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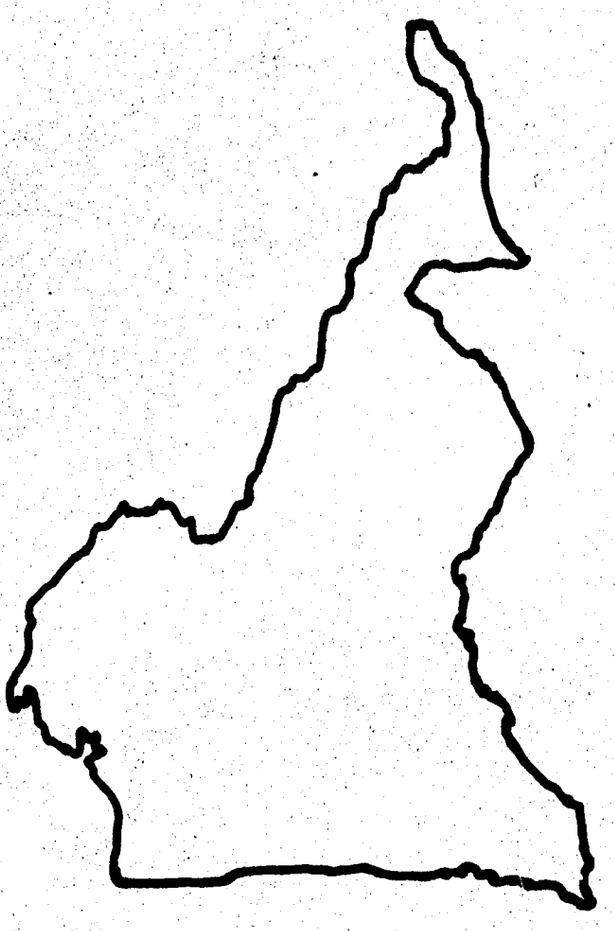

Office of Nutrition
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Agency for International Development
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UNITED REPUBLIC OF CAMEROON

NATIONAL NUTRITION SURVEY

Undertaken By

The Government of Cameroon

FINAL REPORT

October, 1978

With the Assistance of the
UCLA Nutrition Assessment Unit
Division of Population, Family and International Health
School of Public Health
University of California
Los Angeles, California, U.S.A.
In Cooperation With
The United States Agency for International Development

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1. PREFACE

A national nutrition survey was undertaken by the Government of Cameroon (GURC) with the assistance of the University of California, Los Angeles, Nutrition Assessment Unit (UCLA), in cooperation with the United States Agency for International Development. The UCLA Unit Director visited Cameroon in mid-April, 1977, when initial discussions took place concerning survey feasibility. Planning began immediately in Cameroon under the auspices of The Ministry of Economy and Planning with a thorough review of technical and administrative matters.

The survey, which took place from October, 1977, to April, 1978, was a result of the combined efforts of the Government of Cameroon, USAID, and UCLA.

Acknowledgement is made of all those who were involved in the intensive planning and preparation, field and post field phases of the survey. The work of the Ministry of Economy and Planning and the Technical and Interministerial Committees facilitated the survey's smooth implementation. The diligent efforts and high quality of work of the interviewers, supervisors, administrative staff, and drivers during the long field phase enabled the survey to be completed on time. Appreciation is extended to AID/Yaounde, particularly to the Division of Health, Nutrition and Population for their continued support, and to UCLA for their efforts during this entire endeavor. (A complete list of survey personnel and participating organizations appears in Appendices 30 & 31).

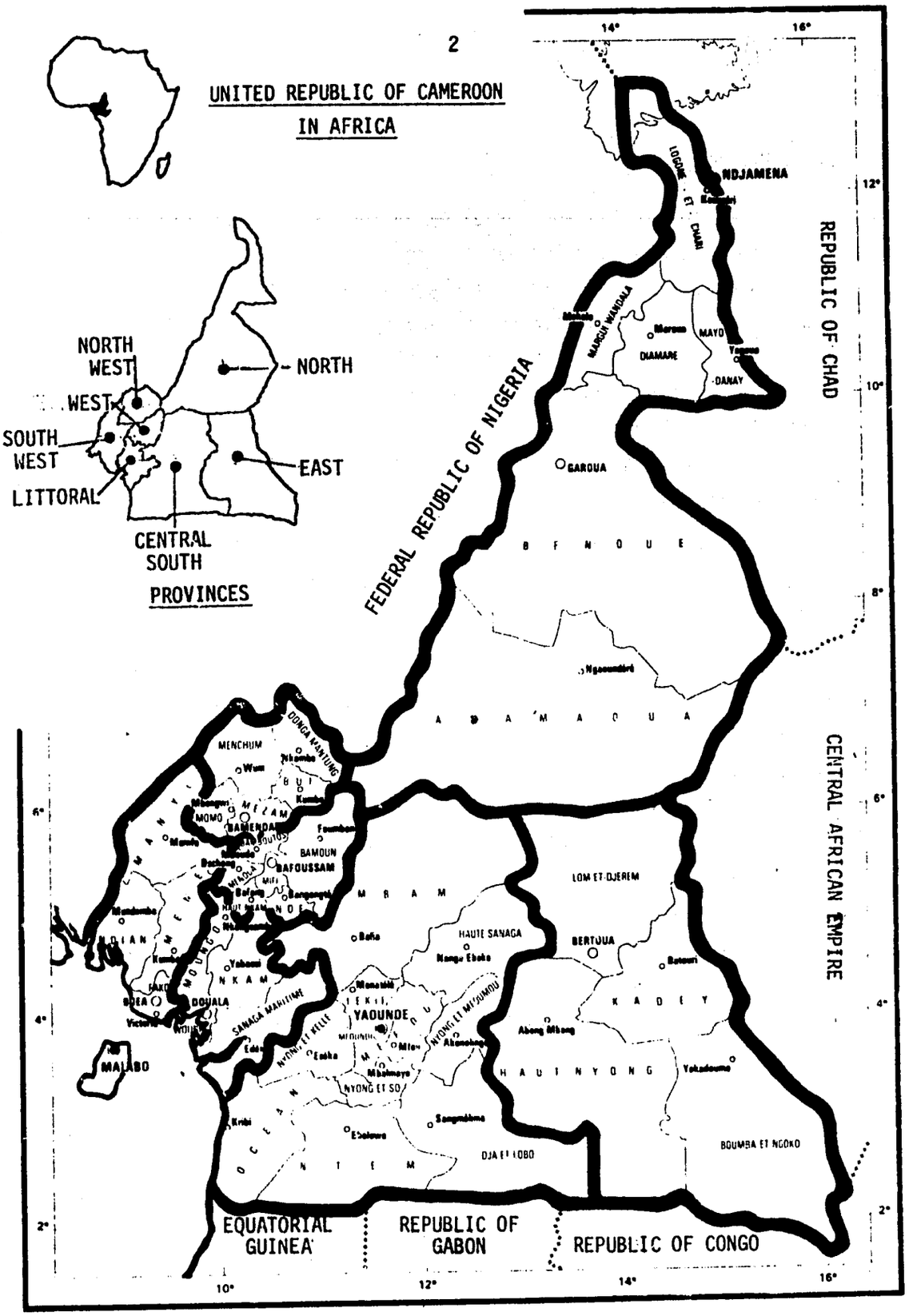

FIGURE 1 UNITED REPUBLIC OF CAMEROON LOCATION IN AFRICA
PROVINCES
DIVISIONS AND CHIEF TOWNS

(Modified from a map drawn by the Centre Geographique National for ONAREST,1976)

3. TECHNICAL SUMMARY

The purposes of the Cameroon National Nutrition Survey were to provide an estimate of nutritional status of young children and their mothers in Cameroon, to compare nutritional status among selected areas and to provide information about certain factors associated with nutritional status such as diet, socio-economic factors, health and demographic variables.

Anthropometry (body measurements), clinical signs, and hemoglobin assessment provided a description of nutritional status. Interviews with the mother or her substitute were conducted to collect information on household and family characteristics, child health, and diet.

A "special group" of 506 children under five years from selected areas in Douala were measured. These children were from families with a relatively high socio-economic status and it was assumed that their nutritional status was relatively superior to serve as a comparison for Cameroon. Their results were compared with those of an international reference group of children (1) to confirm that such a comparison was useful to Cameroon.

The survey sample for Cameroon was based on the results of the 1976 Population Census (2). The sample comprised 5689 children aged 3-59 months (up to five years), 3350 mothers and 3383 households. A multistage, cluster sampling technique was used, based on population proportions by province, as well as the major cities Yaounde/Douala combined. A cluster consisted of 30 children randomly sampled from 190 sites, each of which was within an enumeration area.

Statistically valid descriptions of undernutrition prevalence rates were obtained for five provinces and groupings (Central South, East, North, South-West/Littoral and North-West/West) and for the two major cities of Yaounde and Douala taken as one group. In addition, Cameroon (excluding Yaounde/Douala) was described in two

further ways: by urban and rural classifications and according to ecological areas as defined by the World Bank (3). Each area or grouping consisted of approximately 30 sites. From each site 30 children were sampled, provinding a total of at least 900 children per province or provincial grouping. This is based on a methodology applied in several countries throughout the world, and recently reported in the Bulletin of the World Health Organization (4).

All national results were derived using a weighting factor (i.e. appropriate statistical adjustment) based on population proportionality. Thus prevalence rate estimates for children under five years (excluding 0-2 months) were based on the total number of these children in the United Republic of Cameroon, which constituted approximately 1.3 million out of a total population of 7.6 million.

The findings of the survey are briefly summarized in the pages that follow:

3.1 ANTHROPOMETRIC EXAMINATION OF CHILDREN UNDER FIVE YEARS OF AGE

a. Chronic Undernutrition (or Chronic Protein-Calorie Malnutrition)

A child measuring less than 90% of the expected height for a reference child of the same age was classified as being chronically undernourished. The proportion of children classified in this way gives an estimate of the prevalence rate of chronic undernutrition in any population.

Chronic undernutrition in young children reflects recurrent episodes or prolonged periods of nutrition deficiency for calories and/or protein available to the body tissues. This nutritional deficiency usually has an onset of at least six months prior to the time of examination. The deficiency is usually the result of poor diet and/or ill health.

In Cameroon, 22.1% of young children had chronic undernutrition, indicating a total number of about 250,000 children for the whole country. The prevalence rate was lowest in infancy, began to increase after 12 months of age and reached a plateau from 18 to 59 months. Using the same criteria, only 4.2% of children of the Douala special

group of relatively high socio-economic status, had chronic undernutrition. The difference between the national prevalence rate (22.1%) and that of the special group (4.2%) represents the potential that could be reached with improvement in nutritional status.

The prevalence rates for chronic undernutrition were least in Yaounde/Douala (11.8%) and lower in Urban (19.4%) as compared with Rural Cameroon (22.4%). Among the provinces, the rate was highest in the West (30.8%). The actual numbers of children affected was highest in the North (70,000 - representing 28% of the 250,000 with chronic undernutrition in the whole country).

b. Acute Undernutrition (or Acute Protein-Calorie Malnutrition)

A child measuring less than 80% of the expected weight for a reference child of the same height was classified as acutely undernourished. The proportion of children classified in this way gives an estimate of the prevalence rate of acute undernutrition in any population.

Acute undernutrition in young children reflects a recent period of nutritional deficiency of protein and/or calories available to the body tissues, the onset is usually not more than a few weeks prior to the time of examination. The prevalence of acute undernutrition is expected to be far less than that of chronic undernutrition. In a cross-sectional survey, a child is examined at one time only. Thus the acute episode determined by weight loss might not be present at that time. Evidence of cumulative episodes of acute undernutrition will be apparent through reduced growth in height.

In Cameroon, only 1.0% of young children had acute undernutrition. This prevalence rate was low throughout all areas of the country. No child in the special group had acute undernutrition.

This result indicates there was no famine nor near-famine situation in any area described at the time of the survey. It is highly probable that conditions at the time of the survey were relatively favorable and an adverse seasonal influence on nutrition at another time would not be reflected in the acute undernutrition

measure of this survey.

When a milder degree of acute undernutrition was considered (less than 85% of the expected weight for a reference child with the same height), it was apparent that children aged 3-59 months in the North had a higher prevalence rate than all other areas. This may suggest that the problem of acute undernutrition lies just under the surface and that any deterioration of the present circumstances at any other time of the year may be sufficient to tip the balance.

c. Underweight (Protein-Calorie Malnutrition of Unspecified Duration)

A child measuring less than 80% of the expected weight for a reference child of the same age was classified as underweight. The proportion of children classified in this way gives an estimate of the prevalence rate of underweight in any population.

Underweight-for-age in young children reflects a nutritional deficiency of protein and/or calories available to the body tissues, but the onset and duration is not known. Because the bony skeleton contributes greatly to the weight of a child, the prevalence of underweight might be similar to that of chronic undernutrition, especially when the prevalence of acute undernutrition (i.e. low weight-for-height) is relatively low.

In Cameroon, 21.1% of young children were underweight which is far higher than that of the special group (3.6%). The prevalence rate of underweight was lowest in children aged 3-5 months, began to increase after 6 months and reached a peak at 15-20 months, maintained a plateau throughout the second year of life and reduced slightly after this up to 59 months.

The underweight prevalence rate was least in Yaounde/Douala (10.8%), and much less in Urban (13.6%), as compared with Rural Cameroon (23.0%). The North clearly had the highest prevalence rate as well as the highest number of children with underweight of all Cameroon.

d. Variables Related to Undernutrition

The following variables for the total country sample were found to be related to a significantly higher prevalence rate of chronic undernutrition or underweight in the child; i.e. they may be considered as "at-risk" factors for undernutrition.

i/Demographic

- Household size more than 10 members
- High number (i.e. 4+) of dependents (children under 5 years) in household.

ii/Socio-Economic

- Household head a farmer
- Household structure traditional or improved
- Family owned more cattle, sheep or goats
- Someone other than mother cared for the child
- Mother illiterate (cannot read French, English or other language).

iii/Health and Health Service Utilization

- Child not born in a hospital
- Child with no birth nor clinic record (i.e. calendar of events or declaration required for age determination).
- Recent onset of fever, diarrhea or illness.

iv/Diet

- Child aged 3-5 and 6-11 months receiving no food other than milk
- Child aged 6-11 and 12-23 months who received no family food
- Child aged 12-23 months still being breast-fed (assuming inadequate additional foods other than milk)
- Children of all ages who received less number of total, energy-containing and protein-rich food groups

No relationship was found between sex of the child, age of the mother or birth order of the child, with higher undernutrition rates.

Many of the factors listed which were related to a higher prevalence rate of undernutrition in young children were consistent for the results for rural as compared with urban areas (excluding Yaounde/Douala) reported in the section on undernutrition by area. These factors include a low socio-economic status, illiteracy, recent ill health, poorer access to services, poorer diet and perhaps overcrowding.

Due to lack of sufficient sample size, it was not possible to fully investigate the relationship between these and other factors and undernutrition for each province. For example, in the North, almost all mothers were illiterate, hence this factor was not applied to discriminate the undernourished from normal children.

Further studies, on a longitudinal basis, would be required to investigate actual causal factors.

3.2 EDEMA IN YOUNG CHILDREN

The proportion of children with edema was low (0.6%). This was consistent with the low prevalence rate of acute undernutrition. Edema identifies only a certain type of severe undernutrition, namely florid Kwashiorkor.

3.3 ANEMIA IN YOUNG CHILDREN

In Cameroon, 38.1% of children aged 6-59 months were anemic as defined by WHO criteria (5). The prevalence rates were similar in children aged 6-23 and 24-50 months. There was little difference in the extent of anemia throughout the country, with the exception of the West Plateau where the rate was 23.1%. An unexpected finding considering the lower undernutrition prevalence rate was the absence of a difference between the special group, Yaounde/Douala, and the rest of the country. If this were a valid result, it might be explained by the prevalence of some common factors such as malaria affecting anemia and to a lesser extent, undernutrition. Malaria endemicity is probably less severe in the Western Plateau Highlands where anemia rates were lower.

The prevalence rate for sickle cell disease as determined by hemoglobin genotype, was 0.9%. It is known that sickle cell disease is an important cause of severe anemia, but a relatively uncommon cause of anemia for older ages because of its high mortality effect for earlier ages. The prevalence rate for sickle cell trait, was 15.6%.

3.4 MEASLES IN YOUNG CHILDREN

Measles was found to be widespread throughout Cameroon and contributed to approximately 25% of all deaths in young children.

There was a positive relationship found between undernutrition of the young child measured in the survey and historical measles mortality of young siblings in the same families.

3.5 MATERNAL GOITER

Obvious maternal goiter of Grade II or III by WHO criteria (6), was seen in 4.4% of all mothers examined. Goiter rates were highest in the East Province (16.8%), but were also relatively important in the North (5.6%), North-West (3.4%), and Central-South Provinces (3.1%). Apart from the East and certain populous areas of the North, goiter was found in this survey in various pockets, e.g. in the Central South (northern part near Yoko, near Bafia and Bokito); in the North-West Province north of the Bamenda Plateau and to a lesser extent around Bamenda; and in scattered areas of the West Province around Dschang and Bafoussam.

Although the prevalence rate of goiter was highest in the East, the actual number of mothers affected was highest in the North Province. It should be noted that only obviously visible goiter was considered in this survey. If goiter of all grades were included, the prevalence rates would have been much higher.

Clearly there is a significant problem of goiter in Cameroon especially in the East and in other areas. Methods used in other

countries to reduce goiter prevalence, such as salt iodization, iodized oil by injection or oral administration are described in this report.

3.6 ANTHROPOMETRIC EXAMINATION OF MOTHERS

Maternal nutritional status is more difficult to define using anthropometric measures than the status of young children.

In this study, 13.1% of all mothers were "short" (i.e. height less than 152 cm. or five feet). Short mothers were most common in the East and North-West Provinces (24.8% and 22.5%) and "tall" mothers (over 165 cm. i.e. 5'5") were most common in the North (17.7%). Compared with the remaining provinces the average height was highest in the Yaounde/Douala (159.8 cm. i.e. 5'3") and the North (159.4 cm. i.e. 5'2 3/4").

Maternal stature was considered to reflect the genetic contribution of stature in young children. Based on the survey's findings the prevalence rate of chronic undernutrition in children of the North may be an underestimate, since their mothers were taller than those in the other provinces. That environmental factors are still the most important determinant of a young child's growth (i.e. stature) were supported by the general results of this survey. In Cameroon 33% of the young children of short mothers and 19% of those with mothers who were not short, had chronic undernutrition. More than 86% of children with chronic undernutrition had mothers who were not short.

