method.

Table 20 presents the distribution of age determinatior methods by region.

Table 20

Age Determination Method by Region

Region	Percent by Verifiable Record	Percent by Historical Calendar and Other Methods
Savanna	88.1	11.9
Maritime	70.8	29.2
Plateau	65.6	34.4
Urban	64.4	35.6
Kara	64.3	35.7
Central	54.8	45.2
Weighted Average - Togo	68.0	32.0

It is evident that there is a wide and significant difference in the coverage of the birth registration system from region to region by the F-test ($p < .001$). However, the 68.0 percent countrywide prevalence of children with verifiable records does point out that a relatively high number of children in Togo have been covered by the registration system as compared to a prior USAID supported nutrition survey done in West Africa. This survey was done in Liberia in 1975 and it was found that only 24.5 percent of children had birth records (10).

In order to arrive at some idea of the accuracy of the age data obtained by the historical calendar methods, one of the age dependent measurements (chronic undernutrition or height-for-age) was calculated by grouping the children according to the

method by which their age was determined. Table 21 presents these results.

Table 21

Chronic Undernutrition*

by Age Determination Method by Region

Region	% Chronically Undernourished		
	Verifiable Record	Historical Calendar + Other	Total
Savanna	28.5	25.6	28.2
Kara	23.8	30.2	26.1
Central	18.9	22.1	20.3
Plateau	16.8	15.2	16.2
Maritime	18.3	16.8	17.8
Urban	11.6	11.0	11.4
Weighted Average - Togo	19.3	18.5	19.1

*Height-for-age <90% of reference median

There is no statistical difference in chronic undernutrition calculated by the two methods of age determination. In Togo the historical calendar method of age determination of preschool-children had sufficient accuracy.

L. Rural and Urban Sectors

The first stage of sampling was identical for both urban and rural areas. In the second stage, the on-site random selection of the first concession or starting point of an urban quarter was not

feasible. The starting concession had to be randomly selected for each urban sample site from detailed listings prepared by the census or malaria services. (See Appendix D for details.) No bias was introduced by this change.

In Table 22 the data is arranged to allow comparison of the rural, urban and country-wide values.

Table 22

Comparison of Rural and Urban Sectors

by Undernutrition Parameters*

	Rural	Urban	Average Togo
	(weighted percent)		
% Acute Undernutrition	2.2	0.8	2.0
% Chronic Undernutrition	20.4	11.4	19.1
% Acute & Chronic	0.7	0.3	0.7
% Underweight	16.5	8.9	15.3
% Low Arm Circumference-for-Height	2.5	1.4	2.3
Pedal Edema	0.4	0.2	0.4
Anemia (Children 6-71 Months of Age)	59.1	55.7	58.6
Anemia (Mothers)	30.9	38.5	32.1

*See definitions in previous text.

Of the total population of 6,094 children included in the analysis, 4,868 or 84.7 percent (weighted) were in the rural regions and 1,226 or 15.3 percent (weighted) were in the urban region. All of the anthropometric indices show about a two-fold higher prevalence of undernutrition in the rural areas. The most striking difference, statistically, is in chronic undernutrition (by the chi-square test, $p < .001$).

In the rural areas, anemia rates are higher for children, but lower for mothers. These differences are not statistically significant.

M. Special Group

Anthropometric and age data were collected on 450 children age 6-71 months in several private preschools and in the families of civil servants within the capital city of Lomé. These children are from the highest socioeconomic level in Togo. Table 23 shows the distribution of these 450 children by sex and age.

Table 23

Distribution of Special Group by Age and Sex

Age (Months)	Males		Females		Total	
	No.	Percent	No.	Percent	No.	Percent
6-11	21	4.7	25	5.6	46	10.2
12-23	15	3.3	15	3.3	30	6.7
24-35	7	1.6	5	1.1	12	2.7
36-47	57	12.7	59	13.1	116	25.8
48-59	75	16.7	44	9.8	119	26.4
60-71	60	13.3	67	14.9	127	28.2
Total	235	52.2	215	47.8	450	100.0

There are insufficient numbers of children in the 12-23 and 24-35 age groups to make comparisons with the previous data. Table 24 compares the special group children with the survey children for growth parameters in the remaining age groups.

Table 24

Growth Comparisons

Special Group vs. Togo Survey Children

Weight-for-Height

(Percent <80% of NCHS/CDC Reference Median)

Age (Months)	Special Group	Survey Children (weighted percent)
6-11	-	3.2
36-47	-	0.8
48-59	0.8	0.5
60-71	-	0.7

Height-for-Age

(Percent <90% of NCHS/CDC Reference Median)

Age (Months)	Special Group	Survey Children (weighted percent)
6-11	2.2	6.5
36-47	0.9	24.4
48-59	0.8	23.9
60-71	0.8	24.8

Table 24

(Continued)

Weight-for-Age

(Percent <75% of NCHS/CDC Reference Median)

Age (Months)	Special Group	Survey Children (weighted percent)
6-11	4.3	15.2
36-47	-	12.5
48-59	3.4	13.7
60-71	1.6	14.6

Arm Circumference-for-Height

(Percent <82.5% of Ten State Nutrition Survey Median)

Age (Months)	Special Group	Survey Children (weighted percent)
6-11	-	2.8
36-47	-	1.3
48-59	0.8	0.5
60-71	-	0.9

The special group in Lomé shows a better growth status than survey children.

N. Other Demographic and Descriptive Data

1. Household Size

The mean household size for households with participants in the Togo survey was 9.3. Table 25 presents the mean household size by region.

Table 25

Mean Household Size by Region

Region	Mean Household Size
Savanna	12.3
Central	10.0
Kara	9.3
Maritime	9.0
Plateau	8.2
Urban	7.9
Weighted Average - Togo	9.3

Household size is larger in the northern areas and smallest in the urban region. There is a statistically significant variation in this distribution by the F-test ($p < .001$).

Table 26 shows the mean household size of the survey children in each Waterlow category of nutrition status.

Table 26

Mean Household Size

of 6,094 Survey Children by Waterlow Categories

	Normal	Wasting	Stunting	Wasting and Stunting
Weighted Mean Household Size	10.6	11.3	11.0	13.1

The mean household sizes of the stunting and normal categories differ by the t-test ($p < .005$)*, as do the mean household sizes of the combined and normal categories by the t-test ($p < .01$)*. There is no statistical difference between the wasting and normal categories.

Table 27 shows the mean household sizes of survey children and mothers with anemia.

Table 27

Mean Household Size

by Anemia in Children and Mothers

	Children		Mothers	
	Anemia	Normal	Anemia	Normal
Weighted Mean Household Size	10.8	10.1	10.9	10.3

*Test is computed from actual survey children and not from cluster means, for this variable.

A statistically significant difference in the mean household size exists between children with and without anemia by the F-test ($p < .05$)*, but not between mothers with and without anemia.

All nutrition parameters were also compared for those survey members having a household size of 2-8 and 9-95. The larger households (9-95 members) have a higher prevalence of each form of undernutrition as measured by anthropometry. Using chi-square tests there are statistically significant differences for chronic undernutrition ($p < .005$) and underweight for age ($p < .05$). There was a small statistically significant difference in the prevalence of anemia in children by the chi-square test ($p < .1$), but not in mothers, by these two household size categories.

2. Birth Order

The mean birth order of the participants in the Togo survey was 3.8. Table 28 presents the mean birth order by region.

Table 28

Mean Birth Order by Region

Region	Mean Birth Order
Savanna	4.1
Kara	4.0
Plateau	4.0
Central	3.8
Maritime	3.8
Urban	3.4
Weighted Average - Togo	3.8

*Test is computed from actual survey children and not from cluster means, for this variable.

Birth order is higher in the rural regions than in the urban region by the F-test ($p < .001$). There is a trend to higher birth orders within the rural areas from south to north.

Table 29 shows the mean birth order of the survey children in each Waterlow category of nutrition status.

Table 29

Mean Birth Order

of 6,094 Survey Children by Waterlow Categories

	Normal	Wasting	Stunting	Wasting and Stunting
Weighted Mean Birth Order	3.8	4.1	3.8	4.2

Statistical testing reveals no differences in the mean birth order between the abnormal categories and the normal one.

The mean birth order of anemic survey children was 4.0 and of nonanemic survey children was 3.7. Statistical testing shows no statistically significant difference in mean birth order between these two categories of children.

All nutrition parameters were also compared in those survey members having a birth order 1-3 and 4-15. No statistically significant differences were found in this analysis.

3. Ethnic Group of Mother

The ethnic group of the mother of each survey child was recorded using the precoded list in Appendix D of the field manual. At the completion of the field work, it was found that the following groups had no survey members: ADAN, AGNAGAN, BASSILA, KLOBO, KPESSI, SOLA SOROUBA AND TAOULAMBA. The remaining 31 ethnic groups were regrouped into only 7 using criteria such as similarities in customs and language. The following is a listing of the 7 groups: (Those groups with over 100 survey members are underlined.)

Group 1 - EWE, OUATCHI, ADJA, AHONLAN-ANLO, ENOUE

Group 2 - KABIYE, LOSSO, LAMBA, BARIBA-SOMBA-TAMBERMA

Group 3 - LOTOCOLIS, BASSARI, TCHOKOSSI, TCHAMBA, HAOUSSA

Group 4 - MOBA, GOURMA, KONKOMBA, N'GAM GAM, YANGA, PEULHS, MOSSI

Group 5 - MINA-GAIN-GAINGBE, PEDAH-PLA

Group 6 - ANA-ANA IFE, FON, NAGO-ANAGO, YORUBA

Group 7 - AKPOSSO, AKEBOU, ADELE, AHLON-BOGO AHLON

Distribution of survey members by these 7 ethnic regroupings is presented in Table 30.