It should also be noted that maternal stature might also reflect nutrition-related environmental factors which influenced her growth in her childhood.

The correlation coefficient between stature of mothers and percentage height for age of their children was 0.20. This low value suggests that the genetic effect on short stature in children was not a predominant factor, when compared with other factors, such as diet and poor health.

In Cameroon, 7.3% of mothers had evidence of arm wasting (less than 23 cm. arm circumference) and 13.6% had evidence of fat wasting (less than 7.5 mm. fatfold). In the North Province, mothers showed the highest prevalence of arm (11.6%) and fat wasting (23.7%). This might suggest that a higher proportion of Northern mothers have undernutrition as compared with those of the rest of the country. An important reason for this may be diet. It should be noted that other factors, such as activity may influence maternal arm measures.

3.7 DIET METHODS

a. Introduction

All methodology used for the study of diet was based on the recommendations of the National Academy of Sciences, USA (7), and adapted to Cameroonian needs. This methodology assumes that information on consumption derived for the types of foods eaten throughout a country would be feasible and could provide useful data for nutrition policies and programs.

Diet assessment was conducted on two groups of children. The person interviewed was asked questions about every index child's feeding patterns. A more detailed 24-hour dietary assessment was conducted on every child 3-24 months of age and for the person feeding the child to give an index of family food patterns. A total of 2235 paired dietary listings were analyzed.

b. Breast Feeding

The practice of breast feeding was almost universal (98% of all infants) throughout Cameroon (including Yaounde/Douala) up to 11 months of age. It was commonly practiced in the second year of life. At 21 months of age, 50% of all children still received breast milk. This percent was even higher in the North (70%). These results compare favorably with those of other African countries.

c. Other Milk

Fresh milk consumption was limited almost entirely to the North where 7% of all children aged 3-23 months received it. Artificial or commercial milk feeding was common in Yaounde/Douala (i.e. 25% of infants) and far less common in the rest of the country (i.e. 3% of infants). Bottle-feeding was frequently used for infants in Yaounde/Douala (30%), for children aged 3-5 months in Central South province (24%), and in the Western provinces (10%).

d. Food Received

In Cameroon 46% of children aged 3-5 months, 80% aged 6-11 months and 95% in the second year of life received some food other than milk. These rates for infants were less in rural Cameroon, particularly in the North and East provinces, and higher in Urban areas.

Approximately 40% of infants in Cameroon received specially prepared foods (such as paps) from 3-11 months. The prevalence rate decreased to 25% in the second year of life. Just over half the children aged 6-11 months in the second year received food shared with the family. More children in the North received special foods (e.g. millet/sorghum pap) which was far longer than the children in the other provinces. They also received the family food less often.

By far the most common special food in most provinces other than the North was "corn pap". Imported bread/wheat was most commonly eaten in the Central South Province and Yaounde/Douala. Commercial weaning foods were eaten by 30% of infants aged 3-11 months in Yaounde/Douala and almost 15% in the Central South Province.

The proportion of families who ate any vegetable protein (beans, seeds or nuts) was 60-70%; animal protein (meat, fish or eggs) was 60-70%; dark green leafy vegetables, 40%; a fruit or vegetable, about 50%; and oil, 50-90% depending on the area of the country.

Of the children aged 6-11 months in these families, less than 40% received any vegetable protein; less than 30% had any animal protein; 20% ate dark green leafy vegetables, 20% had a fruit or vegetable and 20-60% had an oil depending on the area of the country. By 18 months most children received the same types of food as the family.

It should be noted that the quantity of food eaten, and whether foods were eaten together or separately, were unknown.

It appears there are two major problems: food unavailability to the family and distribution of foods to the young child, even when available to the family.

3.8 REFERENCES

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3.9 PARTICIPATING ORGANIZATIONS

The Cameroon National Nutrition Survey was administered by the Ministry of Economy and Planning (MINEP). The following Ministries participated:

Ministry of Health
Ministry of Social Affairs
Ministry of Agriculture
Ministry of Education
Ministry of Armed Forces

As well as direct involvement, certain ministries participated through their technical organizations. These include the Scientific and Technical National Research Office and Direction Of Statistics (Ministry of Economy and Planning); and the University Center for Health Sciences (Ministry of Education).

Non-governmental agencies which participated in the survey included UNDP, UNICEF and WHO.

3.10 CONCLUSIONS

Children less than five years of age were chosen on this survey because they are known to be at the greatest risk of serious undernutrition. Whenever high prevalence rates of undernutrition are found within this age group, there is an indication that the problem concerns the community at large.

1. Approximately two hundred and fifty thousand children under five years of age in Cameroon were chronically undernourished (1) at the time of this survey.

The problem of undernutrition :

* Exists throughout the nation
* Is more prevalent in children aged six months to five years
* Is more prevalent in those living in rural areas
* Is more prevalent in the North, West and East Provinces

Undernutrition was found to be related to :

lower socio-economic status
overcrowding
illiteracy
inadequate child care
lack of important foods in the diet
recent child illness
lesser utilization and lack of health services

With regards to diet :

* Breast feeding is adequate at present
* Up to 30% of children from 6-11 months of age (particularly in the North and East Provinces) do not receive any food other than milk

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(1) Defined as a long-term marked impairment of growth when compared with a well-nourished population of children of the same age.

* An additional 20-30% of children this age receive pap as their only source of food

* The remaining children often ate a low variety of important foods

* These problems continue to a lesser extent in the second year of life

* Lack of certain foods, such as cereals, protein-rich foods and oils, stem from two major factors :

  - Inadequate family intake

  - Poor family food practices, resulting in the child not receiving foods eaten by the family

2. Approximately 40% of children under five years in Cameroon have anemia.

The survey highlighted the problem of lack of adequate iron-containing foods in the young child's diet. Sickle cell anemia did not seem to be a significant factor contributing to anemia, its prevalence rate being 0.9%. Other important causes of anemia not investigated in the survey include parasitic infestations, such as malaria, and infections.

3. Measles is widespread throughout Cameroon and contributes to 25% of all young child deaths.

4. Goiter in mothers seems to be endemic in the East Province and in certain localities of the North, North-West and Central-South Provinces.

3.11 RECOMMENDATIONS:

Improved nutritional status throughout Cameroon will result in better health and productivity for the population at large, and will lead to a general improvement in the quality of life. The nutrition problem is related to many different sectors and concerns improvement in the quantity as well as the quality of foods eaten.

Improvement in the quantity and quality of the Cameroonian diet involves attention to agricultural production, processing, marketing, distribution and consumption of food. The sharing of foods within the family influences the differential food consumption by family members and affects young children and mothers. Nutrition education should be directed to correct these imbalances.

In another fashion, nutritional status is affected by the general state of health of the individual, and can thus be ameliorated through improved health services, such as immunization, improved water supply and environmental sanitation, and especially nutrition education.

Considering the multiplicity of sectors which must be taken into consideration in implementing an effective nutrition improvement strategy, it seems necessary that a multisectoral approach be used. In this sense, the solution of the nutrition problem in Cameroon will demand effective coordination and integration of a wide variety of policies and program activities in the concerned sectors.

Thus, following the results obtained from this survey, the participants of the final working group, including technicians, officials and members of international organizations, recommended:

A. In the short term:

1) The creation of a national structure responsible to study problems of food and nutrition

This structure could be designated to plan and coordinate activities in the nutrition sector. Such a structure should be composed of

representatives from various sectors concerned with the nutrition problem and should also have within it a permanant technical working group that could be responsible to implement programs assigned to it.

2) The convening of a seminar/workshop in Yaounde:

This seminar/workshop would serve essentially towards general consciousness raising and exchanges of ideas and information about the nutrition problem in Cameroon. It could also serve as a basis for a future nutrition strategy to follow. Later, its format could be extended to regional seminars and workshops.

3) The eradication of goiter:

One activity which is important to begin is the study and design of a goiter intervention strategy to form the basis for remedial action against this problem in identified areas. This activity could entail the creation of a system for producing and distributing iodized salt throughout the country. Once action has begun, a surveillance team could be organized to ensure the proper attainment of the goals, by planning, execution, and development of alternative methods and strategies.

4) The intensification of vaccination campaigns against measles:

Because of the significance of measles as it relates to mortality of children, it is of high priority that existing immunization programs be strengthened and expanded to cover the entire country.

5) The preparation of a program of promotion and nutrition education:

This action could be coordinated by the Ministry of Economic Affairs and Planning in collaboration with the Ministries of Public Health, Agriculture (e.g. Direction of Community Development), Social Affairs, and other services, where outreach attains the family level. These actions could, in conjunction with the Ministry of Information and Culture, be reinforced through the utilization of mass media.

B. Activities in the long term:

1) The formation of qualified personnel at all levels:

This formation could be assisted by the teaching of nutrition in all scholastic institutions from primary school to university.

2) Research:

Because of the cross-sectional nature of this survey, it may be necessary to conduct future longitudinal surveys of nutritional status, as a means of refining existing information, and of increasing knowledge of seasonal and regional problems. These surveys could be initiated on a pilot basis as soon as possible. They could provide information for the planning of surveillance strategies in certain priority areas.

The problem of anemia , which is particularly complex, should be investigated by further studies. These studies could be carried out by existing institutions such as the University of Yaounde, ONAREST, OCEAC, and the health service system.

3) The creation of dietetic experimentation and rehabilitation centers:

These centers could integrate the four elements of dietetic research, experimentation of novel nutritional concepts, recuperation and finally, practical formation of health workers.

4. BACKGROUND INFORMATION

Introduction

4.1 History

Cameroon was a German protectorate from 1884 to 1916 when the British and French armies invaded it. In 1919, a declaration signed in London divided the country between the United Kingdom and France. This declaration was sanctioned in 1922 by the League of Nations and Cameroon became a trusteeship under their mandate system.

In January 1960, the East Cameroon became independent. On October 1, 1961, reunification of West Cameroon and the Republic of Cameroon was realized. After a referendum was held on May 20, 1972, the federation became the UNITED REPUBLIC OF CAMEROON. Both French and English are the official languages of the country.

4.2 Location (Figure 1)

The United Republic of Cameroon is situated in Central West Africa and is surrounded by six countries: Nigeria to the west; Chad and the Central African Empire to the east; Equatorial Guinea, Gabon and Congo to the south. Cameroon lies just north of the Equator on the Atlantic Ocean. The area of the country covers 183,000 square miles (475,000 km^2).

4.3 Population

According to the last national census held in April, 1976, the total population of Cameroon is 7,663,246 people (2). The annual growth rate is estimated at 2.46%.

4.4 Climate

There are two major types of climate in Cameroon. The southern part of the country is an equatorial wet region and is characterized

by a high and humid temperature the year round. Rainfall is heavy and approaches 1500-2000 millimeters per year. To the north the country enters into the African Sahelian zone. This area is characterized by a high mean temperature that is given to a moderate fluctuation and range throughout the year. Rainfall is less than in the southern part of the country and averages between 700-1000 millimeters per year.

4.5 Ecology

There are five well-defined ecological regions within the republic, each of which is characterized by distinctive agricultural zones and cultural practices. The dry northern plains cover the upper regions of the country. This is an area of thornbush steppes and is given to extensive cattle and livestock grazing. The main agricultural crops in the region are: millet, sorghum, cotton and groundnuts. To the south of this region extends the central savanna where wooded brushy areas become more dominant. In the central savanna cattle are grazed and main crops include: sorghum, maize, cassava, tobacco, and sugar cane. Below the savanna, the southern extent of the country is covered in the southern rain forest. This area is given to cultivation of plantains, cassava, cocoyams and groundnuts. Main cash crops in this region are cocoa and robusta coffee. Bordering the southern rain forest to the west are the western and coastal lowlands. This is a low marshy zone where plantains, maize and cassava are grown as chief agricultural crops. Cash crops in this region include robusta coffee, oil palms and rubber. Above the western and coastal lowlands extends the western highlands. This area is characterized by a semi-mountainous terrain to the south and a region of hilly grasslands to the north and west. Cattle are grazed on the highlands and main agricultural crops include maize, groundnuts and beans. The major cash crop in this region is arabica coffee.

4.6 Economy

Today, 80% of the Cameroonian economy is founded on agriculture, which accounts for approximately 70% of the country's export earnings. Coffee, cocoa, cotton and timber are major sources of export revenue. Major efforts are underway in the country to develop interior markets for foodstuffs and the government is working to improve crop support infrastructures whereby increased services will be provided to farmers.

The industrial sector is growing and is composed of approximately 200 manufacturing, processing and assembly plants producing consumer goods. There is a major aluminum manufacturing complex in the country and other sub-soil prospects seem promising.

4.7 Transportation and Telecommunications

Cameroon has a road network that totals approximately 20,000 miles, of which 2,500 miles are main roads linking all provinces, divisions and districts. There are still regions in Cameroon that are only accessible by foot, yet the government is actively pursuing efforts to connect the existing road network to these enclaved areas.

There are 612 miles of railroad tracks in the country and the major line connects the port of Douala in the Littoral province with Yaounde in the Center South province and then passes north through the sugar cane complex at Mbandjock and continues into the Eastern province at Belabo. The line then continues northward linking the Northern province to the system at Ngaoundere. Along the Douala-Yaounde trunk line is also a branch line that extends southward to Mbalmayo in the Center South province. Another trunk line connects Douala with Nkongsamba in the Littoral province. This trunk line also has a branch spur extending to Kumba in the Southwest province. The new project TRANSCAM is already underway to modernize the entire rail network and should be completed in the near future.

Cameroon has a vast system of river transport throughout the country and in 1973 had seven ports open to international shipping. The major port in Cameroon is Douala-Bonaberi and future plans call for the enlargement of this busy port.

Cameroon has an air system that links all the provinces in the Republic. This air system also extends outside the country, linking Cameroon to East Africa, Central Africa, West Africa and Europe.

The country's telecommunications system has automatic telephone exchanges in all major cities. A satellite communications station facilitates international communication.

4.8 Employment

According to the 1976 census, 79.4% of the Cameroonian labor force is involved in agriculture (2). The following is a detailed breakdown of sectors of activity composing the active labor force in Cameroon:

Total Active Work Force	2,757,899
Agriculture, hunting, fishing and forestry	2,034,974
Extractive industries	1,258
Manufacturing industries	122,411
Electricity, gas and water	2,471
Building and Public Works	46,779
Retailers, wholesalers, restaurants, hotels	108,042
Transport, storage, communications	36,259
Banking, insurance, landlords, distributers	6,039
Social service, Personal service	205,487
Looking for work for the first time	123,045
Undetermined	71,134

Salaried workers were broken down as follows in 1974 (8):

Private and para-public sector	221,320
Public sector	71,000
Total	292,370

4.9 Education

In 1976/77 there were 1,147,000 students enrolled in primary schools in Cameroon. In the same year there were 121,054 students enrolled in general secondary schools and 35,601 students in technical secondary schools (9). In the University in 1977/78 there were 9,942 students (10).

4.10 Agriculture, Livestock and Fish

Agriculture is by far the most important economic activity in Cameroon. Cocoa and cocoa products, coffee, lumber and bananas are the predominant exports, accounting for 37%, 19%, 11% and 3%, respectively, of the exports in 1974/75 (8). The Green Revolution policy of 1972/73 called for increased food production for domestic use.

Table 1 Main Agricultural Crops, 1973 (11)

Crop	Area (000 hectares)	Production (000 MT)	Yield (kg/ha)	Grams/Head/Day
Cocoa Beans	370	110	297	49
Coffee, green	290	95	328	42
Seed cotton	115	56	487	25
Millet	500	330	660	146
Maize	305	314	1030	139
Groundnuts (in shell)	200	170	850	75
Cassava	200	1000	5000	442
Sweet Potatoes	125	476	4000	210
Pulses	85	343	500	19

Other production is as follows: (3)

Crop	Production (MT)
Plantains	794
Taro/Macabo	615
Yams	262
Palm Oil	64

According to the Fourth Five Year Development Plan, the objective of the government is to increase the production as follows for the year 1980/81:

Millet	500,000T
Maize	500,000T
Cocoa	200,000T
Tea	3,500T
Banana	130,000T
Rice	65,000T
Coffee	160,000T
Palm Oil	80,000T
Pineapple	100,000T

Livestock figures are as follows for 1973: (11)

Cattle	1,950,000 head
Pigs	350,000 head
Goats	2,000,000 head
Sheep	1,480,000 head
Horses/Donkeys	150,000 head

Predicted livestock figures for 1980/81 according to the 4th Five Year Plan are as follows:

Bovine	4,000,000 head
Goats/Sheep	5,200,000 head
Pigs	1,300,000 head
Poultry	15,000,000 head

Fish

Important sources of fish include: the rivers throughout the country, Lake Chad in the north, fish ponds, and the Atlantic coast. Commercial fish catches in 1973 totaled 71,000 MT. (11)

4.11 Health Problems

The spectrum of diseases active in Cameroon is similar to that of other Central and West African countries. The following diseases are found in Cameroon:

Gastroenteritis and dysentery
Respiratory infections and tuberculosis
Measles
Malaria
Complication of pregnancy and childbirth
Intestinal parasites
Malnutrition
Skin diseases
Trauma
Leprosy
Goiter

4.12 Health Services

The Ministry of Health coordinates all health services in the country. In 1976, there were 115 hospitals (16,442 bed capacity) and 920 health centers in the country, most of which are government sponsored. Among the rest, some are under the auspices of religious missions. In larger towns there are private clinics (8).

The organization of basic health services is as follows:

Central hospital in the capital
Provincial hospitals
Divisional hospitals
District hospitals (in some cases)
Satellite health centers surrounding each hospital

There is a national public health emphasis on preventive medicine and preventive health services are available throughout the country to complete this national structure.

In the future the government is considering the possibility of launching a primary health care program that will extend to the village level.

In the Fourth Five Year Plan emphasis was also out upon research and personnel training in the health sector.

4.13 Nutrition Sector Activities

These activities were reviewed in 1976 (12). The prior Bureau of Nutrition became the Nutrition Service in the Ministry of Health in late 1975. This service has two major components: a Bureau of Surveys and a Bureau of Teaching and Nutrition Research. A nutrition education program was proposed, using the assistance of CUSS*. Research currently being conducted at ONAREST*includes studies on food composition, protein nutrition in young children, iodine, certain vitamins, the acceptability of cotton seed meal as a food supplement, and ethnic groups and anthropometry.

A pre-school feeding program using imported foods is being conducted in the North-West Province, with the assistance of Catholic Relief Services. From 58 clinics, 17,000 children under five years of age are reached.

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* CUSS - University Center for Health Sciences
ONAREST- Scientific and Technical National Research Office

4.14 Previous Nutritional Studies

The most comprehensive dietary studies were conducted in the late 1950's in four regions of the country: Golompoui (North), Moufous (North Mountains), Batouri (East) and Evodouala (Central South). (13-14).