Table 30

Sample Distribution by Ethnic Group of Mother

Ethnic Group of Mother	No.
Group 1 (EWE, OUATCHI, ADJA, AHONLAN-ANLO, EHOUE)	1862
Group 2 (KABIYE, LOSSO, LAMBA, BARIBA-SOMBA-TAMBERMA)	1328
Group 3 (COTOCOLIS, BASSARI, TCHOKOSSI, TCHAMBA, HAOUSSA)	969
Group 4 (MOBA, GOURMA, KONKOMBA, N'GAM GAM, YANGA, PEULHS, MOSSI)	913
Group 5 (MINA-GAIN-GAINGBE, PEDAH-PLA)	327
Group 6 (ANA-ANA IFE, FON, NAGO-ANAGO, YORUBA)	311
Group 7 (AKPOSSO, AKEBOU, ADELE, AHLON-BOGO AHLON)	294
Total	6004

Results for Groups 5, 6 and 7 must be interpreted cautiously because of their small numbers.

Table 31 summarizes the anthropometry results by ethnic group.

Table 31

Anthropometry Results for Preschoolchildren (6-71 Months of Age) by Ethnic Group of Mother

Ethnic Group of Mother	Waterlow Categories				Other Anthropometry Indices	
	Normal	Wasting	Stunting	Wasting and Stunting	WT/AGE <75% of Reference Median	ARM CIRCUMFERENCE/HT <82.5% of Median of Ten-State Nutrition Survey Data
	(weighted percent)					
Group 1 (EWE, etc.)	82.0	1.1	16.5	0.4	13.3	1.3
Group 2 (KABIYE, etc.)	72.[illegible]	[illegible]1	25.9	0.4	17.8	1.8
Group 3 (COTOCOLIS, etc.)	79.3	1.8	18.2	0.7	15.0	2.3
Group 4 (MOBA, etc.)	72.9	2.4	22.2	2.5	24.3	7.3
Group 5 (MINA-GAIN-GAINGRE, etc.)	87.9	0.5	10.7	0.9	11.6	1.4
Group 6 (ANA-ANA IFE, etc.)	86.4	1.2	12.4	-	8.8	1.4
Group 7 (AKPOSSO, etc.)	83.2	1.6	14.8	0.4	13.1	2.0

Table 31 shows that groups 2 and 4 have the highest prevalences of children with abnormally low anthropometric indices or protein-calorie undernutrition. Group 3 has an intermediate status and the remaining groups are better off. Statistical testing shows that the distribution of children among the ethnic groups by the normal and stunting categories is highly significant by the chi-square test ($p < .001$ in both cases). The numbers were too small to allow testing of the distributions in the wasting and combined categories. The distributions of survey subjects by weight-for-age and arm circumference-for-height among the ethnic groups also show significant differences by the chi-square test ($p < .001$ in both cases).

Table 32 presents the prevalence of anemia in both children and mothers by ethnic group of mothers.

Table 32

Prevalence of Anemia

by Ethnic Group of Mothers

Ethnic Group of Mothers	Preschoolchildren % Anemia	Mothers % Anemic
	(weighted percent)	
Group 1	56.4	32.5
Group 2	61.5	30.9
Group 3	67.0	34.5
Group 4	68.0	27.1
Group 5	40.5	38.1
Group 6	61.0	41.5
Group 7	38.8	19.4
Average - Togo	58.4	31.8

In preschoolchildren there is a statistically significant difference among ethnic groups in the distribution of the prevalence of anemia by the chi-square test ($p < .01$). Children in groups 2, 3, 4, and 6 have the highest rates of anemia. This parallels the anthropometry results except in group 6. Analysis of the prevalence of anemia in mothers, by ethnic group, reveals no statistical differences in the distribution.

O. Maternal and Child-Health Data

A series of questions was posed to the mother of each survey child to determine her physiological status and the weaning pattern of the survey child. Table 33 presents the distribution of mothers by physiological status and region.

Table 33

Distribution of Mothers

by Physiological Status and Region

Region	Pregnant		Non-pregnant and Lactating		Non-pregnant and Non-lactating		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Savanna	98	11.3	696	80.3	73	8.4	867	100.0
Kara	99	12.0	594	72.1	131	15.9	824	100.0
Central	66	7.6	688	78.9	118	13.5	872	100.0
Plateau	80	9.9	529	65.7	196	24.3	805	100.0
Maritime	94	10.3	609	66.6	212	23.2	915	100.0
Urban	132	11.5	694	60.6	319	27.9	1145	100.0
Total No. and Weighted Average - Togo	569	10.4	3810	69.2	1049	20.4	5428	100.0

There are statistically significant regional differences in the distribution of non-pregnant non-lactating women by the chi-square test ($p < .001$), non-pregnant lactating women by the chi-square test ($p < .001$), and pregnant women by the chi-square test ($p < .05$). The southern regions (Plateau and Maritime) plus the urban region have a higher prevalence of women who are neither pregnant nor lactating, which may indicate a more active participation in family planning and/or shorter breast feeding periods than the north.

Table 34 presents the distribution of responses to the question, "Is this child presently breast feeding?"

Table 34

Distribution of Children Breast Feeding

by Age Group

Is this Child Presently Breast Feeding?

(Months)	Percent Yes	Percent No	Total No. of Responses
6-11	99.9	0.1	692
12-23	87.1	12.9	1287
24-35	28.7	71.3	1036
36-47	3.4	96.6	999
48-59	0.8	99.2	858
60-71	-	100.0	563

Our survey elicited responses to this question in a total of 5,435 children of the 6,094 children included in the data analysis.

In Togo, almost all children under 2 years-of-age are breast feeding. In the third year, 28.7 percent of children are breast feeding and in the fourth year, 3.4 percent are still doing so.

If the child was weaned (i.e., was no longer breast feeding), the mother was asked, "At what age did you wean him?" Table 35 presents the distribution of 3,046 weaned children by age of weaning completion.

Table 35

Weaned Children by Age of Weaning Completion

Age (Months)	No.	Percent (weighted)
<6	4	0.1
6-11	45	1.3
12-17	763	25.5
18-23	908	30.7
24-29	895	28.9
30-35	228	7.2
>36	203	6.2
Total - Togo	3046	100.0

This table indicates weaning was completed by 18 months of age in 27.0 percent, by 24 months of age in 57.7 percent and by 36 months of age in 93.8 percent of children. The data in this table is probably less reliable than that in Table 34 since the reply to the question involves remembering a past event and then calculating the age of the child at the time of this event.

Table 36 summarizes the replies to the question, "At what age were the first solid or semi-solid foods introduced?"

Table 36

Age of Introduction of Solid or Semi-Solid Foods

Age (Months)	No.	Percent (weighted)
<6	3580	67.5
6-11	1632	29.8
12-17	106	1.9
>18	40	0.7
Total - Togo	5358	100.0

By a year of age, 97.4 percent of children had begun on some foods other than milk or other liquids. The two northern most regions (Savanna and Kara) introduced such foods later than the southern and urban regions. For example, by six months of age only 56.0 percent in the two northern regions had introduced these foods as compared to 71.0 percent in the rest of the country (significant by the chi-square test with $p < .001$).

P. Socioeconomic Data

The data for this section was obtained from the household heads. Only 3,653 or 58.9 percent of household heads were present. The urban region had the lowest percentage of household heads present, 29.9 percent. This low percentage of responders makes the analysis of this data less reliable than previous results.

The results to the two socioeconomic questions (the question on the quantity of cultivated land was deleted after field testing), were analyzed by statistical testing methods to look for associations with undernutrition. The practical significance of the associations found are unknown.

1. Monthly Spending per Capita by Household

Table 37 presents the distribution of households by monthly per capita spending by region.

Table 37

Distribution of Households by Monthly Per Capita Spending by Region

Region	<500*		500-999		1000-1499		1500-1999		>2000		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Savanna	368	45.2	243	29.9	124	15.2	39	4.8	40	4.9	814	100.0
Kara	127	22.0	190	32.9	112	19.4	69	12.0	79	13.7	577	100.0
Central	228	35.3	242	37.5	117	18.1	32	5.0	26	4.0	645	100.0
Plateau	82	15.4	202	37.8	119	22.3	53	9.9	78	14.6	534	100.0
Maritime	74	14.8	173	34.5	116	23.2	61	12.2	77	15.4	501	100.0
Urban	22	6.0	44	12.1	82	22.5	62	17.0	154	42.3	364	100.0
Total No. and Weighted Average-Togo	901	23.6	1094	32.9	670	20.2	316	9.6	454	13.6	3435	100.0

*CFA's per month.

Monthly per capita spending decreases in the rural areas from south to north. In the urban area, 42.3 percent of the population spend more than 2,000 CFA's per month.

Table 38 presents the mean monthly per capita spending in survey households by Waterlow nutrition category of surveyed children.

Table 38

Mean Monthly Per Capita Spending in Survey Households by Waterlow Category of Surveyed Children

	Normal	Wasting	Stunting	Wasting and Stunting
Weighted Mean Monthly per Capita Spending (CFA's)	1,223	787	995	844

The mean monthly per capita spending level is lower in the households of undernourished children. The differences are statistically significant between the stunting and normal groups by the t-test ($p < .001$)* and between the wasting and normal groups by the t-test ($p < .025$)*. There is a borderline statistically significant difference between the combined and normal categories by the t-test ($p < .2$)*.

*Test is computed from actual survey children and not from cluster means, for this variable.

The mean monthly per capita spending in households with anemic survey children was 1058 CFA's and in households with nonanemic survey children was 1153 CFA's. This difference is not statistically significant. There was also no statistically significant difference in mean monthly per capita spending between households with anemic and non-anemic mothers.

2. Household Articles

The last question in the socioeconomic section determined the presence and number of certain manufactured articles in each surveyed household. (Determination of the number of goats was dropped prior to starting the field work.) During the analysis of the data, fuel stoves and pressure cookers were not included, as they rarely were found in households.

These articles were arbitrarily weighted by a factor of 3, 2, or 1, based on their cost. Those receiving a weight of 3 were: sewing machines, motorbikes, metal roofs, and rifles or shotguns. Those receiving a weight of 2 were: suitcases, gas lanterns, bicycles, radios, and watches or clocks. The remaining articles received a weight of 1. A per capita number of articles was calculated by dividing their weighted number by household size for each household.

Table 39 presents the distribution of households by per capita number of weighted articles by region.

Table 39

Distribution of Households by Per Capita Number of Weighted Articles by Region

Region	0*		≤.5		.5-.9		1-1.9		2-2.9		>3.0		Total	
	No.	Percent	No.	Percent	No	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Savanna	186	21.5	321	37.0	201	23.2	133	15.3	16	1.8	10	1.2	867	100.0
Kara	159	24.2	124	19.0	118	18.0	168	25.7	52	8.0	34	5.2	654	100.0
Central	111	15.9	201	28.7	158	22.6	157	22.4	42	6.0	31	4.4	700	100.0
Plateau	31	5.6	99	17.8	130	23.4	207	37.2	52	9.4	37	6.7	556	100.0
Maritime	43	8.5	61	12.0	112	22.0	175	34.4	72	14.2	45	8.9	508	100.0
Urban	8	2.2	14	3.8	57	15.5	109	29.7	81	22.1	98	26.7	367	100.0
Total No. and Weighted Average-Togo	537	13.0	820	20.8	776	21.6	949	28.2	315	9.3	255	7.1	3652	100.0

*Per capita number of weighted articles.

The household per capita number of weighted articles decreases in the rural areas from south to north. In the urban area, 48.8 percent of the population have 2.0 or more weighted articles per capita.

Table 40 presents the mean per capita number of weighted articles in survey households by Waterlow nutrition category of surveyed children.

Table 40

Mean per Capita No. of Weighted Articles in Survey Households by Waterlow Category of Surveyed Children

	Normal	Wasting	Stunting	Wasting and Stunting
Weighted Mean per Capita No. of Weighted Articles	1.31	1.01	1.15	.86

The mean per capita number of weighted articles is lower in the households of undernourished children. The differences are statistically significant between the stunting and normal groups by the t-test ($p < .001$)*. There is a borderline statistically significant difference between the combined and normal groups by the t-test ($p < .1$)*. The difference between the wasting and normal groups is not statistically significant.

*Test is computed from actual survey children and not from cluster means, for this variable.

Significance testing shows no statistical differences in the mean per capita number of weighted articles, neither between households with anemic and nonanemic children, nor between households with anemic and nonanemic mothers.

VII. Discussion

The Togo Nutrition Status Survey was a cross-sectional study of the entire Togo preschool population. The ideal requirements of the statistician and the realities of field logistics, time, and available funding, were carefully considered in determining the survey data content, sampling methods, and procedures for assessing the quality of the data. Surveys utilizing this methodology have been done in the Sahel[7], Nepal[8], Sri Lanka[9], and Liberia[10].

Knowledge of the existing nutrition status of a population provides a base on which to build effective nutrition policy directed at improving the nutritional status of the population. A well designed study of the nutritional status of a statistical sample of the population provides information on the nature of the nutritional problems, on their severity, on their location by region in a country, and on the identification of "risk" groups[33].

Initially, the results of a nutrition status survey may provide the bulk of useful baseline material. Further research to identify other indicators and elucidate causal factors is indicated in the fields of marketing, economics, agriculture and health to permit the design of appropriate intervention programs. A subsequent cross-sectional nutrition survey could assess change resulting from instituted remedial programs. Repeat surveys permit valid data comparisons at different points in time provided the survey methods remain the same.

A less costly method of assessing change is the establishment of a nutrition surveillance system. Trends in the nutrition status of the population could be continuously monitored by the analysis of routinely collected indicator data. This presupposes the existence of an infrastructure that is already collecting such data or can easily begin its collection.

The simple division of children into well nourished and malnourished on the basis of any single anthropometric parameter can be misleading. No single anthropometric parameter quantitates completely the individual contribution of the acute or chronic components of undernutrition in a population. The deficient weight of a child in comparison to the ideal weight for his height provides an indication of acute undernutrition. Weight deficits in children are nearly always an indication of the duration of undernutrition. The Waterlow classification provides a method for outlining these components of protein-energy undernutrition[20].

The division of undernutrition into acute and chronic components is important in that each has different implications for the design and evaluation of appropriate remedial programs. Acute undernutrition or wasting suggests current or recent deficiency in food intake reflecting actual food unavailability, impaired absorption resulting from diarrhea, or increased metabolic demands of other acute disease. While it may be difficult to rapidly change the prevalence of the latter two situations, the

first may respond to a quickly-instituted short-term remedial program. This is particularly true in famine situations where emergency food distribution can remedy the situation until the acute environmental situations normalize.

Chronic undernutrition or stunting implies past and long-term nutritional inadequacies of food supplies, a more subtle nutritional deprivation that retards linear growth. (An unknown part of the prevalence of stunting relates to the prevalence of chronic diseases or repeated attacks of acute diseases, both of which will influence stature growth.) Mortality and morbidity resulting from chronic undernutrition are not as measurable or as impressive as that of acute undernutrition. Furthermore, the implications of a moderate deficit in height potential on a child's health are not known. Longer-term and multidisciplined approaches to the design and implementation of remedial programs are required to improve the chronic undernutrition problem of a population. The benefits of such programs may take several years to be realized.

Protein-energy undernutrition in Togo is a general problem, the magnitude and composition of which differ in various sectors as summarized in Table 41. The usefulness of survey results is enhanced by data on the Special Group composed of Togolese preschoolchildren age 6-71 months of age from upper class Lomé families, which show growth potential to be markedly increased in a better socioeconomic situation.

Table 41

Togo Nutrition Status Survey Summary:

Percentage Distribution of Children 6-71 Months

of Age by Waterlow Categories

	Percentage				
	Normal	Wasting Only	Stunting Only	Wasting and Stunting	Sample Sizes
Total Togo (weighted)	79.6	1.3	18.4	0.7	6,094
Rural (weighted)	78.1	1.5	19.7	0.7	4,868
Urban	88.1	0.5	11.1	0.3	1,226
Special Group (6-71 Months)	98.3	0.4	1.3	-	450
*NAS Reference Population	98.7	0.8	0.5	-	6,195

*Is an American reference population recommended by the National Academy of Sciences, developed by CDC, and similar to the NCHS/CDC reference population.

Acute undernutrition or wasting as measured by the weight-for-height index varies in prevalence among the regions of Togo. The weighted country average prevalence of 2.0 percent represents the combined result of food unavailability and physiological nutrient misutilization resulting primarily from acute infectious disease. The individual contribution of these two factors is unknown overall and probably varies among regions. In addition the contribution of each factor varies with the seasons of the year. Further specific studies are required to quantitate the contribution of these two factors.

By the weight-for-height index the Savanna region is the worst off. The remaining regions seem to have little acute undernutrition. While the statistical differences between regions are significant, a practical interpretation of the differences must consider that overall the country average is only 2.0 percent and that only an arbitrary decision is possible to establish the level of acute undernutrition at which intervention is required. The prevalence in the acute famine situation in the Sahel in 1975 ranged from 9.1 percent to 22.5 percent[7]. The 2.0 percent value for Togo is much below this and there is no reason to suspect that an acute famine or disaster existed in Togo concurrently with or immediately before the survey data collection. In the Savanna region the much higher prevalence of 5.1 percent, the anecdotal information of diminished harvests from lack of rain in this region, and the fact that data was collected during a period of traditional high food availability, suggest that this region presently has the highest "risk" to develop substantial acute undernutrition in its population.

In Togo the distribution of acute undernutrition or wasting by age groups indicates that children age 12-23 months are most seriously affected. Because factors such as an acute famine would be common to all age groups, the identification of the highest prevalence of acute undernutrition in the 12-23 month age group indicates that certain age related factors are at

work here such as: inadequate weaning foods and techniques, the inability of the infant to compete successfully in the family food chain, and the high risk of infectious diseases. The contribution of these factors should be considered in designing a remedial program targeted at this age group.