The results are summarized:

Golompoui-North Province (Toupouri group)

Although the caloric and protein intake for the year appeared adequate (based on average intake), caloric intake during July decreased 25% due to the seasonal effect. The millet harvest begins October. After harvest the food is dried and stored and remains the major staple until the next harvest in 12 months. Other staples consumed during the hungry season included corn.

Batouri-East Province

Caloric and protein intake was low throughout the whole year. Reliance on calories was primarily on manioc in the Savannah region, perhaps corn in the intermediate and plantain and manioc in the forest zone.

Evodouala-Central South Province

This produced similar results to Batouri, although the protein deficiency was probably not quite as marked in Evodouala.

Mofous-North Province

Intake of calories and protein was the lowest found in all the surveys.

Since that time dietary studies have been done in other parts in Cameroon (e.g. Bayas in Adamoaua Plateau) (15). The conclusion remained that adults in the East (i.e. Batouri Area) had the lowest intake of calories, protein and iron and those in the North were most influenced by seasonal patterns (16). Furthermore, diets were

more varied in the South than in the North: more ground nuts, leafy and other vegetables, fruits and palm oil.

Anthropometric studies have been performed on a limited basis in Cameroon. For example, no comprehensive study has been done to indicate seasonal changes. Measurements were performed on children and adults in the 1958 diet surveys. No conclusion could be drawn from these surveys, but in Batouri and Evodouala, growth retardation (in children) and anemia were common.

A study from CUSS in 1977 on pre-school infants in and near Yaounde showed that growth was much retarded in children of lower compared with those of higher socio-economic status (17).

Le Francois et al (18) have shown that worm treatment in Cameroon children aged 8-20 improved growth and nutritional status.

In May and August 1977 an anthropometric study was carried out on 1511 children aged 1-5 years in Jakiri District, Bui Division, North West Province and in 95 children aged 1-5 years in three small villages in the Mbandjock District, Upper Sanaga Division, Central South Province. The average weight and height according to age was generally lower in the Mbandjock children as compared with the Jakiri, and both were less than the children of upper socio-economic status in Yaounde. In addition, 23.2% of Mbandjock and 7.5% of Jakiri children were underweight-for-age, using 80% of the Boston reference weight-for-age as the criteria (19). A Shakir X-ray film band was used for arm circumference measures. The Mbandjock children had a higher prevalence of arm wasting (less than 12.5 cm) than those in Jakiri (9.5% vs. 0.7%). It is of interest that arm wasting was more prevalent in the more peripheral villages as compared with the semi-urban collectives around Jakiri. Lantum related poorer growth patterns to diarrhea, ill health and inadequate diet, particularly in the weaning period. (20).

OCEAC (Organisation de Coordination pour la lutte contre les Endemies en Afrique Centrale), in conjunction with the measles immunization program, measured 563 children under 5 years in Yaounde proper and 379 children under 5 years in villages near Yaounde,

during November 1975. The prevalence for acute undernutrition (under 80% reference weight-for-height) was under 1% and of chronic undernutrition (under 90% reference height-for-age) was about 12% for each area.(21).

Arnhold measured 313 children during May 1977 in four areas of the country: Nachtigal (Central-South Province); Karanshi, near Mokolo (North Province); Salapoumbe pygmies and non-pygmies (East Province). Although the numbers were small and the sampling not random, results suggest that seasonal differences may have already been apparent. Thus the prevalence rate of acute undernutrition in the Mokolo village was 3% and acute mild undernutrition was 21%. (22) These rates are higher than the findings of the present National Nutrition Survey, conducted during February, 1978. A further finding was the identification of pygmy children as a group for priority care, where 39% had arm wasting (Arm circumference less than 13.5 cm) compared with far less for the other areas. It is of interest that the prevalence of chronic undernutrition for the pygmies aged 6-60 months, in those 51 children where age was known, was 29%. This was quite similar to the findings for the East Province on the National Nutrition Survey. On the other hand the prevalence rate of underweight-for-age in pygmy children was much higher than the rate for the East Province (60% vs. 21%). The same National Academy of Sciences reference values were used for both studies (1).

5. GOALS AND OBJECTIVES

The overall goal of the Cameroon National Nutrition Survey is to provide information about the general level of nutritional status of young children and their mothers. This information can be used in determining policy and priorities for the planning and administration of applied nutrition activities.

The specific objectives of the survey were to:

1. Provide baseline estimate of the level of nutritional status of young children and their mothers throughout the Cameroon and from this derive an indication of the general nutritional status of the entire population.
2. Compare the nutritional status in different areas so that priorities can be determined for planning purposes.
3. Provide information about important relationships between nutritional status and other factors, such as diet, socio-economic status and other demographic variables.

This report considers:

1. Prevalence* of acute and chronic protein-calorie malnutrition (PCM) in children aged 3-59 months and their mothers.
2. Prevalence of anemia in children.
3. Prevalence of abnormal hemoglobin in children, as a guide to the problem of sickle cell disease.
4. Prevalence of goiter in women.
5. Duration of breast feeding.
6. Prevalence of food shared with family and food specially prepared for children aged 3-24 months.
7. Types of foods eaten by children and their mothers.
8. Relationship between nutritional deficiencies and certain household and family characteristics, such as household size and socio-economic status.

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*Prevalence-i.e. Point Prevalence. This survey was done at one point in time of the year (early 1978), which gives information for that time only.

6. SURVEY DESIGN

A valid estimate of the prevalence of malnutrition requires:

1. A well defined universe.
2. A sample which is statistically adequate and representative of this universe.
3. An objective, quantifiable definition of malnutrition (see "Indices of Malnutrition" (Section 8).

6.1 SURVEY UNIVERSE

a. Introduction

The universe included the entire population of Cameroon (7.6 million) based on the results of the 1976 Population Census (Table 2).

The United Republic of Cameroon has seven provinces: Central South, East, North, South-West, Littoral, North-West and West. The Ministry of Economic Affairs and Planning required a nutritional description of each province of the United Republic of Cameroon as well as a separate description for Yaounde and Douala, the two largest cities. This was done. For reasons of utility and conformity with other studies, the World Bank division of Cameroon by ecological areas was adopted for this study. As the West and North-West provinces comprise the West plateau, and the South-West and Littoral provinces comprise the West plains, these two sets of provinces were combined. Previous surveys (16) have suggested that nutritional problems may be particularly serious in the North and East provinces; thus it was important to describe these provinces with greater precision.

For these reasons, a statistically adequate sample size was selected to describe the following provinces or groupings:

1.	Central South	(30 sites)*
2.	East	(30 sites)
3.	North	(40 sites)
4.	South-West and Littoral	(30 sites)
5.	North-West and West	(30 sites)
6.	Yaounde and Douala	(30 sites)

* Each site contains 30 children, aged 3-59 months.

It should be noted that although Yaounde and Douala belong to the Central South and Littoral province respectively, the two cities are not included in the provinces described.

b. Urban-Rural Distribution

The Central Bureau of the Census has defined an urban area as that locality which is the capital of a Province, Divison, Sub-division or District. The population of these localities varies from 243 (Mvengue) to 79,343 (Nkongsamba). The actual urban localities sampled are listed in Appendix 4.

In this survey, a post sample stratification distinguished all urban (apart from Yaounde or Douala) and rural areas in the country, (Tables 3,4). It should be noted that 31.5% of the urban population (excluding Yaounde and Douala) are in the South-West and Littoral provinces and 58.3% are in the four western provinces (Table 4).

This report will not include Yaounde and Douala in the urban description as these two cities were sampled and will be described separately.

c. Ecological Strata (World Bank)

The World Bank Report (3) has divided the Cameroon into five major ecological areas based on vegetation: North, Central Savannah, West Plateau, West and Littoral Plains and South Forest. In the West, these areas correspond closely with their respective provinces. In other areas such as the Central Savannah, there is considerable overlap with provincial borders (see map, p.40).

A post sample stratification is required to describe these areas (Table 5). Again Yaounde and Douala are excluded from the description of ecological strata because of their special characteristics.

In summary, all country descriptions will be presented in three headings according to province, urban-rural distribution and ecological areas. Although some of the components may be the same from one table to the next, the complete profile of the country description will be given for each of the three headings.

(1) Provinces	No. of Sites
Central South	30
East	30
North	40
North-West/West	30
South-West/Littoral	30
TOTAL PROVINCES	160

(2) Ecological Area	No. of Sites
North	34
Central Savannah	19
West Plateau	30
West Plains	32
South Forest	45
TOTAL PROVINCES	160

(3) Urban/Rural	No. of Sites
Yaounde/Douala	30
Rural	131
Urban	29
TOTAL CAMEROON	190
Special Group	

6.2 SAMPLING DESIGN

For cluster sampling, it was predetermined that the minimum of 30 sample sites, each of 30 children for a total sample size of 900, was required (see Appendix 1). This was expected to provide adequate precision estimates (i.e. estimates of variance between sample sites) for each area described. The final precision estimates are included in Appendix 5. Statistical testing based on the estimates and their precisions could then indicate if there were significant differences in the results comparing areas or provinces.

Sampling was random and according to population proportion based on the 1976 census. It was performed in two stages. The first

stage identified small compact geographic areas, the second selected households within these areas.

These small geographic areas (Enumeration Areas or EA's) had been defined by the census and varied from a population of approximately 500 to 2,000. Each site derived from the first stage of sampling was contained in one of these EA's. A random start and a fixed sampling interval were used, to select the total number of predetermined sites required to describe the various sections of the country.

The second stage of sampling was within a selected EA. The first household found to contain a child aged 3-59 months was randomly selected. Then further households were visited in a random manner (by a systematic or cluster method) until a total of 30 children were measured. Further details on sampling are presented in Appendix 2.

TABLE 2

POPULATION DISTRIBUTION BY PROVINCE AND GROUPING

Province	Population	%	%
1. Central South (excluding Yaounde)	1,154,594	15.1	16.9
2. East	366,235	4.8	5.3
3. North	2,233,257	29.1	32.6
4.* Southwest and Littoral (excluding Douala)	1,072,405	14.0	15.7
5.* Northwest and West	2,016,128	26.3	29.5
6. Yaounde and Douala	820,627	10.7	---
Cameroon	7,663,246	100.0%	---
Total All Provinces (excluding Yaounde and Douala)	6,842,619		100.0%
*South-West	620,515	8.1	9.1
Littoral (exc. Douala)	451,890	5.9	6.6
North-West	980,531	12.7	14.3
West	1,035,597	13.6	15.2

Source: Figures adapted from 1976 Census.

Table 3

URBAN - RURAL DISTRIBUTION

Province	POPULATION URBAN Number	POPULATION URBAN %	POPULATION RURAL Number	POPULATION RURAL %	SAMPLE SITES URBAN No.	SAMPLE SITES URBAN %	SAMPLE SITES RURAL No.	SAMPLE SITES RURAL %
Central South (excl. Yaounde)	184,584	16.0	970,010	84.0	3	10.0	27	90.0
East	75,485	20.7	290,750	79.3	4	13.3	26	86.7
North	328,925	14.8	1,904,332	85.2	4	10.0	36	90.0
South West/ Littoral (excl. Douala)	444,474	41.5	627,931	58.5	12	40.0	18	60.0
Northwest/West	378,642	18.8	1,637,486	81.2	6	20.0	24	80.0
TOTAL	1,412,110	20.7%	5,430,509	79.3%	29	18.2%	131	81.8%

Source: Adapted from 1976 Census.

TABLE 4

URBAN - RURAL PERCENTAGE DISTRIBUTION

Province	Population			Sample Sites		
	Urban		Rural	Urban		Rural
Central South (excluding Yaounde)	8.3%	13.1%	17.9%	5.1%	10.3%	20.6%
East	3.4	5.3	5.4	6.8	13.8	19.9
North	14.7	23.3	35.1	6.8	13.8	27.5
Southwest/Littoral (excluding Douala)	19.9	31.5	11.5	20.3	41.4	13.7
Northwest/West	17.0	26.8	30.1	10.2	20.7	18.3
Yaounde	15.1	---	---	22.0	---	---
Douala	21.6	---	---	28.8	---	---
Cameroon	100.0%	---	---	100.0%	---	---
All Provinces Excluding Yaounde and Douala	---	100.0%	100.0%	---	100.0%	100.0%

Source: 1976 Census of Cameroon.

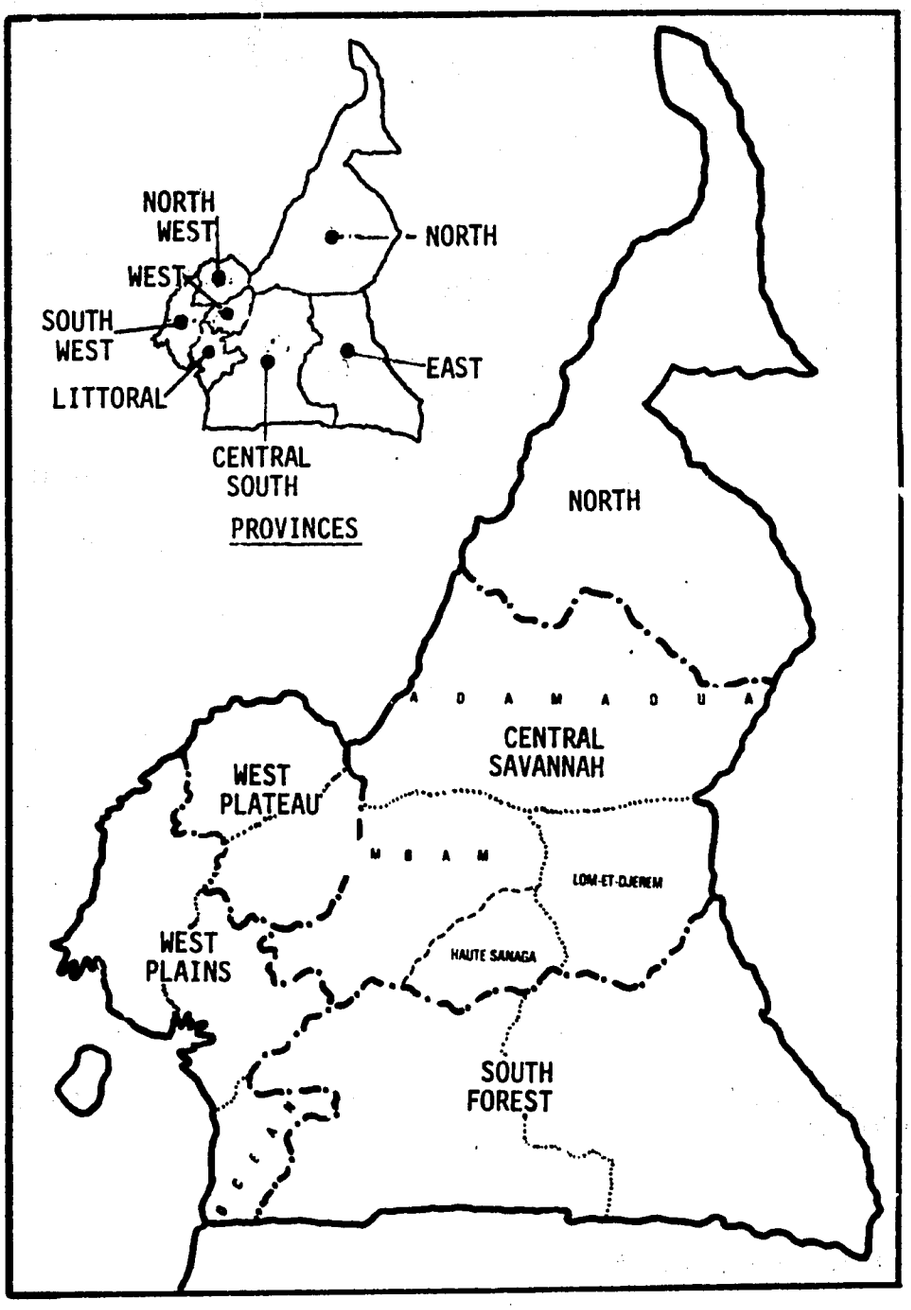


FIGURE 2 ECOLOGICAL AREAS IN CAMEROON
(With Provinces in inset)

Table 5

ECOLOGICAL STRATA (WORLD BANK)
Yaounde and Douala Excluded

			Population No.	Sites	Population %Total*
1.	North	All North Province excluding Adamaoua Division	1,873,923	34	100.0%
2.	Central Savannah	Adamaoua Division	359,334	6	52.3
		Lom & Djerem (East)	91,339	7	13.3
		Mbam (Central-South)	175,730	4	25.6
		Upper Sanaga (Central South)	60,068	2	8.8
		TOTAL	686,471	19	100.0%
3.	West Plateau	All W/NW Provinces TOTAL	2,016,128	30	100.0%
4.	Plains West/Littoral	All SW/L Provinces	1,072,405	30	93.8
		Plus Ocean Division (CS)	71,370	2	6.2
		TOTAL	1,143,775	32	100.0%
5.	South Forest	All CS except Mbam, Upper Sanaga, and Ocean	847,426	22	75.5
		All East Province except Lom & Djerem	274,896	23	24.5
		TOTAL	1,122,322	45	100.0%
		TOTAL	6,842,619	160	

* % of total population within each stratum

Sources: World Bank Report (Agricultural Sector Analysis, 1975).
1976 Census of Cameroon.

7. METHODOLOGY

7.1 RATIONALE

Anthropometry is used because it is quantifiable, objective, rapid and a relatively simple method of assessment of nutritional status, as compared with other longer more complicated methods such as biochemical, clinical, and/or intensive dietary survey analysis. This anthropometric-based nutrition assessment method has been used in several other countries throughout the world (23). It is relatively inexpensive and requires simple equipment, some of which can be built in almost any country. It is less complicated and requires less training time than other survey methods. Survey data can be processed and analyzed within a short time (approximately a year from onset of field phase to final report). Therefore it is a quick and ready method for rapid collection of information for nutrition planning purposes.

It must be emphasized that anthropometry is a valid method which can provide reliable data on the prevalence, incidence, extent and severity of malnutrition. For associations between anthropometry and other variables, indications of nutrition related problems can be derived, but anthropometry alone cannot conclusively identify or explain causes of malnutrition.

7.2 FIELD METHODS

There were 11 teams consisting of two interviewers per team and six supervisors. All survey personnel traveled together throughout the entire country where 190 sites were divided among the 11 teams. In each site, 30 children were selected using a predetermined sampling technique (see p. 33). Within a site, survey members visited homes to conduct the interviews, take anthropometric measurements and collect blood samples. Appendices 25-29 give a further description of full methods, techniques and logistical strategies.