There is a wide range in the prevalence of chronic undernutrition or stunting among the regions of Togo (11.4 percent to 28.2 percent). The Urban region and the two southern most rural regions (Maritime and Plateau) are the superior regions and the Savanna and Kara are substantially inferior by this nutrition status index. Given that the effect of moderate stunting on the health or well being of a child is not known, the practical importance of these findings is hard to interpret. Regardless, the prevalence of stunting in the sample from some regions is two and one-half times that of others showing marked relative differences of chronic undernutrition within Togo. An important consideration may be a disproportionate food intake over a long period of time among regions perhaps because of differences in actual availability to the region populations. This may be related to agricultural production, food distribution, food subsidies and market prices. Other more subtle considerations may include drought cycles, importance of cash crops and socioeconomic divisions. Data on the contribution of each factor to the prevalences of stunting are not available from the nutrition status survey. Some

information on the importance of individual factors in the light of the prevalence data of this survey may be obtainable from the records of various ministries.

In Togo, as a whole, stunting begins during the first year of life. With each succeeding year, until the fourth year, others who fail to obtain adequate nourishment to provide for linear growth needs slip into the stunting category. From 4 through 6 years of age the prevalence levels off at about 24 percent. This seems to indicate that nutrition is adequate enough by 4 years of age to prevent new enterers into this category, but is not adequate enough to permit catch-up growth.

If, as Waterlow suggests, children suffering from concurrent wasting and stunting require a priority remedial response, then 0.7 percent of Togo's 492,729 children 6-71 months of age (3,449 children) have priority needs[20]. These children are suffering the effect of long-term protein-calorie undernutrition - a retardation in linear growth - and the effect of an acute deficit in nutrients - a weight loss creating a disproportionately low body weight-for-height situation. When this category of undernutrition is analyzed, statistical differences are evident among regions and among age groups.

A commitment to improving countrywide the status of affected children has the initial practical problem of identifying the

maximum number of affected children. In all regions and all age groups the high priority child is a relatively uncommo occurrence. A methodical countrywide screening program using weight-for-height and height-for-age measurements implies a major expense in terms of personnel and equipment. Practically, a program for screening may include as its objective all preschoolchildren attending any health unit. A corollary to this is that the participating health units must be capable of providing curative nutritional education and aid to the families with children found to be in the priority category.

Weight-for-age is the most commonly used index of undernutrition. This parameter does not identify the separate contributions of acute and chronic protein-calorie deprivations. In Togo 15.3 percent of the children 6-71 months of age are in the combined second and third degree Gomez classification. The Savanna region has the highest prevalence and the Urban region the lowest prevalence of undernutrition by this criteria. In Togo where, by our anthropometric criteria, there is a high prevalence of chronic undernutrition and very little acute undernutrition, it is probable that a large component of undernutrition as defined by the Gomez system of weight-for-age measurements is related to chronic food deprivation. In fact, in this survey the weight-for-age index for identifying undernutrition and the height- for-age index for chronic undernutrition identify a large number of the same people.

In an attempt to summarize the regional differences for protein-calorie undernutrition, Table 42 presents a ranking of regions as determined by totalling the regional rankings for the three commonly used growth indices of weight-for-height, height-for-age and weight-for-age. These results indicate that the Urban region has the least undernutrition and the Savanna region has the most.

Table 42

Summary Regional Ranking for Undernutrition:
A Combination of Regional Growth Rankings
for Weight-for-Height, Height-for-Age, and Weight-for-Age

	Region	Total Ranking Value
1	Urban	3
2	Plateau	7
3	Maritime	8
4	Central	12
5	Kara	12
6	Savanna	17

The measurement of arm circumference has been advocated as a useful parameter to assess nutrition status and the arm circumference-for-height index has been used to identify acute undernutrition. In Togo, both arm circumference-for-height and weight-for-height identify the Savanna region as having the highest prevalence of acute undernutrition. The two indices do not, however, rank the remaining regions in the same order. The weight-for-height index is believed to be the best anthropometric indicator of acute nutrition. Weaknesses in arm circumference data arise from the following: arm circumference measurement is less acurate than weighing; the reference data for arm circumference needs further development; and arm circumference does not increase very much during the 12-60 month age period. Arm circumference measurement might find its greatest usefulness when screening for acutely undernourished preschoolchildren in a famine or other disaster, rather than in baseline surveys. (<12.5 cm has been used before to rapidly identify these children.)

Pedal edema of nutrition origin is diagnostic of kwashiorkor. In Togo the survey identified a prevalence of 0.4 percent in the 6-71 month age group. The prevalence of pedal edema is 12 fold higher in children with stunting and/or wasting than in children with normal anthropometry. Pedal edema is not common in Togo preschoolchildren but, as it is simple to examine for and diagnostic of severe protein-calorie undernutrition, all children attending clinics should be examined for it, and when found appropriate acute therapy provided.

Anemia (defined as a hemoglobin <11.0 g/100 ml for children 2 years of age and older, and <10.0 g/100 ml for those under 2 years of age[27]) in a population of preschoolchildren, is predominately a reflection of long-term inadequate dietary intake of iron. The country-wide average prevalence of anemia in Togolese preschoolchildren was 58.6 percent. There was a trend toward a decrease in the prevalence with increasing age. In Togo, the prevalences of anemia were higher in the northern regions. Regional differences in anemia prevalence paralled regional differences in protein-calorie nutrition status which suggests regional disparities in the dietary intake of iron.

Besides low dietary intake of iron, malaria, certain intestinal parasites, and hereditary hemoglobinopathies contribute to the anemia problem. Studies by the Malaria Bureau show uniformly endemic rates of malaria among children throughout Togo[29]. There is no reason to suspect significant regional differences in the prevalence of intestinal parasites or hereditary hemoglobinopathies. Further studies would be needed to assess their exact contribution.

Severe anemia (arbitrarily defined as a hemoglobin of <8.0 g/100 ml) occurred in 10.1 percent of Togo's 492,729 preschoolchildren. These 49,765 Togolese children have a high priority for detection and treatment of anemia.

Anemia (defined as a hemoglobin <12 g/100 ml in nonpregnant and lactating women and <11 g/100 ml in pregnant women) in the mothers of the survey

preschoolchildren showed a prevalence of 30 to 35 percent among regions with no statistically significant variation. The regional variations that did occur did not follow the trends of anemia or protein-calorie undernutrition seen in the survey children. There is a high anemia prevalence (46.9 percent) in pregnant Togolese mothers. Anemia during pregnancy is partly physiological, but also is due to insufficient dietary intake of iron. The anemia prevalence of 30.7 percent in nonpregnant Togolese women is higher than the 16.0 percent prevalence for nonpregnant U.S. white women of child bearing age, but is lower than the 39.4 percent prevalence for nonpregnant U.S. black women of child bearing age[27].

Anemia is a moderate problem among Togolese mothers of child bearing age. Pregnant mothers have a higher risk and would be the group at which to aim any intervention program, such as iron or food supplementation.

Past CDC nutrition status surveys, have not attempted to assess urban populations because of the problems of sampling. In Togo, the 1970 census and the malaria campaign records provided sufficient urban demographic data to permit urban sampling (see Appendices C and D).

The survey results indicate real differences in nutrition status between the rural and urban sectors of Togo. The preschool population of the urban sector is statistically better off by all survey anthropometric indices. The differences between the two sectors are practically important for chronic undernutrition as defined primarily by the

height-for-age index and secondarily by the weight-for-age index. Because of the superior status of the urban sector which composes one-fifth of the total survey population, the country-wide average prevalences of protein-calorie undernutrition are lowered proportionately.

The anthropometric nutrition parameters of the Togo special group are in all instances superior to those of the Togo survey group and indicate a nutrition status obtainable in the next few generations by the entire preschool population of Togo. Figures 6 and 7 compare both the weight-for-height and height-for-age medians of the Togo special group, the Togo survey group, and the NCHS/CDC reference population. The weight-for-height comparisons show the Togo special group median to be almost equal to the NCHS/CDC median and equal to or superior to the Togo survey group median. The height-for-age comparisons show the Togo special group to be almost equal to the NCHS/CDC median at all ages, except from 1 to 3 years of age; the latter is most likely explained by the lack of sufficient numbers of children in the special group from 1 to 3 years of age. The Togo special group is superior to the Togo survey group median at all ages.

The relationship of nutrition status to household size, to positions in the birth order, and to the ethnic group of the mother were examined individually. There were some statistically significant associations of these factors with the nutrition indices. However, the practical significance of the associations are unknown.

COMPARISON OF DATA IN AGE GROUP 6-71 MONTHS:
TOGO SURVEY, TOGO SPECIAL GROUP AND NCHS/CDC REFERENCE MEDIANS

Figure 6. WEIGHT-FOR-HEIGHT

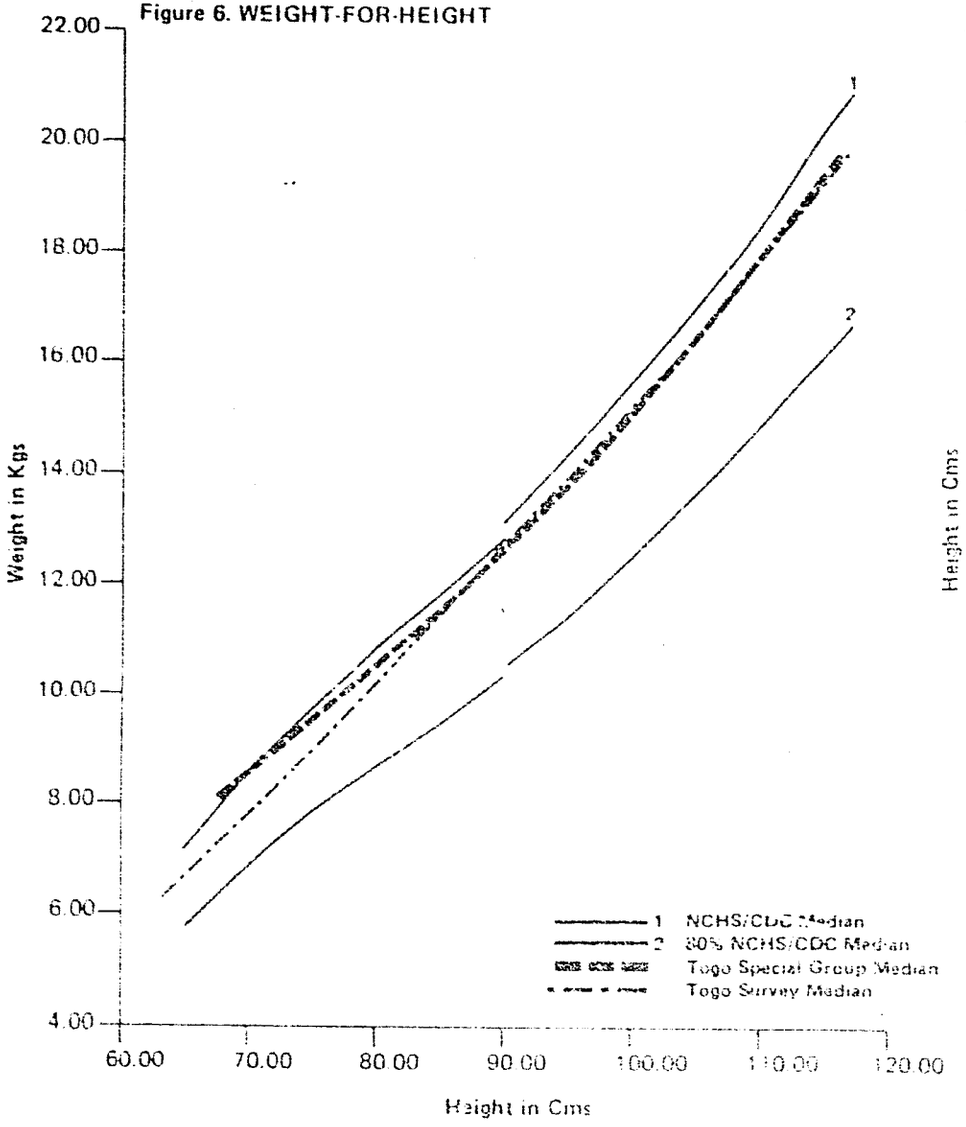
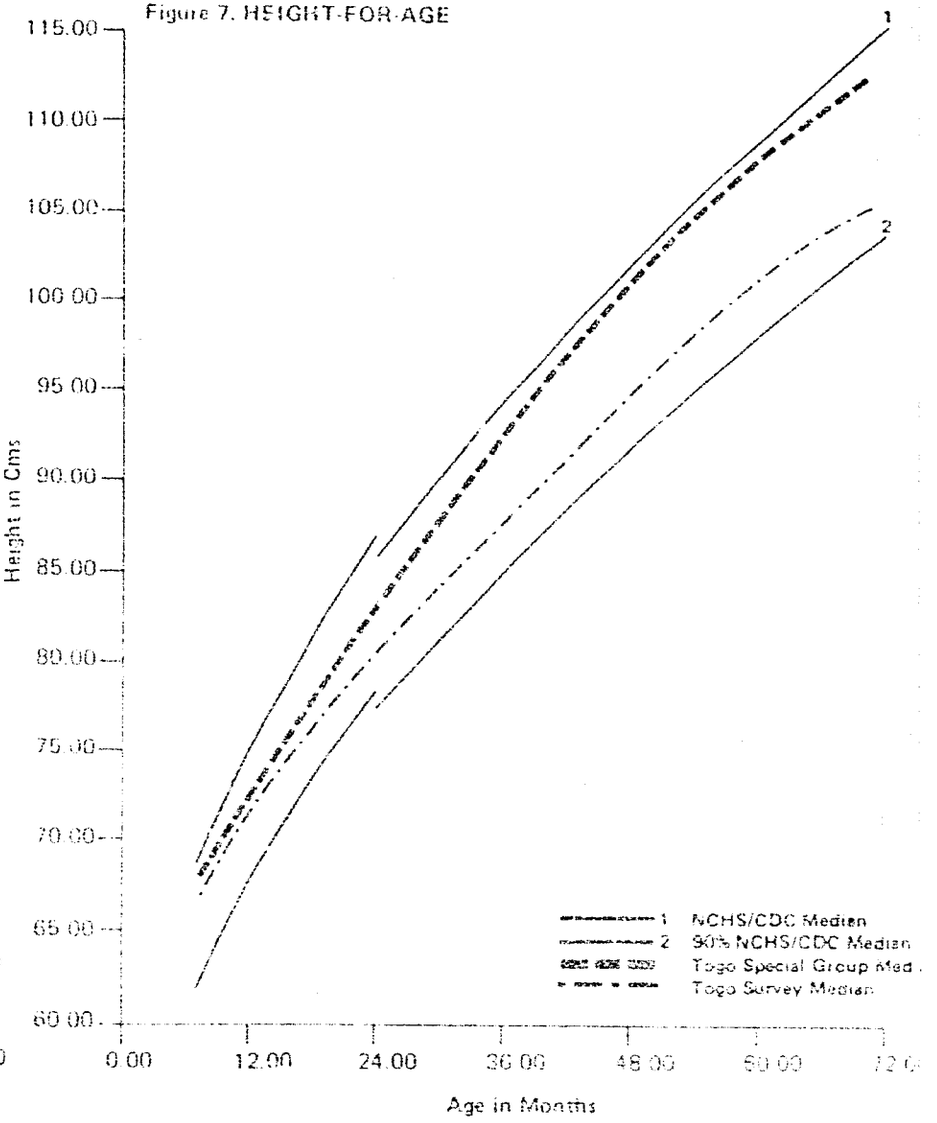


Figure 7. HEIGHT-FOR-AGE



The mean household size of the survey participants was 9.3 with a range of regional means of 7.9 to 12.5. There were statistical associations between increasing household size and higher rates of the following: stunting; combined wasting and stunting; and anemia in children. Larger households probably have a proportionately lower socioeconomic level and therefore are less able to provide appropriate nutritional levels to their young children.

The mean birth order of the survey participants was 3.8 with a range of regional means of 3.4 to 4.1. There were no statistically significant associations shown between birth order and the indices of nutrition status.

The 31 ethnic groups were regrouped into 7 major groups by Togolese government officials at the end of the field work. These regroupings were based on similarities in customs and language. There were statistically significant differences in the nutrition status of children by ethnic group, with groups 2 (Kabiye, etc.) and 4 (Moba; etc.) having the poorest nutrition status. These two groups live in the northern Togo regions where the prevalences of nutrition are highest. The observed ethnic differences in nutrition probably reflect geographical location rather than inherent cultural differences.

The average percentage of Togolese mothers (with survey preschool-children) who were pregnant at the time of the survey was 10.4 percent. This compares to a 6.9 percent rate of pregnancy in U.S. women of childbearing age (34). The percentage of lactating mothers with preschoolchildren

increased from south to north with a low of 60.6 percent in the urban region to a high of 80.3 in the Savanna region.

In the northern two regions (Savanna and Kara), there was a statistically significant higher prevalence of lactating mothers, a later introduction of first solid foods, and an older age of weaning. These two regions also had the highest rates of protein-calorie undernutrition and anemia.

In Togo, almost all the children under 2 years of age were breast-fed. Weaning usually took place during the last half of the second year and first half of the third year of life, although 6.2 percent of children were not weaned until after their third birthday. Solid foods were introduced by one year of age in 97.4 percent of survey children. Anecdotal information obtained during the field work indicated that these first solid foods were not of high nutritional quality.

The maternal and child health data suggest the need for more information on the weaning habits and foods of Togolese mothers. An informed plan for health education or other interventions could then be developed.

Socioeconomic data were collected and statistical testing methods were used to look for associations with undernutrition. An indirect method to evaluate the effect of income on undernutrition was the determination of per capita monthly spending. Monthly per capita spending decreased from south to north with the urban region having the highest spending levels. This follows inversely the geographical distribution of protein-calorie undernutrition and anemia in Togo. The statistical associations

of decreasing monthly per capita spending levels with higher rates of undernutrition were of a high level for the stunting group and the wasting group.

The per capita number of specified manufactured articles was determined for each survey household. These articles received an arbitrary weighting based on their monetary value. The per capita number of weighted articles decreased from south to north with the urban households having the highest values. Again this follows inversely the geographical distribution of protein-calorie undernutrition and anemia. The association of decreasing per capita number of weighted articles with higher rates of undernutrition was of a high level only in the stunting group.

There were some associations found between the two measured socioeconomic indicators and undernutrition. The income indicator identifies more children with undernutrition than the articles indicator. The practical significance of these associations are unknown. Further research is needed to identify other socioeconomic indicators or to develop a composite index that would be more useful in identifying households at high "risk" of developing undernutrition.