Lists of specific questions were developed and then used during the interview for both Forms I and II (see Appendices 10-13).

Further detailed information is available from the Field Manual, National Nutrition Survey, 1977.

Form I was completed on every child aged 3-59 months (N=5790). Anthropometric measurements of all surveyed children and their mothers were recorded. In addition, Form I contained items on demographic, dietary, health, clinical and biochemical characteristics relevant to the nutritional status of the child and household. Form II was designed to gather more detailed socio-economic, health, and diet information on every child aged 3-24 months identified in Form I (N=2371).

Blood was collected from every fifth child for hemoglobin determination. Hemoglobin electrophoresis was done on all blood samples in order to identify sickle cell trait and disease carriers.

The core of this report will describe the point prevalence of protein-calorie malnutrition and anemia in Cameroon during the first trimester of 1978. This description will be based on anthropometric measurements, hemoglobin determinations, and the clinical sign of edema. From other information gathered on the survey attempts will be made to identify factors associated with PCM.

The survey forms and a list of anthropometric equipment are in Appendices 11, 13 and 19. The following is an explanation of survey items and data preparation.

7.3 SURVEY ITEMS DESCRIBING PREVALENCE OF MALNUTRITION

a. Anthropometry

Weight, height or length (for children less than 80cm.) and mid-upper arm circumference were measured on all children under five years of age.

Height and arm circumference of all mothers were measured. Triceps fatfold was measured on about three-quarters of the children and their mothers.

A Salter hanging scale was used for weight; a custom-made height-length board for stature; the Zerfas insertion tape for arm circumference and the Holtain-Tanner/Whitehouse caliper for fatfold measures. In addition the Shakir Strip was used as a screening test for arm circumference on children from all four western provinces and Douala.

b. Laboratory Indices

i Blood Analysis

Hemoglobin Estimation

Capillary blood was obtained by the finger prick method and collected in Unopettes(see Appendix 20). A total of 1245 blood samples were collected.

The cyanomethemoglobin method was used to determine hemoglobin. All unopettes were sent to Yaounde by commerical plane or road within seven days of collection for immediate analysis at the Hematology Laboratory, University Center for the Health Sciences (CUSS) using an Ependorf No. 1101 M Spectrophotometer.

Hemoglobin Electrophoresis for Sickle Cell Disease/Trait

One ml of each Unopette blood-Drabkins solution was used for haemoglobin electrophoresis which was done at the Hematology Laboratory CUSS immediately after the hemoglobin estimation test.

ii Saliva Test

A starch paper saliva test to indicate recent cassava ingestion was taken on every child in the sample. The test papers were supplied by CUSS.

c. Clinical Signs

Every child was examined for clinical evidence of kwashiorkor. This was determined by testing for the presence of bilateral pedal edema by applying firm thumb pressure on the dorsum of the feet and observing whether pitting occurred.

Every mother was examined for clinical evidence of goiter. Goiter was noted when a swelling of the thyroid was seen. Methods were based on the WHO classifications (6), see Appendix 14.

7.4 OTHER SURVEY ITEMS

The following items were used to provide information relating to nutritional status:

a. Identification Information

Zone, ecological area, urban/rural classification

b. Index Child Characteristics

Child Name and Sex

Child's Age - determined by one or more of the following: civil or other birth record, clinic record, parent record or declaration, or calendar of events.

Child's Birth Order - according to live births.

Milk Teeth Count - was used to assist in verifying ages that were suspected of being grossly incorrect.

Child Care - The primary person currently caring for the child during the day.

Child Place of Birth - Hospital, clinic, or home, with/without Traditional Birth Attendant (TBA)

Child Morbidity Status - recent illness, diarrhea or fever (for children aged 3-24 months).

c. Household and Family Information

The following information was obtained about the household:

Occupation(s) of household head

Household size - defined as those, including infants, who regularly eat meals together under common household head.

The subsample included investigation of ecological variables:

Type of house - traditional, improved, semi-concrete, and concrete*

Method of cooking - wood, coal, kerosene, gas and electricity

Possession of cattle, sheep, goats, pigs and poultry

Whether cash crops sold

Origin of water and distance away

---

*See Appendix 14 , Form Clarification

The following information was obtained about the mother:

Approximate age (20 or less; 21-40; 41 years and over)

Ability to read English, French or other language as tested by a simple reading passage.

Marital status - monogamous, polygamous or unmarried

Occupation

Market sales - whether she sold any goods at the market, number of times sold during the past week, and total money earned from this.

Saliva test - starch paper test for presence of hydrocyanic acid in saliva to suggest recent ingestion of unrefined cassava (24). (See Appendix 14).

The following retrospective information was obtained from the mother about children in her household:

Mortality information - number of children born in the last 12 months and number and ages of children under 5 years who have died within the last 12 months.

Measles - number of children who had measles and number of children who died from measles and complications within the last 12 months.

The following information was obtained about diet for children aged 3-24 months:

Source of milk - breast, artificial, fresh milk

Bottle feeding, and method of cleaning bottle

Food shared with the family

Food specially prepared for the child

Number of times child breastfed yesterday (subsample)

Person feeding the child yesterday (subsample)

d. Qualitative Dietary Recall

All dietary methodology used was based on the recommendations by the National Academy of Sciences, USA, modified to Cameroon requirements (7).

Food intake information was obtained from the interviews. The person questioned was almost always the mother of the child or the person feeding the child. The dietary recall was performed on every child aged 3-24 months in the sample; a total of 2358 dietary recalls were conducted.

The index child's consumption of 27 different foods was assessed using a modified 24-hour recall method. The mother (or person feeding the child) was first asked what the child ate the day before the intervew. After checking her responses with the list in Form II (Appendix 13), the interviewer then asked the mother if the child ate each of the foods listed (e.g. "Did (child's name) eat manioc yesterday?").

After the child's diet was assessed and noted, the mother's diet was assessed in the same way.

Comments were made when modification of the food listed was ingested (e.g., type of baby food). This diet assessment method was easily learned by the interviewer and was rapidly completed in the field.

7.5 DATA PREPARATION AND ANALYSIS

At both the completion of each interview and each sample site, team members and respective supervisors reviewed survey forms for clarity and completeness. Later, senior survey personnel further checked the forms, in the presence of the respective teams. The original forms were then brought by plane or car to the Direction of Statistics, Yaounde, every two or three weeks during the survey field phase.

During January, numerical coding and keypunching began in Yaounde under the supervision of the Director of Statistics, Ministry of Economy and Planning. Also in January, the data for the sites in Yaounde was brought to UCLA for preliminary analysis.

The data for 90 sites, i.e., half the survey, was processed in Yaounde. A total of five coders and keypunchers were trained to process the forms from January through March, 1978. This data, encoded on Floppy-

discettes, was printed out from an IBM-32 Computer for manual checking, then transferred to a magnetic computer tape. This tape was hand carried to UCLA, where editing and coding was completed. A copy of all survey forms was taken to UCLA where the rest of the data was coded and keypunched on to cards.

A Fortran program and the BMDP computer package were used in editing the data on an IBM 360 computer at the Health Sciences Computing Facility, UCLA. The errors detected were manually corrected after referring to the form copies. The BMDP package was used in the final analysis.

The core system of Fortran subroutines for anthropometric analysis was obtained from the Center for Disease Control, Atlanta, Georgia, USA and included in the basic program structure at UCLA. The subroutines contained the reference standards for the description of all body measurement indices.

The Chief of the Service of Data Processing and the Survey Director, both from the Government of Cameroon, assisted in the data preparation, analysis and report drafting for three weeks during June, 1978, at the UCLA Nutrition Assessment Unit, School of Public Health, Los Angeles, California.

These two Cameroonian technicians hand carried part of the draft report back to Cameroon for initial in-country review. The remainder of the report was sent to Cameroon before the UCLA technicians' and USAID/Washington DSB/N representatives' arrival in Cameroon for the final two-week review and in-country presentation of the report. The final corrections were incorporated in the report and brought back to UCLA for final typing and printing. The report was then sent to USAID/Washington DSB/N who in turn sent the report to the Government of Cameroon for approval.

8. INDICES OF MALNUTRITION

8.1 ANTHROPOMETRIC INDICES FOR PROTEIN-CALORIE MALNUTRITION IN CHILDREN

a. Introduction

The focus of this survey was to identify the extent of malnutrition in young Cameroonian children by the use of anthropometry. The nutritional condition resulting from a deficiency in protein and/or calories utilized by the body, is called protein-calorie malnutrition (PCM) (25). Children with PCM have a low weight or height for their age (26), and thus, anthropometric measurements can be used to indicate the presence and severity of undernutrition. In this report, the classification of PCM (or undernutrition) is based on anthropometry following the recommendations of WHO (19).

b. Reference Values

An "optimal" weight or height is represented by the median values in a population where there is little or no PCM. Such a well-nourished population is called a reference or special group. Many reference groups which are used consist of children from industralized areas of the world or from the best nourished groups of children in developing countries (27,28).

In the present survey, a "special group" of 506 children under five years from selected areas in Douala were measured. These children were from families with a relatively high socio-economic status and it was assumed that their nutritional status was "optimal" for Cameroon. Their results were compared with those of an international reference group of children (1) to confirm that such a reference was applicable to Cameroon.

Unlike adults, young children from different ethnic groups but similar socio-economic backgrounds have similar body measurements (27).

Reference data for height and weight for this survey were adapted from large, representative studies recently completed in the U.S.A. This was recommended by the National Academy of Sciences (NAS) Committee on Nutrition Advisory to the Center for Disease Control, U.S.A. in 1974, and reported recently in the Bulletin of the World Health Organization (4). The reference populations included children up to 24 months from middle to upper socio-economic status families and those aged 2-6 years from a nationwide survey in the U.S.A. (1). The median values (50th percentile) in each group were taken as the 100 percent reference point (median reference). For example, if the height of one thousand children of the same age in good health were measured, the height of the child ranked 500 (50th percentile) would be used as the median reference. (The median values for height and weight of the reference population are described and tabulated in Appendix 9.)

c. Index Levels for Protein Calorie Malnutrition

The reference median values for body measures are used to represent a level of normal growth. The farther a body measure, such a weight or height, is below the reference median level, the more severe is the level of undernutrition.

A certain percentage of the reference value is selected as a point below which a child is classified as having PCM. The basis of this selection is discussed later in this section (see page 53).

8.2 SPECIFIC ANTHROPOMETRIC INDICES AND THEIR INTERPRETATION

The three major indices presented in this report are weight-for-height, height-for-age, and weight-for-age.

a. Weight-for-Height

The weight of a child is the sum total of all body tissues, whereas height measures only the body skeleton. During an acute or sudden period of nutritional deficiency, there is a reduction of

muscle and fat. This results in weight reduction, but height is not affected. The relationship between weight and height alters so that the weight-for-height ratio is reduced. After a recovery period when weight is restored, the weight-for-height returns to "normal" (29).

Acute undernutrition (also termed acute PCM or recent body wasting) is a nutritional deficiency of recent onset of usually a few weeks to a few months. The highest prevalence occurs in times of famine or seasonal food shortage. In this survey, acute undernutrition is defined by using the weight-for-height index. This is based on the principle that a child of a certain height has an expected "normal" weight (4). This index is independent of precise age, so it is particularly useful when exact ages are difficult to determine (30). A child weighing less than 80% of the reference weight-for-height will be classified as acutely undernourished. The proportion of children with low weight-for-height gives an estimate of the prevalence of acute undernutrition in a population.

b. Height-for-Age

As a result of frequent episodes or a prolonged period of undernutrition, the height or length of a child will fail to increase in the normal way. Short stature can be the end result, which may be considered an indication of chronic undernutrition (also termed chronic PCM or stunting). Chronic undernutrition has a prior onset of at least six months. The highest prevalence occurs with a long term deficit of food (calories and/or protein) often combined with persistent or recurrent ill health.

In this survey, chronic undernutrition is defined by using the height-for-age index, which compares the height of a child with that expected for a "normal" or "reference" child of the same age. This index, unlike weight-for-height, requires a precise estimate of age, particularly for very young children. A child measuring less than

90% of his expected height-for-age will be classified as chronically undernourished. The proportion of children with low height-for-age gives an estimate of the prevalence of chronic undernutrition in a population.

c. Weight-for-Age

The weight of an individual measured repeatedly over a period of time will indicate the onset and duration of protein-calorie malnutrition (31). In a single cross sectional study of weight measurement of a population, however, the weight-for-age index does not distinguish between the acute protein-calorie malnutrition (recent undernutrition)and the chronic form (long-term undernutrition), since it is not possible to determine if a child recently lost weight (acute undernutrition), or never attained an expected "normal" weight (chronic undernutrition). It is also not possible to determine whether a child with low weight-for-age is tall with body wasting or short and well proportioned. The use of both weight-for-height and height-for-age indices overcomes this problem.

d. Combined Weight-for-Height and Height-for-Age

The weight-for-height index defines acute undernutrition and height-for-age defines chronic undernutrition. Because these two indices represent different durations of a child's nutritional history the presence or absence of acute and/or chronic undernutrition may be combined for each individual child (32). One of four possible categories can be described: normal nutritional status, acute undernutrition, chronic undernutrition and both acute and chronic undernutrition (Table 6). For example, a child with normal weight-for-height and a low height-for-age would be considered as having the chronic type of undernutrition but not the acute type.

Table 6 Combined Weight-for-Height and Height-for-Age Indices

Nutritional Index[1]		
Weight-for-Height*	Height-for-Age**	Nutritional Status
Normal	Normal	Normal
Low	Normal	Acute Undernutrition
Normal	Low	Chronic Undernutrition
Low	Low	Both Acute and Chronic Undernutrition

*Weight-for-Height

Normal: 80% or more than reference median weight-for-height.
Low (Acute Undernutrition): Less than 80% of reference median weight-for-height

**Height-for-Age

Normal: 90% or more than reference median height-for-age.
Low (Chronic Undernutrition): Less than 90% of reference median height-for-age

[1]Waterlow, who devised this classification, used the terms "wasting" for acute undernutrition and "stunting" for chronic undernutrition (32).

e. Other Anthropometric Indices

These include measurements of arm circumference and triceps fatfold. They may be considered of secondary importance to the major indices based on weight and height measurement. The interpretation of results from these measures is different from that of weight-for-height and weight-for-age.

A key clinical sign for undernutrition is thin limbs (19). Arm circumference quantifies arm bulk; hence it is a more direct indication of muscle and fat of the body than weight measurement alone. There is a high correlation (r=0.7) between mid-upper arm circumference and weight

indices (33). Arm circumference in well-nourished children increases rapidly during the first year of life. It does not change significantly between 1-5 years of age, and, therefore, it is a useful screening tool for protein-calorie malnutrition when precise age is not known (33). Arm circumference-for-age was analyzed on this survey because ages were carefully determined and children under one year were included.

Arm circumference-for-height was also used. Like weight-for-height, it is independent of precise age. Results have a similar interpretation as arm circumference-for-age.

The triceps fatfold is the only measure used on this survey to quantify body fat. It is an indirect index for total caloric storage. Subcutaneous fatfold measures correlate well with overall body fat (34). Fatfold is difficult to measure reliably, therefore, results should be interpreted cautiously.

f. Interpretation of Children's Indices

Indices are based on internationally available reference median values. A list of these sources and the actual values are presented in Appendix 8/9. These reference values do not constitute a specific "standard" of ideal nutrition, but simply compare the results from populations with reasonable health and nutrition backgrounds (35). No reference information was available for Cameroon at the time of the survey or analysis, thus outside sources were required.

Reference information for Cameroon was collected to compare results for upper socio-economic groups in a major city (Douala) with those of the internationally available reference. There were insufficient numbers in the Douala sample for this to be considered as the reference group, since the requirement by the International Union of Nutritional Sciences, was at least 100 children for each age and sex sub-unit, making a total of some 2,000 (35). An explanation of the comparability between the NAS reference values and those of the Cameroon Special Group appears on page 262.

For each index value, a single value was predetermined below which a child was classed as having undernutrition. This value or cut-off point is based on a percentage of the reference median according to age (or height). In general, this cut-off point corresponds to the first to third percentile level of the reference distribution. This means that any result below the cut-off point is equivalent to the lowest 1% of the reference population.

Experience in Africa indicates that the cut-off points selected for this survey are suitable for estimating the presence of PCM in young children. Such studies include weight-for-age (36), weight-for-height (37), height-for-age (38), arm circumference-for-height (39) and fatfold-for-age (40). The cut off points according to the percentage of medians and percentiles, with their interpretations are listed in Table 7.

Table 7 : Anthropometric Indices in Young Children

INDEX	CUT-OFF POINT REFERENCE VALUE % MEDIAN	PERCENTILE*	INTERPRETATION**
Height-for-Age	90%	1st	Chronic Protein-Calorie malnutrition (PCM)
Weight-for-Height	80%	3-5th	Acute PCM -mod/severe
Weight-for-Age	80%	3rd	Combination Acute/ Chronic PCM
Arm Circum.-for-Age	82.5%	3rd	Arm Soft Tissue Wasting
Fatfold-for-Age	60%	3rd	Fat Wasting - Low Calorie Reserve

*In the reference population this is the approximate percentile, due to some variation according to age.

** Interpretation of a value below the cut-off point percent median of reference: for example, a child with under 90% of the reference median for height-for-age is classed as having chronic PCM.

Throughout the report percentage prevalence rates for PCM are presented. A prevalence rate for a particular index is the proportion of children who fall below the cut-off point compared with the total number of children, expressed as a percentage.

The selection of a single cut-off point for a description of PCM allows comparisons between areas of the country and selected groups. It also permits investigation of associated factors, such as occupation of household head with PCM in children.

The values above the cut-off point are interpreted as "normal" and those below signify undernutrition. Values just above the cut-off point may be considered borderline normal. There is a spectrum from the lowest to the highest values, i.e. undernutrition, borderline normal, normal and overnutrition.

It should be noted that distributions of index values according to percentage ranges of the reference median are also included in this report. This is particularly useful to estimate "borderline" values. For example, the 90-92.5% of median reference height for age quantifies those children who are very close to the level for chronic undernutrition. This estimates the number who may fall below the cut-off point of 90% if unfavorable environmental changes occur which commonly result in a worsening of nutritional status.

8.3 MATERNAL ANTHROPOMETRIC MEASURES

For the purposes of this survey, maternal age was categorized according to three groups: under 20 years, 20-40 years and over 40 years. This took into account the variation of expected anthropometric results of adolescent and older women according to age.

Maternal anthropometric indices with cut-off points are listed in Table 8.

Table 8 Anthropometric Measures for Mothers

	Cut-Off Point	Significance
Height	less than 150 cm (or 5ft.)	Short
Arm Circumference	less than 23 cm	Undernutrition
Fatfold (triceps)	less than 7.5 cm	Loss of calorie reserve

a. Height

A maternal stature of less than five feet may be considered sufficiently short to be associated, at least to some degree, with short stature in the woman's child. Studies in Liberia and Lesotho have shown that approximately 10% belong to this group. Correlation between the height of the mother and child could suggest important genetic factors and/or the effect of the environment on growth (41). The nutritional significance of short stature

in women is not nearly as clear as for young children, although it may reflect her nutritional status as a child. The choice of the cut-off point for maternal height of five feet, a level used in parts of Africa has an added value in obstetric interpretations, in that a shorter woman is decidedly at risk for obstructed labor due to a relatively small bony pelvis i.e., cephalo-pelvic disproportion (42).

b. Arm Circumference

An arm circumference of 23 cm corresponds to 80% of the reference value for adult women and has been used to provide an estimate of undernutrition in other countries (19).

c. Triceps Fatfold Thickness

The triceps fatfold cut-off point of 7.5 mm is the value for the third to fifth percentile for adult black women in the U.S.A. (43). A value below this does not necessarily mean undernutrition, but does suggest a lack of caloric reserve and low fat stores in the body.

Survey results for adult fatfold should be interpreted with the utmost caution, as this measurement was the most difficult to standardize.

8.4 CLINICAL SIGNS

a. Children

Kwashiorkor was diagnosed by the presence of bilateral pedal edema. Edema was determined by the occurrence of pitting as a result of thumb pressure on the dorsum of each foot. Kwashiorkor is a much more severe manifestation of acute undernutrition than the levels described by anthropometry in this report. This sign should be interpreted with caution in countries such as Cameroon where sickle-cell disease in children and other pitting edema causing diseases are quite common; e.g. filaria and nephropathies.

b. Mothers

Goiter was determined by a visible neck swelling in accordance with modification of the WHO classification (i.e. use of only Grades 2 and 3). (6).

8.5 LABORATORY INDICES

a. Hemoglobin Concentration Estimation

The presence of anemia was determined according to the WHO reference for hemoglobin levels below which a young child was considered anemic: 10.0 gm/100 ml for children aged 6-24 months and 11.0 gm/100m. for those aged 2-5 years. Allowances were made for high altitudes. For each survey result, 0.2 gm/100 ml was deducted for each increment of 2,500 feet above sea level (44).

b. Hemoglobin Genotype

The hemoglobin genotype was determined by electrophoresis, particular attention being made for the presence of sickle cell disease and trait.

9. SURVEY RESULTS AND ANALYSIS

9.1 INTRODUCTION

a. Format of Survey Results

Results are generally presented as a description with a table, followed by analysis, interpretation and discussion in each major section. For convenience, tables are often grouped together at the end of the section. They usually indicate the percentage result or frequency for each variable. For the anthropometry and hemoglobin descriptions, the prevalence of abnormal findings indicates a percentage below a specific reference value. Percentage distributions in certain tables may not sum to 100% as there may be more than one answer to the same question (e.g. in methods of age determination). Sample sizes are included but not repeated for each table in the same section.

b. Weighting

When areas are combined, results are weighted (i.e., adjusted) according to the population proportion in each area. For example, the result for total provinces is calculated from the weighted sum of the results for each province.

Weighting is also required for the Central Savannah, West Plains, South Forest, Urban and Rural Cameroon. Each of these areas consist of one or more provinces from which the basic sample was taken.

Reference is made to the population proportions listed in Tables 2 to 5, from which the weights are derived. For example, the percentage estimates for the Provinces, excluding Yaounde and Douala are calculated by the following formula:

$\overline{P}$ (Total Province) = $\overline{P}$ (Central South) x 0.17 + $\overline{P}$ (East) x 0.05 + $\overline{P}$ (North) x 0.33 + $\overline{P}$ (South West/Littoral) x 0.16 + $\overline{P}$ (North West/West) x 0.29. Where $\overline{P}$ is the percentage result for the particular area and

each weight is the ratio of the area population to that of the combined provinces. Thus the Central South ratio is 0.17. A listing of weights used in the analysis is presented in Tables 9 & 10.

It should be noted that results for the North Province have a far greater influence on the total province result than those for the East, in view of the much larger population. The Weight is based on population proportionality and is unaffected by sample size.

c. Comparison of Results

Tables are presented so that three comparisons of results are facilitated between individual provinces, ecological areas and urban/rural subdivisions. In addition, as Yaounde/Douala are not in this description considered as part of any province or ecological area, these cities may be readily compared with any other province or area.

It should be noted that the special group results are most appropriately compared with total Cameroon results. This group is not part of the sample.

Throughout all table headings, the word "area" refers to all the geographic entities listed in the table; i.e. provinces, ecological area, urban, rural and Yaounde/Douala.

d. Criteria for Comparing Prevalence Estimates

These criteria depend on the extent of the percentage difference and the sample size of each area or group described. The extent is based on a relative as well as an absolute scale such that a result of 10% vs. 20% shows a more meaningful difference than 40% vs. 50%. In general, a difference of at least 5% is required to merit attention. Even this difference may be due to inadequate sample sizes.

The smaller the sample size, the less the precision (i.e. the greater the variation within the area or group described), so that

estimated prevalence has a wide range around the "true" prevalence and is less likely to be close to the "true" result. Caution should be exercised in making prevalence estimates when the sample size is less than 900 (e.g. for individual ecological areas and all subsets).

Prevalence estimates describe results which strictly summarize areas or groups, whereas associations do not require such precision because their descriptions do not purport to exactly represent the population within their components. Thus, the criteria for comparing associations, (e.g. nutritional status according to household size) do not depend on exactness in sample size and precision.

e. Age Definitions and Categories

Throughout the report the age of the child is defined in a standard demographic manner, as recommended by the survey Technical Committee of the United Republic of Cameroon. The age of the child is based on the actual months or years attained. For example, six months represents 6.0 to 6.9 months; the second year of life is defined at 1.00 - 1.99 years or 12.0 to 23.9 months. The latter range is presented on the table headings and in the text as 12-23 months, (i.e. 12 through 23 months) which includes the 12th month and up to but not including the 24th month.

The only exception to this definition as it pertains to the age in months is the anthropometric description. For example, six months represents 5.5 to 6.4 months. The reason for the exception is that the reference population ages were estimated using a similar method (1). It could be misleading to use the age-attained method for estimating age-specific anthropometry, such as height-for-age. A fuller discussion is in Appendix 7).

TABLE 9

WEIGHTING FACTORS FOR TOTAL PROVINCES, URBAN/ RURAL, AND TOTAL CAMEROON

Total Provinces

PROVINCE	Weight
Central South	0.17
East	0.05
North	0.33
N-West	0.14
West	0.15
S-West	0.09
Littoral	0.07
TOTAL	1.00

Total Cameroon

PROVINCE	Weight
Central South	0.13
East	0.05
North	0.30
N-West	0.13
West	0.14
S-West	0.08
Littoral	0.06
Yaounde	0.04
Douala	0.06
TOTAL	1.00

Urban Cameroon

PROVINCE	Weight
Central South	0.13
East	0.05
North	0.23
N-West West	0.27
S-West Littoral	0.32
TOTAL	1.00

Rural Cameroon

PROVINCE	Weight
Central South	0.18
East	0.05
North	0.35
N-West West	0.30
S-West Littoral	0.12
TOTAL	1.00

TABLE 10

WEIGHTING FACTORS WITHIN EACH ECOLOGICAL AREA
(DOUALA AND YAOUNDE EXCLUDED)

Area	Province	Site No.	No. Sites	Weighting Fraction
North	North	80-113	34	NIL
Savannah	North	74-79	6	0.52
	East	67-73	7	0.13
	Central South	24-27	4	0.26
	Central South	16-17	2	0.09
		TOTAL	19	1.00
Plateau	North-West	114-127, 190	15	
	West	128-142	15	
		TOTAL	30	NIL
Plains	South-West	156-172	17	0.94
	Littoral	143-155	13	
	Central South	42-43	2	0.06
		TOTAL	32	1.00
Forest	Central South	14-15, 18-23, 28-41	22	0.75
	East	44-66	23	0.25
		TOTAL	45	1.00

9.2 AGE AND SEX DISTRIBUTION OF SAMPLE (Tables 11-14)

The age distribution for Cameroon shows a similar pattern for males and females. Children aged 48-59 months comprise proportionately less of the sample than all the other 12 month age groups (Table 11). This is particularly evident in the North Province, where relatively more infants from 3-11 months were sampled, compared with other areas (Table 12). The Special Group results on the other hand show a lesser proportion of infants (i.e. 3-11 months) than those in the Cameroon Sample (Tables 12-13).

The generally decreasing number of children found in the older age group might be explained by the following:

1. Actual demographic patterns
2. Fewer numbers of older children available for interview
3. Exclusion of older children due to difficulties with age determination.

No data on the age distribution by year are available for children under five years in Cameroon.

Apart from minor fluctuations, the sex distribution appears fairly even throughout the country (Table 14).

9.3 METHODS OF AGE DETERMINATION (Table 15)

Half of the sample in Cameroon had some type of verifiable record of birth.

There were marked differences in the frequency of use of methods and techniques to determine age. The birth record was used less often in the North (17.4%) and North-West (28.7%) as compared with other provinces (45.5%-66.9%). In Yaounde/Douala it was used in 72.6% of the cases and Urban Cameroon 66.2% of the cases as

Rural Cameroon (35.7%). In the North-West a clinic record often provided indirect evidence of date of birth. This may suggest that there are more developed clinic services for children under five years in the North-West provinces.

The "local calendar of events" and "stated age" methods were used most commonly when a birth or clinic record was unavailable.

Evaluation of Methods

Hemoglobin estimations and most of the children's anthropometric indices require precise ages for evaluation. The importance of determining the correct date of birth was stressed throughout the survey. The interviewers had extensive training and practice on age determination, particularly with the use of the calendar of events (Appendices 17-18)which was used in approximately half the sample (Table 15). The calendar of events was most often used to verify other methods of age determination such as stated age. When no other form of age assessment was available, it remained the only applicable method. About half the sample had a verifiable record such as birth, clinic or baptismal records. The birth record, which provides the most reliable information, was found in 43.2% of the children.

The methods and techniques used to determine age in this survey, therefore appear to give reasonably acceptable data. The calendars of events were often very comprehensive documents compiled by the interviewers with several village leaders, and often with two to three major or well-known events for each year over the last six year period in each village (Appendix 18).

Very few forms were discarded during the ending phase. Forty-nine forms were discarded because the children's ages were less than three months each. These 49 children constituted an error of inclusion, which fell outside the age range of the sample. Three forms were disregarded because of non-conformity. Thus, out of the initial sample of 5790 children, 5738 were retained for analysis.

TABLE 11

AGE AND SEX DISTRIBUTION OF CHILDREN - CAMEROON SAMPLE (w)

Age in Months	Sex: Males		Sex: Females		Sex: Total	
	No.	(w)	No.	(w)	No.	(w)
3-5	188	3.6	155	2.7	343	6.3
6-11	350	6.6	379	7.0	729	13.6
12-23	638	10.8	648	10.8	1286	21.6
24-35	611	11.3	664	12.0	1275	23.3
36-47	541	10.1	514	9.2	1055	19.3
48-59	490	8.6	460	7.3	950	15.9
TOTAL	2818	51.0%	2820	49.0%	5638	100.0%

(w) Weighted Percent

DUE TO THE WEIGHTING PROCEDURE, THE RESULTING WEIGHTED PERCENT IS NOT THE SAME AS THE PERCENT DERIVED FROM THE SAMPLE NUMBER. THIS APPLIES TO ALL TABLES WHERE A WEIGHTED PERCENT APPEARS.

TABLE 12

PERCENTAGE AGE DISTRIBUTION FOR INDEX CHILD (w) BY AREA

	Age in Months							
PROVINCE	3-5	6-11	12-23	24-35	36-47	48-59	Total	Sample Size
Central South*	6.1	13.3	25.2	20.7	19.3	15.4	100.0	889
East	6.8	11.6	23.9	22.3	17.0	18.4	100.0	897
North	6.7	15.2	19.0	25.3	20.5	13.3	100.0	1183
N-West	5.5	12.4	23.9	21.4	17.7	19.1	100.0	435
West	6.7	9.9	21.3	20.9	17.2	24.0	100.0	446
S-West	5.9	12.1	22.3	22.1	17.9	19.7	100.0	503
Littoral*	6.2	9.2	24.7	24.2	18.0	17.7	100.0	389
Total Provinces*	6.4	12.6	22.6	22.6	18.6	17.2	100.0	4742
ECOLOGICAL AREA								
North	6.7	14.6	18.4	25.7	21.0	13.6	100.0	1004
Central Savannah	6.2	15.5	24.4	22.0	18.7	13.2	100.0	563
West Plateau	6.1	11.1	22.6	21.1	17.5	21.6	100.0	881
West Plains	6.0	10.9	23.3	23.0	17.9	18.9	100.0	952
South Forest	6.5	13.6	24.8	21.4	18.0	15.7	100.0	1342
URBAN/RURAL								
Yaounde/Douala	4.6	14.7	24.1	22.4	19.3	14.9	100.0	896
Urban Cameroon*	6.5	11.1	21.6	23.6	20.6	16.6	100.0	866
Rural Cameroon	6.6	13.8	21.4	23.5	19.0	15.7	100.0	3876
TOTAL CAMEROON	6.3	13.7	21.6	23.3	19.3	15.8	100.0	5638
Special Group	4.0	10.3	22.2	20.2	21.0	22.3	100.0	506

*Excluding Yaounde and Douala
(w) Weighted Percentage

TABLE 13

AGE AND SEX DISTRIBUTION OF CHILDREN
SPECIAL GROUP IN DOUALA

Age in Months	SEX Males		Females		Total	
	Nº	%	Nº	%	Nº	%
3-5	10	2.0	10	2.0	20	4.0
6-11	28	5.5	24	4.8	52	10.3
12-23	55	10.9	57	11.3	112	22.2
24-35	43	8.5	59	11.7	102	20.2
36-47	62	12.3	44	8.7	106	21.0
48-59	60	11.9	53	10.5	113	22.4
TOTAL	258	50.6	247	49.4	505	100.0%

TABLE 14

SEX DISTRIBUTION BY AREA (w)
Children Aged 3-59 Months

	Sex			
	Male		Female	
PROVINCE	No.	(w)	No.	(w)
Central South*	443	49.8	446	50.2
East	441	49.2	456	50.8
North	624	52.7	559	47.3
N. West	201	46.2	234	53.8
West	239	53.6	207	46.4
S. West	241	47.9	262	52.1
Littoral*	202	51.9	187	48.1
Total Provinces*	2391	50.4	2351	49.6
ECOLOGICAL AREA				
North	525	52.3	479	47.7
Central Savannah	279	52.0	284	48.0
West Plateau	440	50.0	441	50.0
West Plains	477	49.7	475	50.3
South Forest	670	50.0	672	50.0
URBAN/RURAL				
Yaounde/Douala	427	47.7	469	52.3
Urban Cameroon*	433	51.0	433	49.0
Rural Cameroon	1958	51.4	1918	48.6
TOTAL CAMEROON	2818	51.0	2820	49.0
Special Group	258	51.0	248	49.0

*Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 15

PERCENTAGE DISTRIBUTION
OF METHODS OF AGE DETERMINATION - BY AREA (w)

PROVINCE	Birth Record	Clinic Record	Baptismal Record	Calendar of Events	Stated
Central South*	75.1	1.2	2.1	14.1	20.3
East	66.9	2.6	0.9	26.6	29.8
North	17.4	0.3	0.7	80.3	80.8
N. West	28.7	32.7	4.0	35.0	35.0
West	23.9	12.7	0.0	20.7	23.2
S. West	45.5	10.6	2.4	28.9	36.8
Littoral*	77.2	8.7	1.0	12.8	13.3
Total Provinces*	39.8	5.1	1.3	50.7	53.0
ECOLOGICAL					
North	15.8	0.3	0.6	81.9	82.5
Central Savannah	45.3	0.3	1.0	51.0	51.0
West Plateau	46.4	22.7	2.0	27.8	29.1
West Plains	59.3	9.8	1.8	21.9	26.6
South Forest	73.2	2.1	2.3	15.6	22.9
URBAN/RURAL					
Yaounde/Douala	72.6	7.2	0.7	13.4	19.9
Urban Cameroon*	66.2	8.2	0.4	23.0	25.9
Rural Cameroon	35.7	3.8	1.5	55.1	57.7
TOTAL CAMEROON	43.2	5.3	1.2	47.0	49.7

* Excluding Yaounde and Douala
(w) Weighted Percent

9.4 NUTRITIONAL STATUS OF CHILDREN IN CAMEROON

Prevalence of Undernutrition (Protein-Calorie Malnutrition)*

Table 16 lists the prevalence rates of undernutrition, as defined by anthropometry, in children under five years in Cameroon. The criteria for determining these rates are discussed in Section 8 on "Indices of Malnutrition."

Table 16 Prevalence of Undernutrition

Type of Undernutrition	Cameroon(w)	Special Group
Chronic Undernutrition	22.1%	4.2%
Acute Undernutrition	1.0%	0.0%
Underweight	21.1%	3.6%

Discussion

Table 15 shows that chronic undernutrition appears to be a serious problem for children under five years in Cameroon. More than one child out of every five (22.1%) in the nation is chronically undernourished (height-for-age less than 90% of the reference median value). This group of children is well below the expected growth potential. This result is a reflection of an inadequate nutritional background, where a complex set of factors, including poor diet and ill health, interact, often insidiously. Approximately 16% of the total population of Cameroon are children under five years. Based on the 1976 Census results, the number of children in this group, who are chronically undernourished, is computed to be of the order of a quarter of a million.

*PCM (Protein-Calorie Malnutrition) is also termed PEM (Protein-Energy Malnutrition).

(w) All percentages in this and following sections are weighted (see page 60 for details)

The significance of this result can be noted by comparing it with that of the special group of children in the same age range with a better socio-economic status, who presumably have better nutritional resources and less frequent illness than other Cameroon young children. Cameroon as a whole has a prevalence rate more than five times that of the special group. This implies that, given a more favorable environment in which to develop, Cameroonian children can improve their nutritional status towards that of the special group. The findings for the special group approaches that of the population in the USA from which the reference data was compiled, i.e. a prevalence of 1%. Another study in the USA, on poorer socio-economic groups resulted in a prevalence rate of 6.0% for chronic undernutrition (45).