VIII. List of Survey Field Workers

A. Civil Servants

1. AGBANGBA, Tchato
2. BIEM, Komlan
3. DAPO, N'fambi
4. KONDO, Kao

B. Temporary Workers

1. ADAGLO, Ayawo
2. AGBEKPONOU, Koissi
3. ANAOU, Fada
4. ANLEKA, Akamakan
5. ASSOGBA, Koudolo
6. BARAKOU, Yawo
7. GIBRILA, Sahidou
8. NTCHA, Doulele
9. PANDAM, Hountchetyo
10. SESSOU, Komlan
11. VIDEKE, Koffi

IX. BIBLIOGRAPHY

1. Joint FAO/WHO Expert Committee on Nutrition (1971), World Health Organization Technical Report Series, No. 477, Geneva.

2. Miller, DC, Michaman, MZ, Lane, JM (1977) Simplified Field Assessment of Nutritional Status in Early Childhood: Practical Suggestions for Developing Countries, (Accepted for Publication in the Bulletin of the World Health Organization.)

3. Bengoa, JM, Jelliffe, DB, Perez, C (1959) Some Indicators for a Broad Assessment of the Magnitude of Protein-Calorie Malnutrition in Young Children in Population Groups, Amer J Clin Nutr, 7:714.

4. Seone, N and Latham, M (1971) Nutritional Anthropometry in the Identification of Malnutrition in Childhood, J Trop Pediatr, 17:98.

5. Jelliffe, DB (1966) The Assessment of the Nutritional Status of the Community, Monograph Series, 53, World Health Organization, Geneva.

6. Kish, L (1965) Survey Sampling, John Wiley & Sons, Inc, New York, pp. 3-30.

7. U.S. Dept. of Health, Education, and Welfare, Public Health Service, Center for Disease Control in Cooperation with U.S. Agency for International Development (1975), Sahel Nutrition Surveys - 1974 and 1975.

8. U.S. Dept. of Health, Education and Welfare, Public Health Service, Center for Disease Control in Cooperation with U.S. Agency for International Development and His Majesty's Government of Nepal (1975), Nepal Nutrition Status Survey (January-May 1975).

9. U.S. Dept. of Health, Education and Welfare, Public Health Service, Center for Disease Control in Cooperation with U.S. Agency for International Development and the Government of Sri Lanka (1976), Sri Lanka Nutrition Status Survey (September 1975 - March 1976).

10. UCLA Nutrition Assessment Unit, Division of Population, Family and International Health, School of Public Health, University of California, Los Angeles, in Cooperation with U.S. Agency for International Development and the Government of Liberia (1976), Liberia National Nutrition Survey (December 1975 - March 1976).

11. Gadagbé, EZ (1973) Conseils de Santé à la Famille Africaine, Direction Générale de la Santé Publique et Des Affaires Sociales, République Togolaise.

12. Enquête sur les Budgets Familiaux et la Consommation des Ménages au Togo (1967), Société d'Etudes pour le Développement Economique et Social, Paris.

13. Ayeva, A (1975) Etude de la Malnutrition Protéo-Calorique chez l'Enfant au Centre Hospitalier Universitaire de Lomé, Mémoire No 8, Ecole des Assistants Medicaux, Universite du Bénin.

14. Périssé, J (1958) L'Alimentation des Populations Rurales du Togo, Report of ORSTOM.

15. Bégue, P (1976) Personal communication.

16. Waterlow, JC (1972) Classification and Definition of Protein-Calorie Malnutrition, Br Med J 111, 566.

17. Committee on Nutrition Advisory to CDC Food and Nutrition Board (1974), Comparison of Body Weights and Heights of Groups of Children, Center for Disease Control, Atlanta, pp. 3-5.

18. Habicht, JP, et al (1974) Height and Weight Standards for Pre-school Children: How Relevant are Ethnic Differences in Growth Potential?, Lancet 11, 611.

19. Gomez, F, et al (1956) Mortality in Second and Third Degree Malnutrition, J Trop Pediat, 2:77.

20. Waterlow, JC and Rutishauser, IHE (1974) Malnutrition in Man, in Early Malnutrition and Mental Development, Symposium of the Swedish Nutrition Foundation, XII, ed by Cravioto, J, Hambraeus, L, Vahlquist, B, Almquist and Wiksell, Uppsala, pp. 13-26.

21. Miale, JB (1972) Laboratory Medicine: Hematology, C.V. Mosby, St. Louis, pp 475-481, 592-593.

22. Schor, SS (1968) Fundamentals of Biostatistics, G.P. Putnam's Sons, New York, pp. 145-146, 176-181.

23. Cochran, WG (1963) Sampling Techniques, John Wiley & Sons, Inc., New York, pp. 157, 247-248.

24. Zerfas, AJ (1975) The Insertion Tape: A New Circumference Tape for Use in Nutritional Assessment, Amer J Clin Nutr, 28:pp. 782-787.

25. Drabkin, DL (1949) The Standardization of Hemoglobin Measurement, Am J Med Sci, 217:710.

26. Habicht, JP (1972) Standardization Procedures for Quantitative Epidemiological Field Methods, in Manual of Internationally Comparable Growth Studies in Latin America and the Caribbean, PAHO/WHO, Washington, DC, pp. 44-59.

27. U.S. Dept. of Health, Education and Welfare, Public Health Service, Center for Disease Control, Ten-State Nutrition Survey Reports, I-V (1972).

28. World Health Organization Technical Report Series No. 405, Nutritional Anemias, World Health Organization, Geneva, Switzerland, (1968).

29. Service National du Paludisme du Togo, Carte Epidemiologique du Paludisme au Togo (1975-1976).

30. World Health Organization Technical Report Series No. 302, Nutrition in Pregnancy and Lactation, World Health Organization, Geneva, Switzerland, (1965).

31. Waterlow, JC (1973) Note on the Assessment and Classification of Protein-Energy Malnutrition in Children, Lancet 1, 87.

32. Snedecor, GW and Cochran, WG (1967) Statistical Methods, Iowa State, Univ. Press, Ames, Iowa, pp. 100, 517.

33. Beaton, GH (1975) Defining a Food and Nutrition Policy, Food and Nutrition 1 (3) 10.

34. National Fertility Survey (1970), Office of Population Research, Princeton University, Unpublished Data.

X. APPENDICES

Appendix A - Glossary of Terms

Circumscriptions - The major administrative divisions of each region. There are a total of 19 for the entire country.

Commune - Seven of the largest population centers of Togo, whose administration is fully independent of the circumscription in which they are located. The central government designates a civil authority for each of these whose title is "President of the Special Delegation." All seven have populations greater than 10,000 and for purposes of the survey we have grouped them together to form the urban region of Togo.

Commune Quarter - A further division of a commune for census and administrative purposes.

Date of Birth/Age - The most reliable date is determined from a registration form (or copy thereof); alternatively, age is determined by intensive questioning of the parents with use of the historical calendar when a form is not available (to be of useful value, age must be accurate to within 3 months of its true value).

Field Survey Team - A team composed of two Togo technicians who collect the field survey data.

Historical Calendar - The dates of significant events are placed on the calendars for the years which are of concern (in this study from 1970 through mid-1976). These include dates of political events, religious holidays, and the seasons of rain, crop planting, harvests, etc. Through careful questioning of the parents, the child's birthdate is related to events on this calendar and the age estimated.

Population Center - An administrative definition adopted by the 1970 census to replace the traditional term "village." It consists of a territorial entity whose households depend on the same traditional authority called the "village chief."

Random Sampling (Selection) - A type of sampling (selection) where every sample site has an equal chance of selection. Samples were drawn continuously throughout the country, with the two largest regions sampled at half the rate of the rest of the country.

Region - For administrative reasons, rural Togo is divided into five economic regions. From the coast northward those are: (1) Maritime region; (2) Plateau region; (3) Central region; (4) Kara region; and (5) Savanna region. For the purpose of the survey we have extracted the seven communes from these five geographical regions to form a sixth or urban region.

Sample Concession - A concession is a walled compound containing the homes and families of one or more households.

Sample Household - A household is a group of people normally preparing and taking their major meals together. Sample households are systematically selected from each sample site beginning with the random selection of an initial household.

Survey Member - To be a survey member a child must be:

(a) a member of a selected household, and

(b) between 6 and 71 months of age inclusive.

Survey Population - A total of 6,150 preschoolchildren are measured and examined. Subgroupings of this total are required for comparisons between children in the survey with regard to selected characteristics (e.g., sex, age, etc.) and by region.

Sample Site - A population center or a quarter of a commune selected from the total sample universe by population proportional sampling. From these selected sample sites, the sample units are drawn.

Sample Unit - A unit is composed of 30 children between 6 and 71 months of age who are members of households selected for inclusion in the survey from a sample site. There are 205 sample units in the survey, yielding 6,150 children.

Sample Universe - the total population of Togo. The 1970 Togo census provides this information.

Appendix B - References and Data Comparisons

Data have to be organized before they can be interpreted. Values to be useful must be categorized into normal or abnormal, or similar classifications. In a survey using anthropometric measurements, distribution cutoffs of values for category determination can be arbitrarily based on the survey range or can be arbitrarily decided on by utilizing experience gained from previous surveys.

Reference populations used in anthropometry are frequently critized as not being applicable to developing areas of the world. Because of this, problems arise in methods of assessing the deficits in height and weight, in order to quantitate the size of the problem in a survey population. In the preschool period, the influences of environment, such as nutrition and infectious disease, are of much greater importance on growth than those of race or ethnicity. The differences in growth of preschoolchildren associated with social class are many times those attributable to ethnic factors alone. The magnitude 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 socioeconomic class[18]. 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 - normal or deficient[31]. The reference values are used as a basis for the interpretation of survey results and not as a set of restrictive diagnostic criteria. They 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 for comparison 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, is 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 the data, the lack of valid weight-for-height percentiles, the limited socioeconomic representation, and the age of the data itself. The 10th and 90th percentile were based on such a small number of children 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 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 large 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 simgle reference be agreed upon. It was chosen to describe the Togo survey findings using the NCHS/CDC reference population.