Surveys in African countries, using the same methodology and definition for chronic undernutrition, have shown the following prevalence rates:

Liberia National Nutrition Survey (1976)-children aged 3-59 months 19.4% (38)

Togo National Nutrition Survey (1977)-children aged 6-71 months 19.6% (46)

These rates are quite similar to that for Cameroon. This is not unexpected, considering the similar unfavorable problems of diet, health and socioeconomic status influencing nutritional status of children in all these countries.

Although the genetic factor could, and does in fact affect the growth of the child, its importance has been shown to be far less than that of the environment (27).

Acute undernutrition, at least according to the proportion of children affected, did not appear to be a problem in Cameroon, at the time of the survey. The prevalence rate of 1.0% was quite low. Thus undernutrition of recent onset occurred in relatively few children throughout the country.

A possible explanation for this result is that in this point prevalence study, nutritional conditions may have been relatively

favorable during the time of the survey from January to March, 1978. Adverse seasonal influences at another time of the year could give different results. For example, in the North during the rainy season from June to September, food intake of the population is the lowest for the whole year (14).

9.5 NUTRITIONAL STATUS OF CHILDREN IN CAMEROON BY AGE

Tables 17, 18 and 19 and Figure 3 indicate the prevalence rates of undernutrition, according to the age of the child.

Table 17 Chronic Undernutrition by Age - Cameroon *

Age in Months	Percent with Chronic Undernutrition
3-5	7.3
6-8	8.4
9-11	10.3
12-14	10.2
15-17	16.9
18-20	24.1
21-23	28.5
24-29	22.3
30-35	24.5
36-47	27.4
48-59	26.8
Average - Cameroon	22.1%

* Under 90% Height-for-Age of Reference Median

The prevalence of chronic undernutrition starts to increase in the beginning of the second year and reaches a peak at 18-23 months. From 23 months this plateau continues up to the fifth year of life.

Table 18 Acute Undernutrition by Age - Cameroon*

Age in Months	Percent with Acute Undernutrition
3-5	0.9
6-8	1.2
9-11	1.6
12-14	0.3
15-17	1.2
18-20	3.6
21-23	0.5
24-29	1.4
30-35	0.8
36-47	0.9
48-59	0.5
Average - Cameroon	1.0

* Under 80% Weight-for-Height of Reference Median

Results indicate that the prevalence of acute undernutrition at the time of the survey was consistently low throughout almost all age groups.

Table 19 Underweight by Age - Cameroon*

Age in Months	Percent with Underweight
3-5	10.0
6-8	16.4
9-11	25.7
12-14	24.9
15-17	28.7
18-20	28.8
21-23	26.3
24-29	22.9
30-35	18.6
36-47	19.9
48-59	20.8
Average - Cameroon	21.1

* Under 80% Weight-for-Age of Reference Median

Underweight prevalence starts to rise at about six months of age, reaches a peak at 15-20 months of life and reduces slightly after 20 months.

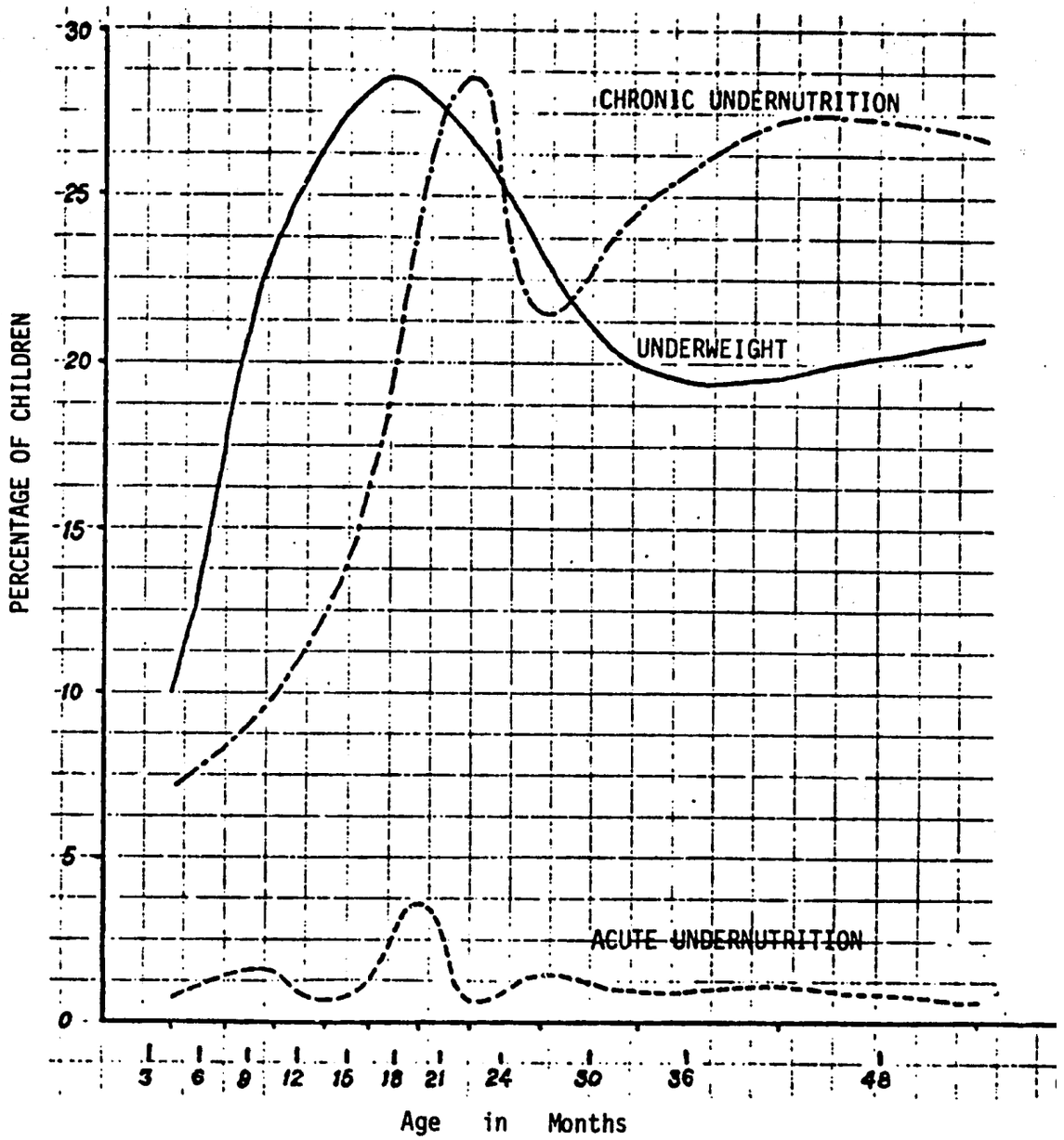


Figure 3 PERCENTAGE OF CHILDREN HAVING UNDERNUTRITION
(By Age of Child)

Discussion

Children aged 3-5 months had the least prevalence of chronic undernutrition and underweight. This probably results from the high resistance to infection conferred by protective maternal antibodies in the children. Breast feeding is a further major factor contributing to adequate nutritional status.

From 6-11 months, there was an increase in the proportion of children with chronic undernutrition and underweight. At the age of six months, maternal antibodies become greatly reduced and the child becomes exposed to a more adverse environment including poor sanitation with subsequent diarrhoeal conditions, infections, infestations and inadequate diet. Breast feeding is still essential and continues to be practiced but alone is insufficient for the child's needs.

From the second year of life it is likely that many children, already chronically undernourished, may fail to improve. The results for children aged two up to five years is mainly a reflection of their past growth and, to a large extent, nutritional and disease history.

The low prevalence rates for acute undernutrition at the time of the survey throughout all age ranges, reinforce the need to further investigate seasonal patterns. The problem of acute undernutrition is directly related to recent events, which may only be detected at a more unfavorable time of the year.

9.6 GRADATIONS OF UNDERNUTRITION IN CAMEROON

Although it is the practice in anthropometric methods to use single "cut-off points" in the determination of limits for the type of undernutrition, note should also be made of gradations at various levels at lesser or greater risk of undernutrition. For example, milder degrees of acute undernutrition can be recognized (e.g., under 85% of reference value of weight for height), as well as more severe

levels of underweight (e.g., under 60% of reference value of weight-for-age) (36,47). Obesity has been defined as over 120% weight-for-height (48).

Table 20 stresses such a frequency distribution of weight-for-height and height-for-age.

Table 20 Percentage Frequency Distribution of Children's Weight-for-Height and Height-for-Age According to Percentage Levels of Reference Median - Cameroon

% Levels	Weight-for-Height	Height-for-Age
<80	1.0	1.0
80-84.9	3.9	3.9
85-89.9	7.9	16.1
90-94.9	15.9	37.3
95-99.9	20.2	38.5
100-104.9	20.6	10.1
105-109.9	14.4	3.0*
110-119.9	12.6	
120+	3.5	
TOTAL	100%	100%

*105%+ level

These results show that 3.9% of children are just above the limit of acute undernutrition and 37.3% of children just above the chronic undernutrition definition. These may be considered as borderline groups. It is likely that the factors in the environment influencing the development of poor nutritional status are only marginally better for these borderline groups than those groups with undernutrition as defined in this report.

Further frequency distribution tables are presented in the Appendix 22.

9.7 NUTRITIONAL STATUS BY AREA (Tables 21-27)

a. Introduction

In order to determine the extent of undernutrition within the nation, the sample included separate descriptions for each province and for urban and rural divisions. The prevalence rates listed are estimates, which in general become more precise the larger the sample size. A sample size of 900 children for a description is required to ensure an adequate level of precision (see Survey Design).

Based on the clear requirement of 900, there are sufficient sample sizes for each of the following: North, East and Central South Province (but not for those four western provinces), all ecological areas (other than Central Savannah), Yaounde and Douala combined, Urban and Rural Cameroon. For the purpose of this description all provinces and areas, including those of the West, are presented separately because each has a special interest. It should be noted that the West Plateau comprises the North-West and West Provinces, and almost all of the West Plains consists of the South-West and Littoral Provinces. The actual precision of the estimates can be made, and statistical comparisons made of the prevalence rates (Tables 26-27). For a fuller explanation, see Appendices 5-6 .

The results for total provinces, each ecological area, urban and rural Cameroon, and Total Cameroon were computed by weighting according to population proportionality and then summing the results for each constituent (e.g., province) of the total (see page 60).

The results for the Special Group are given separately and are not included in the country's average (Total Cameroon).

All tables describe the percentage frequency according to the cut-off point listed. The first set of tables (21-24) shows the prevalence rates by each area, together with the sample size. The second approach (Table 25)is to show the ranking of rates by province,

Yaounde, Douala, and Special Group from the highest prevalence to the lowest according to each undernutrition index. To simplify presentations, the rates within a rectangle are significantly greater than those rates outside and below the rectangle. For example, the prevalence, or percentage, of children with chronic undernutrition in Douala (13.6%) is significantly greater than that in Yaounde (9.1%) and the Special Group.

b. Results

i Chronic Undernutrition (Tables 21 and 25)

The prevalence rate of chronic undernutrition (height-for-age less than 90% of the reference median) in children aged 3-59 months was significantly greater in the West Province (30.8%) than for the North, South West, Central South and Yaounde/Douala. It was next highest in the East (26.7%). The prevalence rates in all provinces were significantly greater than that in Yaounde/Douala.

The West Plateau had the highest percentage of children with chronic undernutrition (27.5%) and the Central Savannah the lowest (15.5%).

The results for Rural (22.4%) and Urban Cameroon (19.4%) tended to be close to each other.

Children in the Special Group had by far the lowest prevalence rate (4.2%) as compared with all other areas.

ii Acute Undernutrition (Tables 22 and 25)

The prevalence of acute undernutrition (weight-for-height less than 80% of the reference median value) was low throughout all areas. The only significant result was the North (1.4%) having a higher prevalence rate than Yaounde (0.3%).

No child in the special group had acute undernutrition.

iii Mild Acute Undernutrition (Tables 23 and 25)

This estimate of children with a weight-for-height less than 85% of the reference median was used as a more sensitive measure of differences between provinces. In this measure, the percentage of children aged 3-59 months in the North (7.5%) was significantly greater than every other province and that in rural Cameroon (5.3%) was greater than in urban (2.2%). Yaounde had a smaller prevalence rate (0.8%) than most provinces and the result for the special group in Douala was similar to that of Yaounde.

The prevalence rate was greatest in the Ecological North (8.1%) when compared with all the other ecological areas.

iv Underweight (Tables 24 and 25)

The percentage of children underweight (less than 80% of the reference median weight for age) was significantly greatest in the North (27.2%). It was next highest in the West and East Provinces (22.0% and 21.2%) and lowest in Central South (14.8%).

The ecological North clearly had the highest percentage of underweight children (28.7%) compared with all other areas (18.0% to 20.4%).

The result for rural Cameroon was far greater than for urban (23.0% vs. 13.6%).

Other than the Special Group, where the prevalence rate was 3.6%, Yaounde had the lowest prevalence rate of all.

c. Discussion

i. Chronic Undernutrition

Certain generalizations can be drawn from the above information:

1. Chronic undernutrition in children aged 3-59 months is a problem throughout Cameroon.

2. The prevalence rates are greater in the rural areas of the country, compared with the urban.

3. Yaounde/Douala (particularly Yaounde) has the lowest prevalence rates, except for the Special Group, which has rates far below any area of Cameroon.

4. There are important differences between results for provinces, the West having the highest rate and Central South the lowest.

ii Acute Undernutrition

Acute undernutrition did not appear to be a problem in any area of Cameroon. The reasons for this have been discussed on page 73 . This indicates that there was no famine nor near famine situation at the time of the survey. Unless the rates became much higher, for example, at a more unfavorable time of the year, no special urgency is required for remedial action, at least on a large scale.

However, if milder degres of acute undernutrition are considered, there may be a problem in the North ecological area, where 8.1% of children aged 3-59 months were affected. This suggests that the problem of acute undernutrition in the North lies just under the surface. Any deterioration due to poor environment, such as the hungry season, the onset of epidemics such as illness or diarrheal disease, at other times of the year may be sufficient to tip the balance.

iii Underweight

The same generalizations relating to chronic undernutrition can be made for underweight children. An exception is taken with regard to the comparison of provinces, where the North has the highest prevalence rate of underweight. The weight of a child is a composite measure of skeletal size (assessed by height-for-age) and soft tissue bulk (assessed by weight-for-height). It would appear that children in the North have a lesser prevalence rate of chronic undernutrition than those in the West, but a greater rate of mild acute undernutrition, hence the overall greater prevalence in underweight. In other words, children in the North are taller, but thinner, and therefore lighter than their West Province counterparts.

The relationship between height, weight and age is complex and not always fully explicable.

Two important considerations are necessary. First is the genetic effect on the child's stature and weight; second, the validity of age determination and anthropometric measures.

There was a much higher prevalence of short mothers (less than 152 cm) in the East, North-West and South-West than in the other provinces (see page 234). Prevalences rates were similar in the urban and rural areas, and least of all in Yaounde/Douala. Furthermore, the average height of mothers, according to areas, gave similar patterns of differences as the prevalence rates for short mothers; i.e., the average height was least in the East, etc.

Maternal stature does influence, to a certain extent, that of the child, although environmental factors affecting the child (e.g., poor diet, ill health) are more important (27). This is indicated by the direct relationship between child and maternal stature, where 86% of children with chronic undernutrition occurs in mothers who were not short.

The validity of age determination may be compromised where there were relatively few verifiable records of birth (see p.65). In the North, only 17.7% of the children had such a record. Errors in age determination will affect the age-related anthropometric variables, e.g., height-for-age and weight-for-age.

In the study of population groups, large errors of age determination would produce bizarre results in the anthropometric descriptions. This would show higher proportions of children with a very low height-for-age under 80% and a very high height-for-age over 120% of reference value compared with that expected by the rest of the distribution (i.e., 80-90%, 90-100%, 100-110%, 110-120%). This occured extremely rarely (less than 0.2% of cases). The age results were considered to be reliable enough for the purpose of the description. Furthermore, the local calendars of events were used with extreme care to establish a reliable age.

Anthropometric measurements were rigidly standardized during the training and the survey to make sure such measures were correct.

On the basis of the results for maternal stature, it would appear that the child prevalence rate of chronic undernutrition in the West is a valid estimate as there was a relatively low prevalence rate of short mothers (which might otherwise explain this result) in that province. This would also be the case for the North, Central South and Littoral Provinces, and Yaounde/Douala. In the East, North-West and South-West Provinces, the relative percentages of children with chronic undernutrition may be slightly less when compared with other areas. A further point to be mentioned with the results for the West Province is that the full sample size of 900 children was not taken, so that the precision of the estimates was less than some of the other provinces, such as the North and East.

Other factors were not investigated, such as paternal height. Nevertheless, the height of the mother can still provide a suitable indication of the genetic potential of her child's growth, although the combined heights of the mother and father are better and preferred when available. Furthermore, the ethnic group of the individual child or parent was not elicited. Some ethnic groups in Cameroon are known to possess distinctive anthropometric features which could seriously influence regional anthropometric means.

d. National Perspective

An overall objective of studying the extent of undernutrition was to estimate the actual numbers of children affected throughout the country. It is statistically valid in this study to do this since the sample was valid and the sample sizes adequate. The prevalence estimates for each province and the range due to sampling are presented in Table 26. The range is based on twice the standard error (2SE) from the average prevalence per site in each province. This is acceptable at the 95% confidence level. (See Appendix 5 for further explanation).

Table 27 and Figure 4 show the estimated numbers of children with chronic undernutrition. It is apparent that the major contributions to the total number affected in Cameroon (252,000) were from the North (28%), West (19%), North-West (14%), and Central South (13%) Provinces.

The North Province alone had 54% of all children in Cameroon with acute (mild) undernutrition (Table 27 and Figure 5).

It should be noted that the prevalence rates were based on the numbers of children with undernutrition per each 100 children; the numbers affected and percent of those to the national population will obviously depend on the prevalence rates and total population of children aged 3-59 months in the province, i.e., the population at risk as defined in this study.

e. Summary

Based on the anthropometric results, it would appear that the problems could be listed in the following order of priorities for remedial action:

1. Children aged 6-24 months
2. Rural areas throughout all provinces
3. The North, and probably the East and West Provinces
4. Least in Yaounde and Douala

Differences between provinces were present but not very marked, except in the North, where the mild acute undernutrition rate was highest.

If there were interests in investigating smaller parts, groups or divisions of larger areas already described, it would be necessary to conduct separate studies for each of them, using appropriate sampling techniques and procedures.

Seasonal effects should be further investigated, particularly for the North ecological area. Nutrition surveillance would be suitable for this purpose (49-51).

In view of the difficulties of age assessment an appropriate surveillance may include age-independent anthropometric measures such as weight-for-height and arm circumference alone.

TABLE 21

PREVALENCE OF CHRONIC UNDERNUTRITION
(Under 90% Height for Age of Reference Median)
ACCORDING TO AREA - Children Aged 3-59 Months

PROVINCE	% Chronic Undernutrition (w)	Sample Size
Central South*	18.8	899
East	26.7	899
North	21.1	1199
N. West	24.2	466
West	31.0	447
S. West	20.1	504
Littoral*	24.0	389
Total Provinces*	22.1	4783
ECOLOGICAL		
North	22.6	1019
Central Savannah	15.5	570
West Plateau	27.5	893
West Plains *	21.7	954
South Forest*	20.8	1348
URBAN/RURAL		
Yaounde/Douala	11.8	897
Urban Cameroon*	19.4	840
Rural Cameroon	22.4	3943
TOTAL CAMEROON	21.0	5681
Special Group	4.2	505

* Excluding Yaounde/Douala
(w) Weighted Percent

TABLE 22

PREVALENCE OF ACUTE UNDERNUTRITION
(Under 80% Weight for Height of Reference Median)
ACCORDING TO AREA - (Children Aged 3-59 Months)

PROVINCE	% Acute Undernutrition (w)	Sample Size
Central South*	0.7	899
East	0.8	899
North	1.4	1199
N. West	0.7	446
West	0.7	446
S. West	0.8	502
Littoral*	0.7	389
Total Provinces*	1.1	4780
ECOLOGICAL		
North	1.5	1018
Central Savannah	1.0	570
West Plateau	0.7	892
West Plains	0.8	952
South Forest	0.6	1348
URBAN/RURAL		
Yaounde/Douala	0.7	895
Urban Cameroon*	0.7	838
Rural Cameroon	1.1	3942
TOTAL CAMEROON	1.0	5675
Special Group	0.0	503

*Excluding Yaounde and Douala
(w) Weighted percent

TABLE 23
PREVALENCE OF MILD ACUTE UNDERNUTRITION
(Under 85% Weight for Height of Reference Median)
ACCORDING TO AREA - (Children Aged 3-59 Months)

PROVINCE	%Mild Acute Undernutrition (w)
Central South*	3.7
East	3.0
North	7.5
N. West	1.8
West	2.7
S. West	3.0
Littoral*	2.0
Total Provinces*	4.8
ECOLOGICAL	
North	8.1
Central Savannah	3.8
West Plateau	2.3
West Plains	2.6
South Forest	3.8
URBAN/RURAL	
Yaounde/Douala	1.5
Urban Cameroon*	2.2
Rural Cameroon	5.3
TOTAL CAMEROON	4.7
Special Group	0.6

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 24

PREVALENCE OF UNDERWEIGHT
(Under 80% Weight for Age of Reference Median)
ACCORDING TO AREA - (Children Aged 3-59 Months)

PROVINCE	% Underweight (w)	Sample Size
Central South*	14.8	900
East	21.2	899
North	27.3	1200
N. West	15.5	446
West	21.9	448
S. West	19.1	504
Littoral*	16.7	390
Total Provinces*	22.3	4787
ECOLOGICAL		
North	28.7	1020
Central Savannah	20.4	570
West Plateau	18.6	894
West Plains	18.0	954
Sourth Forest	18.1	1349
URBAN/RURAL		
Yaounde/Douala	10.8	894
Urban Cameroon*	13.6	840
Rural Cameroon	23.0	3947
TOTAL CAMEROON	21.1	5681
Special Group	3.6	505

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 25
STATISTICAL DIFFERENCES IN PREVALENCE OF UNDERNUTRITION - BY AREA

PROVINCE	% Chronic Undernutrition			
West	30.8		30.8	
East		26.7	26.7	
N-West			24.2	
Littoral			23.9	
North	21.0		21.0	
S-West	20.0		20.0	
Central South	18.8	18.8	18.8	
Douala	13.6	13.6	13.6	13.6
Yaounde	9.1	9.1	9.1	9.1
Special			4.2	4.2

PROVINCE	% Underweight		
North	27.2		27.2
West		22.0	22.0
East	21.2	21.2	21.2
S-West	19.0		19.0
Littoral	16.7		16.7
N-West	15.4	15.4	15.4
Central South	14.8	14.8	14.8
Douala	12.6	12.6	12.6
Yaounde	8.3	8.3	8.3
Special Group			3.6

PROVINCE	% Acute Undernutrition
North	1.4
Yaounde	0.3
Special Group	0.0

PROVINCE	% Acute (Mild) Undernutrition	
North	7.5*	7.5
Central South	3.7	3.7
S-West	3.0	3.0
East	3.0	3.0
West	2.9	2.9
Littoral	2.0	
Douala	2.0	
N-West	1.8	
Yaounde	0.8	0.8
Special	0.6	0.6

* Special group results included for comparisons, although no precision estimates could be done in the same way as the areas in the main sample.

TABLE 26
UNDERNUTRITION PREVALENCE
ESTIMATES AND PRECISIONS

Area	% Chronic Undernutrition			% Underweight		
	Estimate	2SE	Range	Estimate	2SE	Range
Central South	18.8	3.2	15.6-22.0	14.8	2.9	11.9-17.7
East	26.7	4.6	22.1-31.3	21.2	3.6	17.6-24.8
North	21.0	4.1	16.9-25.1	27.2	4.5	22.7-31.7
North-West	24.2	6.0	18.2-30.2	15.4	4.5	10.9-19.9
West	30.8	5.8	25.0-36.6	22.0	5.8	16.2-27.8
South-West	20.0	5.3	14.7-25.3	19.0	7.0	12.0-26.0
Littoral	23.9	5.5	18.4-29.4	16.7	5.6	11.1-22.3
Yaounde	9.1	4.6	4.5-13.7	8.3	2.8	5.5-11.1
Douala	13.6	3.5	10.1-17.1	12.6	3.9	8.7-16.5

Area	% Acute Undernutrition			%Acute(Mild)Undernutrition		
	Estimate	2SE	Range	Estimate	2SE	Range
Central South	0.7	0.5	0.2- 1.2	3.7	1.7	2.0- 5.4
East	0.8	0.5	0.3- 1.3	3.0	1.0	2.0- 4.0
North	1.4	0.7	0.7- 2.1	7.5	2.5	5.0-10.0
North-West	0.7	0.9	0.0- 1.6	1.8	1.4	0.4- 3.2
West	0.9	0.8	0.1- 1.7	2.9	1.6	1.3- 4.5
South-West	0.8	0.7	0.1- 1.5	3.0	1.7	1.3- 4.7
Littoral	0.8	0.8	0.0- 1.6	2.0	1.6	0.4- 3.6
Yaounde	0.3	0.5	0.0- 0.8	0.8	0.8	0.0- 1.6
Douala	1.0	0.9	0.1- 1.9	2.0	1.4	0.6- 3.4

*2SE = Two Standard Errors

TABLE 27

ESTIMATED NUMBERS OF CHILDREN AGED 3-59 MONTHS WITH CHRONIC UNDERNUTRITION - BY AREA

	TOTAL POPULATION (THOUS)	ESTIMATED No. OF CHILDREN 3-59M (THOUS)**	CHRONIC UNDERNUTRITION PREVALENCE %	RANGE	ESTIMATED NUMBERS (THOUS) CHRONIC UNDERNUTRITION AVERAGE	RANGE	NUMBERS AS A PERCENT OF TOTAL CAMEROON
Central South *	1,155	173	18.8	15.6-22.0	33	27-38	13.1
East	366	55	26.7	22.1-31.3	15	12-17	6.0
North	2,233	335	21.0	16.9-25.1	70	57-84	27.8
North-West	981	147	24.2	18.2-30.2	36	27-44	14.3
West	1,036	155	30.8	25.0-36.6	48	39-57	19.0
South-West	621	93	20.0	14.7-25.3	19	14-24	7.5
Littoral *	452	68	23.9	18.4-29.4	16	13-20	6.3
Yaounde	337	51	9.1	4.5-13.7	5	2- 7	2.0
Douala	483	72	13.6	10.1-17.1	10	7-12	4.0
TOTAL CAMEROON	7,664	1,149	22.1	18.4-25.8	252		100.0%

ESTIMATED NUMBERS OF CHILDREN AGED 3-59 MONTHS WITH MILD ACUTE UNDERNUTRITION - BY AREA

Central South *	3.7	2.0- 5.4	6	3- 9	13.0
East	3.0	2.0- 4.0	2	1- 3	4.4
North	7.5	5.0-10.0	25	17-33	54.3
North-West	1.8	0.4- 3.2	3	1- 5	6.5
West	2.9	1.3- 4.5	4	2- 7	8.7
South-West	3.0	1.3- 4.7	3	1- 4	6.5
Littoral *	2.0	0.4- 3.6	1	¼- 2	2.2
Yaounde	0.8	0.0- 1.6	½	0- 1	1.1
Douala	2.0	0.6- 3.4	1½	½- 2½	3.3
TOTAL CAMEROON	4.7	3.0- 6.4	46		100.0%

* Excluding Yaounde/Douala

** Population of children aged 3-59 months based on 15% of total population.

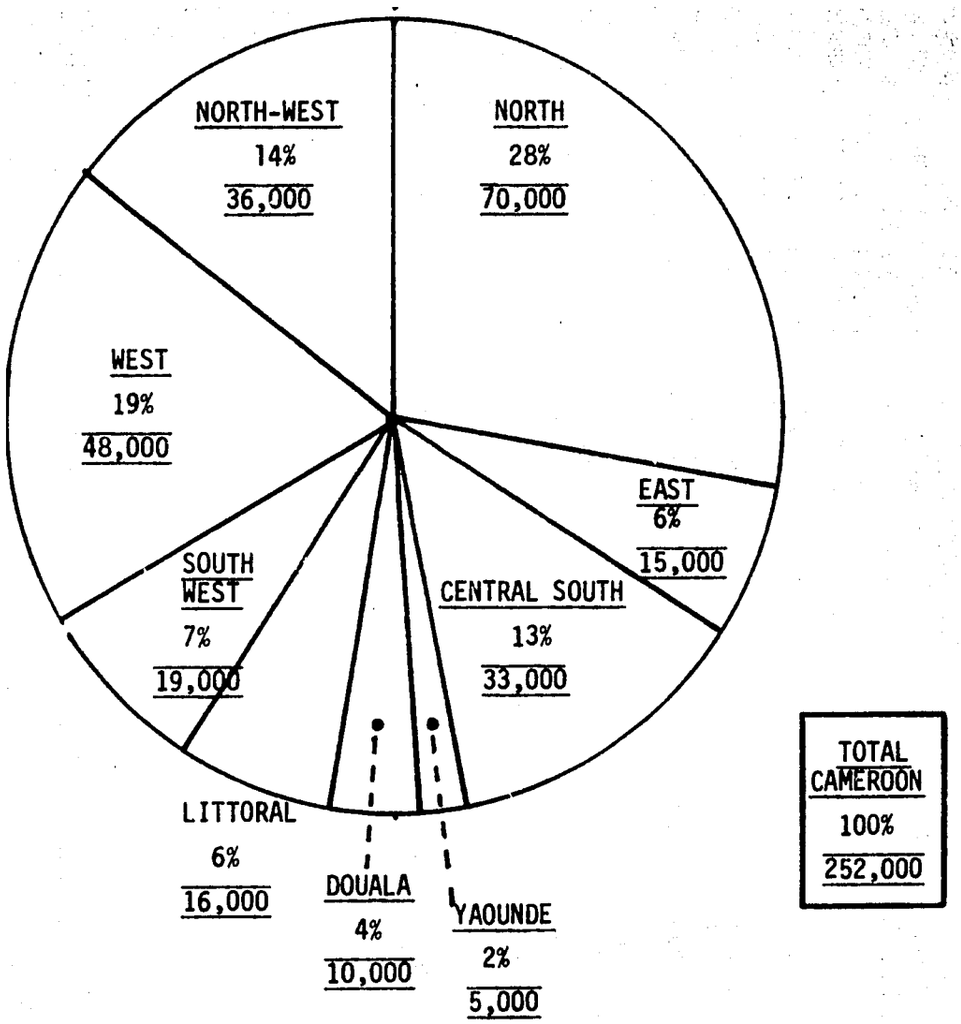


FIGURE 4

ESTIMATED NUMBERS OF CHILDREN AGED 3 TO 59 MONTHS WITH CHRONIC UNDERNUTRITION AND THE PERCENT CONTRIBUTION TO TOTAL CAMEROON.

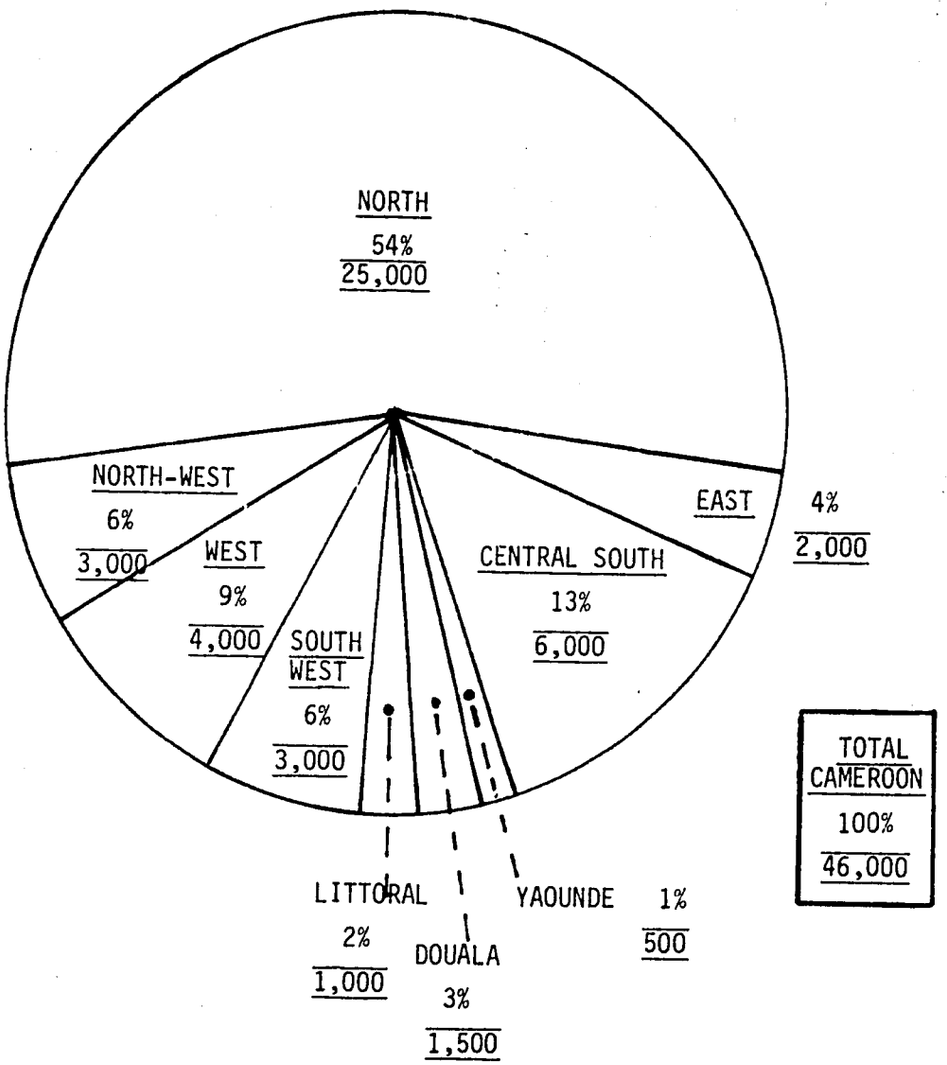


FIGURE 5
ESTIMATED NUMBERS OF CHILDREN AGED 3 TO 59 MONTHS WITH MILD ACUTE UNDERNUTRITION AND THE PERCENT CONTRIBUTION TO TOTAL CAMEROON.

9.8 OTHER ANTHROPOMETRIC INDICES OF CHILDREN

a. Introduction

These arm indices are based on the mid-upper arm circumference and triceps fatfold measures in children under five years of age. They are used to confirm the results for other general measures of non-chronic undernutrition, such as underweight (low weight-for-age) as well as to investigate the value of arm measures (in particular arm circumference alone) for future nutritional surveillance.

b. Prevalence of Arm and Fat Wasting in Cameroon (Table 28)

There was a marked difference between the results for arm wasting for the Cameroon Sample, as compared with the special group in Douala. This difference was even more apparent than that shown by underweight (Table 16,p.72). On the other hand, there was little difference in the results for fat wasting.

Table 28 Prevalence Rates for Low Arm Measures

Type of Measure	Cameroon (w)	Special Group
Arm Wasting		
Low Arm Circ.-for-Age	13.0	0.8
Low Arm Circ.-for-Height	3.9	0.0
Fat Wasting	17.0	14.0

c. Arm and Fat Wasting By Age (Table 29)

All measures showed a rapid increase in prevalence rates at six months of age followed by a decrease around the end of the second year of life. Such a trend although less clear-cut, was apparent for acute undernutrition and underweight prevalences rates by age.

d. Arm Wasting By Area (Tables 30 and 31)

The highest prevalence rates for arm wasting were in the North Province (i.e. 16.9% for low arm circumference-for-age and 5.4% for low arm circumference-for-height). Prevalence rates for arm wasting were much higher in rural areas as compared with urban areas and Yaounde/Douala.

e. Fat Wasting by Area (Table 32)

There was a higher prevalence of fat wasting in rural Cameroon (18.6%) as compared with urban areas (11.5%). Otherwise differences by area did not conform with results for other measures of under-nutrition.

f. Discussion

The results for arm wasting prevalence rates, particularly arm circumference-for-age do indeed confirm the results for underweight prevalence rates. This is based on the differences between the Cameroon Sample and the Special Group, the results for prevalence rates by age and by area. The conclusion is that arm wasting (i.e. arm circumference) would be a valuable tool for nutrition surveillance and the present results used as a baseline.