Appendix C - Determination of Survey Sample Size

A number of factors enter into the determination of sampling specifics for a statistical study, including:

a) Resources available, both financial and physical.

b) Constraints such as time and logistical problems effecting the survey in the field.

c) The nature of the sample distribution assumed applicable.

d) The precision desired and the confidence level to be associated with it.

Considering the effect of these factors on the survey, a minimum of 30 sample sites or clusters in each region allows the use of normal parametric statistical procedures in the estimation of population characteristics* of a sample region and in testing for a significant statistical difference among them[23].

The universe sampled was the entire population of Togo as defined by the 1970 census. Samples were drawn for each region to allow comparison of nutrition parameters among them.

For survey purposes, Togo was divided into 5 rural regions and one urban region, each being considered as a separate sampling area. In Togo the regional population configuration was as follows:

Maritime	493,972
Plateau	434,393
Central	252,727
Kara	235,552
Savanna	239,182
Urban	297,952
Total	1,953,778

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

Inspection of the population distribution showed that the Savanna, Kara, Central and Urban regions were of roughly equal size, and the Maritime and Plateau regions were about twice this size. For this reason it was decided that good country-wide precision could be obtained by sampling the Maritime and Plateau regions at half the rate of the other regions and by drawing one continuous sample rather than six independent ones.

After dividing the populations of the Maritime and Plateau in half, the smallest regional population grouping was 217,197 (1/2 of the Plateau population). Since it was determined that the smallest region would have a minimum of 30 clusters, the total number of sample sites needed was:

$$\frac{1,953,778}{217,197} \times 30 = 270$$

A pre-existing program for the Monroe 325 calculator was used to determine the 270 sampling sites. By excluding the odd-numbered sampling sites from the Maritime and Plateau regions, these two regions would then be sampled at half the rate of the other regions; this resulted in the following distribution of sample sites:

Maritime	34
Plateau	30
Central	35
Kara	32
Savanna	33
Urban	41
Total	205

A random start and a fixed interval method for population proportional sampling was then applied to the 1970 Togo population lists to identify the rural villages or urban quarters that became the actual sample sites in each region. This procedure is fully explained in Appendix D.

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')[32].

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:

$$n = \frac{K Z^2}{D^2} (p)(1-p)$$

Past experience has shown that K = 2 should provide at least the desired precision for most variables. 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% ± 5% might be considered acceptable but 10% ± 5% might not.

The value of 'p' yielding the largest 'n' is 0.5 (50%); 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.

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

$$K = 2 \text{ (cluster effect)}$$

$$Z = 1.96 \text{ (95\% confidence)}$$

$$p = 0.5 \text{ (50\%)}$$

$$D = .046 \text{ (4.6\%)}$$

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

$$n = 900$$

Since a minimum of 900 children and a minimum of 30 clusters are necessary for an acceptable level of precision for each region, 30 children becomes the size of each sample unit. For Togo this resulted in a total of 6,150 children (205 sample sites x 30).

A region 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 (p1 - p2)
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 regions 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 $(p1 - p2)$[32].

Predetermination of the sample size did 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 D - Selection of Sample Sites and Survey Children

1. The Togo survey universe was defined as the entire population as defined by the 1970 census.
2. Survey design required 205 sites or clusters, and 30 children in each sample unit, to permit the required estimates and comparisons to be made. (See Appendix C)
3. Using the 1970 Togo line-listing by population and by region a fixed interval method of population proportionate sampling was applied to the population of each region.
   a. The populations of all villages (or urban quarters) within the sample region were calculated.
   b. The cumulated total regional population was divided by the predetermined number of sample sites (see Appendix C) to obtain a sampling site interval; i.e., 14,472 for the Maritime and Plateau regions, and 7,236 for the others.
   c. A starting number within the bounds of the sampling site interval was randomly selected for the Maritime region.
   d. The village including this number in its cumulative population was identified as the first sample site in the Maritime region.
   e. The sample site interval was added consecutively to the starting number 34 times.
   f. With each addition the village with the number in its cumulated population was identified as a sample site for the Maritime region.

g. This procedure was continued into the 5 remaining regions until all 205 sites had been chosen.

h. It should be noted that the only random start was in the Maritime region. The other region starts were predetermined by the first random start and the sampling intervals.

4. On arrival at each sample site, the first concession was randomly selected by the following methods:

a. In rural sites

1) With the aid of the village officials, a map was drawn of the geographical subgroupings of concessions comprising the entire population center and these subgroupings were numbered sequentially. The approximate number of concessions was determined in each subgrouping.

2) The number of concessions for all subgroupings was cumulated.

3) A number between one and the total number of cumulated concessions was selected from a random number table.

4) The concession subgroup in which the randomly selected number fell, became the starting point.

5) One then determined the geographical center of the chosen concession subgroup and proceeded to this point. A village official was asked to determine the four points of the compass and to draw them on the ground. He then selected a number from 1 to 4. (One = north; two = east; three = south; four = west.)

6) The survey team estimated the number of houses between the center and edge of this concession subgroup, along the direction determined in (5. A number between 1 and the estimated number of houses was chosen (using the random number table), and the team proceeded in the selected direction until this concession was reached.

b. In urban sites

1) In all urban areas, except Lomé, the starting concession was chosen for each sample site from the lists of concessions created by the 1970 census. The number of concessions for the chosen commune quarter was cumulated, and a random number method was used to select the first concession. This concession was located in the field by local officials from the name and age of the head (or heads) of the household.

2) In Lomé, the starting concession was chosen for each sample site by using the concession numbering system of the Malaria Bureau. The total number of concessions in Lomé was divided by 26 (the number of required sample sites) to obtain a sampling interval (942). A random number between 1 and 942 was selected and the concession on the cumulated malaria listing corresponding to this number

became the first concession of the first sample site. The sampling interval was added to the number of the first concession to determine the first concession of the second sample site. This was continued until all first concessions of the 26 sample sites had been determined. These starting concessions were located in the field by finding their malaria identification number on the wall or door.

5. Selection of households in a concession
   a. In most cases, there was only one household per concession. If there were more than one, the households were numbered and cumulated. A random number table was employed to choose the first and subsequent households to be surveyed.
6. 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 inclusive.
   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.
7. 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.

8. The second and subsequent concessions included in the survey were the next geographically closest ones. This procedure was followed in a sample site until 30 children had been surveyed.

9. If in a selected population center or commune quarter 30 children were not obtained, the geographically closest population center or commune quarter was entered at its geographically closest point and the survey unit completed

10. If a preselected population center or commune center were found abandoned, then the geographically closest population center or commune quarter was used as a sample site.

Appendix E - 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, weight and arm circumference 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, weight and arm circumference measurements. It seems to some that the recording of height and weight is so straightforward 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 25 kgm scale with 0.1 kgm divisions.

- Salter pants.

- Tripod - quadripod or other system to hang scale from.

3. Arm circumference tape - Zerfas tape.

B. Procedures

The measurements will be done in the following order:

1. Length/height
2. Weight
3. Arm circumference

1. Length or height

The measurer determines if the child's age is greater or less than 2 years. Those less than 2 years will then be accurately measured for length lying down; those 2 years of age or older are measured for height standing.

(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 (the recorder) 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 aloud 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 mid-way point of a 0.1 cm graduation.

6) The recorder then records the length clearly in the appropriate blocks on the questionnaire (blocks 78-81).

7) The measurer then looks at the recorded value on the form to be sure that it is the same number that he called out.

(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 (the recorder) 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 by the measurer. 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."

7) As in (a) (7).

2. Weight

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

(2) The child is undressed by the parent or guardian.

(3) 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.

(4) The child in Salter pants hangs freely from the scale. The scale face is read aloud by the measurer 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 a 0.1 kgm graduation. The reading is made after the child is reasonably still, and the needle is stationary.

(5) The recorder then records clearly the weight in the appropriate blocks on the questionnaire (blocks 75-77).

(6) The measurer then looks at the recorded value on the form to be sure that it is the same number that he called out.

(7) The child is then removed from the Salter pants and partially reclothed.

3. Arm Circumference

(1) The child is held by the parent or guardian; the left arm and shoulder is bared.

(2) With the elbow flexed to an angle of 90^0 and the arm rotated across the abdomen, the midpoint between the posterior tip of the acromion process of the scapula and the oleocranon process of the ulna is determined using the Zerfas tape. This point is marked on the skin with a pen.

(3) The Zerfas tape is looped around the upper arm and the distal free end of the tape inserted through the window and through the slot from behind.

(4) The distal end of the tape is pulled until firm but gentle and uniform contact is made with the arm circumference at the marked midpoint. The soft tissues of the arm are <u>not</u> to be compressed.

(5) The measurer reads aloud the value indicated between the opposing arrows to the nearest 0.1 cm, reading to the next higher 0.1 cm when the arm circumference falls at or beyond the midpoint of a 0.1 cm graduation on the tape.

(6) The recorder then records the arm circumference value clearly in the appropriate blocks on the questionnaire (blocks 84-86).

(7) The measurer then looks at the recorded value on the form to be sure that it is the same number that he called out.

C. Precautions

1. Assistants are necessary - in measuring children, their strength and mobility cannot be overstated.
2. When measuring the arm circumference, pulling the tape end tight enough to indent the skin contour produces INACCURATE READINGS.
3. The Frankfort plane is a plane perpendicular to the body constructe 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.
4. Children, especially infants, have a tendency to extend their feet while lying or standing. Accurate height or length depends on a measurement trom the heel.

Appendix F - Procedure for Obtaining Blood Samples

A. Fingerstick Method - for child or mother.

1. Take one of the unopette containers from the sealed plastic bag and place the survey site code number and the ID code number for this child or mother. Add the word "child" on the unopette label before beginning to draw blood on the child. Add the word "mother" on the unopette label before beginning to draw blood on the mother. Do not mark both unopettes at the same time.
2. Clean index finger or middle finger of child's or mother'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. After the pipet is filled, wipe off any excess blood on the out side 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 out 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. 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).
12. Make sure patient's hand is wiped off, and if desired apply bandaid.
13. Return unopette to premarked plastic bag and place bag in pack.
14. Check "yes" on the questionnaire in the appropriate block on the survey form. (Block 90 if collected on the child and block 94 if collected on the mother.)

B. Heel Stick Procedure (exterior lower lateral side of the sole) - For small child only; usually the fingerstick can be done in all children over 1 year of age. 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. 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. Apply a bandaid when finished.

C. Handling of Unopettes

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 at the end of the day, if possible.

ENQUETE SUR LA NUTRITION AU TOGO

CODE D'IDENTIFICATION

Région (1) | Circonscription ou Commune (2-3) | Zone d'enquête (Centre de Quartier etc.) (4-6) | Foyer (7-8) | Mère (9) | No ID de l'enfant (10-11) | Equipe (12) | Date de la Visite: Jour / Mois / Année (13-18)

RENSEIGNEMENTS SUR LE FOYER

Nom de l'enfant _____

Nom du chef du foyer _____

Sexe de l'enfant (19): 1 ☐ M 2 ☐ F

Nombre des personnes du foyer (20-21) ☐☐

Indicatif du groupe ethnique de la mère (22-24) ☐☐

DONNEES SUR L'AGE

Date de naissance: Jour (24-25) / Mois / Année (26-29)

Origine des données sur l'âge (33):
1 ☐ Pièce officielle vérifiable
2 ☐ Calendrier historique
3 ☐ Autre

Rang de naissance (34-35) ☐☐

Intervalle de naissance: Années (36) ☐ / Mois (37-38) ☐☐

Age: Années (30) ☐ / Mois (31-32) ☐☐

A LA MERE SEULEMENT

MERE (39)
1 ☐ Présente
2 ☐ Absente

"Etes vous enceinte?" (40) 1 ☐ Oui 2 ☐ Non 9 ☐ Inconnu

Si la réponse à la précédente question est "non" ou "inconnu":
"Donnez vous le sein actuellement à un enfant?" (41) 1 ☐ Oui 2 ☐ Non 9 ☐ Inconnu

"L'enfant d'enquête est il actuellement nourri au sein?" (42) 1 ☐ Oui 2 ☐ Non 9 ☐ Inconnu

Si la réponse est "non" à la précédente question "A quel âge l'enfant a-t-il été sevré?" Années (43) ☐ / Mois (44-45) ☐☐

"A quel âge a t il reçu pour la première fois des aliments solides ou semi-solides?" (46)
1 ☐ < 6 mois 2 ☐ 6-12 mois 3 ☐ 12-18 mois 4 ☐ > 18 mois
0 ☐ L'enfant n'a pas encore reçu 9 ☐ Inconnu

AU CHEF DU FOYER SEULEMENT

CHEF DU FOYER (47)
1 ☐ Présent
2 ☐ Absent

"Combien d'argent a été dépensé dans ce foyer pendant les derniers douze mois?" (48-53) ☐☐☐☐☐☐ francs CFA/an

"Quelle surface de votre propriété cultivez vous?" _____ = (54-55) ☐☐☐ hectares

"Combien des articles suivants les membres de votre foyer possèdent ils et lesquels?"

(57) ☐ Machines à coudre (58) ☐ Valises (59) ☐ Lanternes à gaz (60) ☐ Cuisinières à gaz, etc. (61) ☐ Motocyclettes, vélomoteurs, etc.
(62) ☐ Bicyclettes (63) ☐ Radios (64) ☐ Montres ou Pendules (65) ☐ Cocottes minute (66) ☐ Fers à repasser (67) ☐ Lunettes de soleil
(68) ☐ Toits en métal (69) ☐ Chaussures de cuir (70) ☐ Projecteurs (71) ☐ Photos encadrées
(72) ☐ Carabines de chasse ou fusils de chasse (73-74) ☐☐ Chèvres

MENSURATIONS

Poids (75-77) ☐☐.☐ kg Taille (78-81) ☐☐☐.☐ cm Mesureur (82-83) ☐☐

Circonférence du bras (84-86) ☐☐.☐ cm Oedème malléolaire bilatéral (87) 1 ☐ Oui 2 ☐ Non 9 ☐ Inconnu Mesureur (88-89) ☐☐

LABORATOIRE

Prélèvement du sang de L'ENFANT (90) 1 ☐ Oui 2 ☐ Non

Dosage de l'hémoglobine de L'ENFANT (91-93) ☐☐.☐ g/100ml

Prélèvement du sang de la MERE (94) 1 ☐ Oui 2 ☐ Non

Dosage de l'hémoglobine de la MERE (95-97) ☐☐.☐ g/100ml

Appendix H - Detailed Distributions of Togo Anthropometric Indices

I. a. Distribution of Togo Survey Population by the Weight-for-Height Index by Region.

Table 1 - Appendix H

Weight-for-Height:

Percentage Distribution of Survey Population

by NCHS/CDC Reference Weight-for-Height Median

by Region

Region	Percent of NCHS/CDC Reference Median			
	<80.0	80.0-89.9	90.0-99.9	100.0+
Savanna	5.1	29.3	44.3	21.4
Kara	1.7	20.6	43.1	34.6
Central	2.0	19.7	48.9	29.4
Plateau	1.7	20.4	48.4	29.6
Maritime	1.8	21.6	49.0	27.6
Urban	0.8	18.3	48.1	32.8
Weighted Average - Togo	2.0	21.4	47.4	29.1

I. b. Distribution of Togo Survey Population by the Weight-for-Height Index by Age Groups.

Table 2 - Appendix H

Weight-for-Height:

Percentage Distribution of Survey Population

by NCHS/CDC Reference Weight-for-Height Median

by Age Groups

Age (Months)	Percent of NCHS/CDC Reference Median			
	<80.0	80.0-89.9	90.0-99.9	100.0+
	(Weighted Percent)			
6-11	3.2	23.0	42.5	31.4
12-23	4.5	33.6	44.7	17.2
24-35	1.8	23.3	47.2	27.7
36-47	0.8	11.9	50.9	36.3
48-59	0.5	15.7	47.4	36.5
60-71	0.7	16.3	52.9	30.2
Average - Togo	2.0	21.4	47.4	29.1

II. a. Distribution of Togo Survey Population by the Height-for-Age Index by Region.

Table 3 - Appendix H

Height-for-Age:

Percentage Distribution of Survey Population

by NCHS/CDC Reference Height-for-Age Median

by Region

Region	Percent of NCHS/CDC Reference Median			
	<85	85.0-89.9	90.0-94.9	95.0+
Savanna	6.2	22.0	40.4	31.4
Kara	5.6	20.5	38.6	35.3
Central	4.1	16.2	41.2	38.5
Plateau	3.0	13.2	42.5	41.3
Maritime	2.4	15.5	39.7	42.5
Urban	1.5	10.0	37.3	51.3
Weighted Average - Togo	3.4	15.6	40.1	40.8

II. b. Distribution of Togo Survey Population by the Height-for-Age Index by Age Groups

Table 4 - Appendix H

Height-for-Age:

Percentage Distribution of Survey Population

by NCHS/CDC Reference Height-for-Age Median

by Age Groups

Age (Months)	Percent of NCHS/CDC Reference Median			
	<85	85.0-89.9	90.0-94.9	95.0+
	(Weighted Percent)			
6-11	0.9	5.7	28.0	65.4
12-23	2.1	12.9	42.0	43.0
24-35	3.4	15.2	42.0	39.4
36-47	3.9	20.5	39.9	35.7
48-59	5.4	18.5	42.5	33.6
60-71	5.2	19.6	42.8	32.4
Average - Togo	3.4	15.6	40.1	40.8

III. a. Distribution of Togo Survey Population by the Weight-for-Age Index (Gomez Classification) by Region

Table 5 - Appendix H

Weight-for-Age:

Gomez Classification of Malnutrition

by Region

	Percent of NCHS/CDC Reference Median-Gomez Classification			
Region	Normal 90.0+	1º 75.0-89.9	2º 60.0-74.9	3º <60.0
Savanna	21.8	51.1	24.5	2.6
Kara	30.8	50.4	17.8	0.9
Central	30.5	54.0	14.8	0.7
Plateau	32.9	53.4	13.3	0.3
Maritime	30.8	56.1	12.5	0.6
Urban	40.3	50.8	8.3	0.6
Weighted Average - Togo	31.6	53.1	14.5	0.8