TABLE 29
ARM AND FAT WASTING BY AGE - CAMEROON

Age in Months	Percent with Arm Wasting		Percent with Fat Wasting
	Low AC/A	Low AC/H	Low FF/A
3-5	6.4	1.2	8.2
6-8	15.8	3.3	27.7
9-11	23.5	6.0	28.9
12-14	20.9	3.3	35.4
15-17	22.8	8.1	38.9
18-20	21.8	7.8	27.8
21-23	22.2	5.3	17.3
24-29	14.8	5.5	18.1
30-35	9.0	2.8	9.2
36-47	7.5	2.4	6.9
48-59	7.0	2.8	10.5
3-59	13.0	3.9	17.0

Low AC/A - <82.5% of Reference Median

Low AC/H - <82.5% of Reference Median

Lwo FF/A - <60% of Reference Median

TABLE 30

PREVALENCE OF LOW ARM MEASURES
(Under 82.5% of Reference Median)
ACCORDING TO AREA - (Children Aged 3-59 Months)

PROVINCE	Arm Circumference for Height	Arm Circumference for Age
Central South*	3.9	11.8
East	3.4	13.4
North	5.4	16.9
N. West	1.4	7.0
West	1.6	9.6
S. West	3.6	12.0
Littoral*	1.8	6.4
Total Provinces*	4.1	13.7
ECOLOGICAL		
North	5.6	17.9
Central Savannah	3.3	12.0
West Plateau	1.5	8.3
West Plains	1.6	9.6
South Forest	3.9	12.5
URBAN/RURAL		
Yaounde/Douala	1.6	6.3
Urban Cameroon*	1.7	5.7
Rural Cameroon	4.4	14.4
TOTAL CAMEROON	3.9	13.0
Special Group	0.0	0.8

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 31a

STATISTICAL DIFFERENCES IN PREVALENCE OF ARM WASTING-BY PROVINCE

PROVINCE	Low Arm Circumference For Age (<82.5%)			
North	16.9			16.9
East		13.3		13.3
S-West			12.0	12.0
Central South	11.8		11.8	11.8
West	9.6			
Douala	8.6	8.6		
N-West	7.1	7.1	7.1	
Littoral	6.4	6.4	6.4	
Yaounde	2.9	2.9	2.9	2.9
Special	0.8			

PROVINCE	Low Arm Circumference For Height (<82.5%)	
North	5.3	5.3
Central South	3.9	3.9
S-West		3.6
East		3.3
Douala	2.1	2.1
Littoral	1.8	1.8
N-West	1.6	1.6
West	1.5	1.5
Yaounde	0.8	0.8
Special	0.0	

TABLE 31b

UNDERNUTRITION PREVALENCE ESTIMATES AND PRECISIONS

% Thin Arms

PROVINCE	% Low Arm Circ. for Age			% Low Arm Circ./Height		
	Estimate	2SE *	Range	Estimate	2SE *	Range
Central South	11.8	2.9	8.9-14.7	3.9	1.4	2.5- 5.3
East	13.3	2.6	10.7-15.9	3.3	1.6	1.7- 4.9
North	16.9	3.2	13.7-20.1	5.3	1.6	3.7- 6.9
North-West	7.1	3.6	3.5-10.7	1.6	1.3	0.3- 2.9
West	9.6	3.5	6.1-13.1	1.5	0.9	0.6- 2.4
South-West	12.0	5.6	6.4-17.6	3.6	2.5	1.1- 6.1
Littoral	6.4	3.6	2.8-10.0	1.8	1.4	0.4- 3.2
Yaounde	2.9	1.7	1.2- 4.6	0.8	0.9	0.0- 1.7
Douala	8.6	2.7	5.9-11.3	2.1	1.4	0.7- 3.5

* 2SE - Two Standard Errors

TABLE 32
PREVALENCE OF LOW FATFOLD
(Under 60% Fatfold for Age of Reference Median)
ACCORDING TO AREA - (Children Aged 3-59 Months)

PROVINCE	Low Fatfold for Age (w)	Sample Size
Central South*	19.9	709
East	19.8	751
North	16.8	950
N. West	17.6	371
West	9.3	357
S. West	22.3	436
Littoral*	11.8	356
Total Provinces*	17.1	3930
ECOLOGICAL		
North	16.7	831
Central Savannah	18.3	446
West Plateau	13.5	728
West Plains	17.4	822
South Forest	21.1	1103
URBAN/RURAL		
Yaounde/Douala	15.8	634
Urbar Cameroon*	11.5	688
Rural Cameroon	18.6	3242
TOTAL CAMEROON	17.0	4564
Special Group	14.0	464

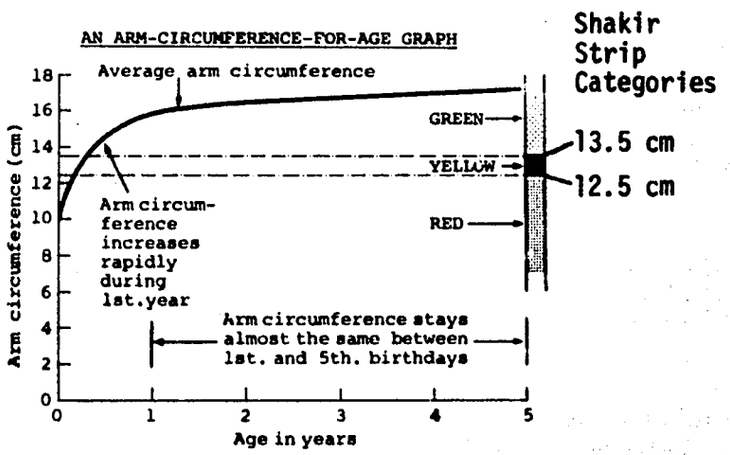
* Excluding Yaounde and Douala
(w) Weighted Percent

g. Screening Method for Undernutrition

The Shakir Strip is a narrow strip of X-ray film used for measuring arm circumference. The strip has three colors, which correspond to the categories shown in Figure 6. "If a child's mid-upper arm circumference falls in the green, the child is well nourished; if in the yellow, the child is probably malnourished; if in the red, the child is malnourished." (51). The figure also demonstrates that the average arm circumference of well nourished children does not change significantly over the 1 to 5 year age range, so that precise age is not essential for interpretation.

It was decided to add this test at the beginning of the survey phase in the Western Provinces. Hence it was not done prior to this when the other provinces were surveyed.

FIGURE 6 AN ARM CIRCUMFERENCE-FOR-AGE GRAPH SHOWING SHAKIR STRIP CATEGORIES



Reproduced from Morley D, Child to Child Program Institute of Child Health, 30 Guilford Street, London WCIN IEH, United Kingdom.

Results

Altogether, 1602 children aged 1-5 years were measured. Results indicated that approximately 3% of children had definite arm wasting (under 12.5 cm arm circumference) and 4.7% to 11.9% had borderline arm wasting (12.5 cm to 13.4 cm), depending on the western province described. Borderline arm wasting was most prevalent in the South-West and least prevalent in the Littoral Province. Similar relationships between provinces were found with the arm circumference-for-age index. It should be noted that the equivalent cut-off point for 82.5% arm circumference-for-age is 13.8 cm, so that the prevalence rates for this index and the Shakir strip are not the same.

The findings for arm circumference categories less than 12.5 cm, 12.5-13.4 cm and over 13.4 cm using the Shakir Strip and Zerfas Insertion Tape (52) were directly compared (Table 33).

TABLE 33
COMPARISON OF ARM CIRCUMFERENCE MEASUREMENTS

	Insertion Tape				
	<12.5cm	12.5-13.4cm	13.5cm+	TOTAL	%
X-ray Strip					
RED	54	13	0	67	3.1
YELLOW	14	100	54	168	7.7
GREEN	7	54	1890	1951	89.2
TOTAL	75	167	1944	2186	
%	3.4	7.6	89.0		100.0%

The prevalence rates were almost identical. This suggests that either instrument is reliable as a survey tool, given adequate training. On the other hand there was some misclassification. For example, seven children classified as malnourished by the tape (under 12.5cm) were considered normal (green) using the strip. Although this represents a small percent (0.3%) of the total number of children measured, it is much greater (7/75 = 9.3%) when based on the numbers malnourished. On the other hand, no child over 13.5cm arm circumference using the tape was classified as malnourished (red) with the strip. This suggests that caution should be used with screening, i.e. identifying malnourished children. It should be noted however, that an arm circumference category set at 14cm as suggested by King et al (31) might effectively screen as "normal" a large proportion of children aged 1-5 years, with the provision that the clinical sign of edema be included. This would save considerable resources, and enable further testing for the smaller group of children under 14cm arm circumference who are not "normal".

The decision for a particular "cut-off" point for screening purposes should be based on available resources for action, as well as for the screening process itself.

9.9 ANEMIA

Capillary blood was obtained, using the finger prick method and collected in Unopettes (see Appendix 20). Results were read at the Hematology Laboratory, University Center for the Health Sciences (CUSS), Yaounde, Cameroon.

A specimen was obtained from every fifth child in the main sample. In uncommon instances when this was not possible, the next child had blood taken (e.g. if child number five refused, child number six in the site was tested).

A total of 1020 blood specimens from the main sample were collected and found suitable for reading. In addition, 225 specimens from the special group in Douala were read.

Anemia was defined according to the WHO classification; i.e. a hemoglobin level below 10 Gm% for children aged 6-23 months and below 11 Gm% for children aged 24-59 months (5).

Allowance was made for high altitudes. For each survey hemoglobin Gm% result, 0.2 Gm% was deducted for each increment of 2,500 feet above sea level (44).

a. Results (Table 34)

Anemia was found to be present in 38.1% of children aged 6-59 months throughout Cameroon. There was little difference in the anemia rate for children aged 6-23 months (34.0%) and those aged 24-59 months (39.6%).

Comparing results within the country requires caution, because of the low sample sizes. However, it would appear that there was no difference between the Cameroon Sample (38.1%) and the Special Group (37.9%). Furthermore, the prevalence rates of anemia were similar for Yaounde/Douala (42.8%) and the rest of Cameroon (37.5%).

The North-West and West Provinces (West Plateau) had by far the lowest prevalence of anemia (23.1%).

A hemoglobin level of under 8 Gm% for children aged 6-23 months was found in 8.7% of cases and under 9 Gm% for children aged 24-59 was present in 8.3% of cases. These cut-off points represent the more severe grades of anemia in the total Cameroon Sample (Table 35).

b. Discussion

Anemia prevalence rate in Cameroon (38.1%) was less than that found in Liberia (62%) and Togo (59%) but higher than Lesotho (25%). In all these countries the same methods and anemia definitions were used.

Dietary deficiency in iron and/or folic acid, malaria, intestinal parasitic infestation such as hookworm, and recurrent infections are common contributing causes of anemia in developing countries. Only diet and sickle cell disease/trait were investigated in this survey. However, evidence that malaria parasitism is particularly important is supported by the following:

1. It was the only common cause of anemia which did not exist in Lesotho, explaining the relatively low prevalence rate in that country.
2. It may explain the lower prevalence rates in the West Plateau area, where malaria is perhaps less common than much of the rest of Cameroon.

It should be noted that the causes of anemia are multiple and complex and it was not possible to investigate them in this survey.

Some caution should be exercised in the full acceptance of the data for anemia prevalence, with particular reference to the results for Yaounde/Douala and the Special Group. In these areas, the prevalence rates for undernutrition in young children were much less than the rest of the country. One would expect the prevalence rates for anemia to be less also. Such was not the case. No adequate explanation for this disparity is apparent. The possibility of errors in technique cannot be excluded.

TABLE 34

PREVALENCE OF ANEMIA (w) - BY PROVINCE

AFTER ADJUSTING FOR ALTITUDE

Children Aged 6-59 Months

PROVINCE	PERCENT	SAMPLE SIZE
Central South*	53.3	165
East	57.6	163
North	41.0	200
North-West/West	23.1	164
South-West/Littoral*	38.9	172
Total Provinces	37.6	864
Yaounde/Douala	42.8	156
TOTAL CAMEROON	38.1	1020
Special Group	37.9	225

*Excluding Yaounde/Douala
(w) Weighted Percent

TABLE 35
PERCENTAGE DISTRIBUTION OF HEMOGLOBIN (GM%) IN CHILDREN
BY AGE GROUP AND PROVINCE
(AFTER ADJUSTING FOR ALTITUDE)

Children aged 6-23 months

PROVINCE	Ranges of Hemoglobin Gm%									
	<7	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-12.9	13.0-13.9	14.0+	N
Central South*	3.8	9.4	7.5	22.6	17.0	22.6	13.2	3.8	0.0	53
East	3.0	9.1	12.1	37.9	15.1	16.7	3.0	3.0	0.0	66
North	5.0	3.3	5.0	25.0	28.3	16.7	6.7	3.3	6.7	60
N-West/West	2.2	4.3	2.3	10.9	26.1	34.8	15.2	4.3	0.0	46
S-West/Littoral	0.0	6.5	6.5	21.7	28.3	28.3	8.7	0.0	0.0	46
Total Provinces	3.1	5.4	5.3	20.7	25.1	24.7	10.4	3.1	2.2	271
Yaounde/Douala	3.6	7.1	14.3	16.1	28.6	23.2	7.1	0.0	0.0	56
TOTAL CAMEROON	3.1	5.6	6.2	20.2	25.4	24.4	10.1	2.8	2.0	327
Special Group	0.0	6.0	14.9	31.3	19.4	20.9	7.5	0.0	0.0	67

Children aged 24-59 months

PROVINCE	<7	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-12.9	13.0-13.9	14.0+	N
Central South*	0.0	3.6	9.8	17.0	27.7	19.6	13.4	8.0	0.9	112
East	1.0	1.0	8.2	20.6	23.7	26.8	14.4	3.1	1.0	97
North	0.7	2.9	5.7	10.7	22.1	25.0	15.0	9.3	8.6	140
N-West/West	0.0	0.0	5.1	4.2	15.3	31.3	27.1	13.6	3.4	118
S-West/Littoral	0.0	3.2	4.0	15.1	18.3	33.3	19.0	5.5	1.6	126
Total Provinces	0.2	2.2	6.1	11.1	20.6	27.3	18.8	9.4	4.3	593
Yaounde/Douala	2.0	1.0	5.0	18.0	18.0	31.0	13.0	10.0	2.0	100
TOTAL CAMEROON	0.2	2.1	6.0	11.8	20.3	27.8	18.2	9.5	4.1	693
Special Group	0.6	0.6	1.9	12.7	16.5	34.8	27.8	4.4	0.6	158

*Excluding Yaounde and Douala
(w) Weighted Percentage

9.10 HEMOGLOBIN GENOTYPE

Hemoglobin Electrophoresis was performed to determine the hemoglobin genotype in the child's blood. The types are as follows:

A A - Normal
A S - Sickle Cell Trait
S S - Sickle Cell Disease
Other - Other hemoglobin abnormalities

Results (Table 36)

Sickle Cell Trait occurred in 15.6% of children examined. Sickle Cell Disease was relatively uncommon since it was found in just under 1% of the sample. The prevalence rate of trait varied throughout the country, ranging from 11.9% to 22.2%. It was the least common in Yaounde/Douala and the North Province. Other hemoglobin abnormalities were found in 2.6% of the Cameroon Sample.

It is known that Sickle Cell Disease is an important cause of severe anemia but is a relatively uncommon cause of anemia for older ages because of its higher mortality effect at earlier ages.

9.11 EDEMA (Table 37)

Only 42 children in the total sample (0.6%) had bilateral pitting edema of the lower legs, the cardinal sign for kwashiorkor. It is possible that other cases of edema may have been overlooked, but even so the percentage would still be very low.

This percentage rate is consistent with the very low prevalence of acute undernutrition found throughout the country (1.0%). It should also be noted that the sign of edema is very insensitive in detecting the prevalence of acute undernutrition, as it identifies only a certain type of sever undernutrition, florid kwashiorkor.

Edema prevalence was low in all areas of the country, and least of all in Yaounde/Douala.

TABLE 36
PREVALENCE RATES OF HEMOGLOBIN GENOTYPE - BY AREA
Children aged 6-59 months

PROVINCE	AA	AS	SS	Sample Size
Central South*	76.1	22.2	1.7	176
East	79.4	20.0		175
North	87.2	11.9	0.9	226
N.West/West	71.5	17.3	0.6	179
S.West/Littoral*	75.7	18.1	0.6	177
Total Provinces*	80.8	15.9	0.9	933
ECOLOGICAL AREA				
North	88.0	11.0	1.0	191
Central Savannah	82.9	16.4	0.3	113
West Plateau	71.5	17.3	0.6	179
West Plains	75.6	18.2	0.6	189
South Forest	77.2	21.7	1.2	261
URBAN/RURAL				
Yaounde/Douala	81.9	12.7	1.2	166
Urban Cameroon*	77.2	18.0	0.5	173
Rural Cameroon	83.3	15.8	0.8	760
TOTAL CAMEROON	80.9	15.6	0.9	1099

*Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 37
PREVALENCE OF EDEMA - BY AREA
Percentage Distribution (w)

PROVINCE	
Central South*	0.5
East	1.5
North	0.8
N. West	0.9
West	0.4
S. West	0.4
Littoral*	1.8
Total Provinces*	0.7
ECOLOGICAL	
North	0.8
Central Savannah	0.6
West Plateau	0.7
West Plains	1.0
South Forest	0.8
URBAN/RURAL	
Yaounde/Douala	0.2
Urban Cameroon*	0.9
Rural Cameroon	0.7
TOTAL CAMEROON	0.6

* Excluding Yaounde and Douala
(w) Weighted Percent

9.12 CHILD CHARACTERISTICS

a. Person Interviewed by Relationship to Index Child and Person Caring for the Child (Tables 38 and 39)

The mother of the index child was interviewed about four fifths of the time. When she was absent, the father was usually interviewed (Table 38). The mother took care of the child in most cases - 86.3% (Table 39).

b. Birth Order of Index Child (Table 40)

Approximately 35% of the children were first or second born while about 30% of the children were third or fourth born. A birth order greater than 7 was found in 16.1% of all children.

c. Birthplace of Index Child (Table 41)

Half of the children sampled were born in a hospital while 25% of children were born in their homes, with a Traditional Birth Attendant (TBA) assisting and another 25% born in the homes without a TBA . Hospitals were most frequently used for child delivery in the Yaounde/Douala and urban areas (98.7 to 94.4%). Hospitals were least used in the Northern Province (16.6%), and East Province (39.8%) where the home served as the most common birthplace. In other provinces, birth in hospitals ranged from 67.9% to 92.8%. When children were born at home the proportion of TBAs assisting versus no TBA present was about the same for almost all provinces.

TABLE 38

PERSON INTERVIEWED BY RELATIONSHIP TO INDEX CHILD - BY AREA

Percentage Distribution (w)

PROVINCE	Mother	Father	G'mother	Other
Central South*	81.5	6.9	3.9	7.7
East	73.1	16.7	3.3	6.9
North	78.3	15.1	1.9	4.7
N. West	81.3	11.2	1.6	5.8
West	75.3	14.5	4.2	6.0
S. West	79.1	13.4	1.0	6.5
Littoral*	81.0	9.2	1.3	8.5
Total Provinces*	78.7	13.0	2.5	5.8
ECOLOGICAL				
North	77.4	15.5	2.2	5.0
Central Savannah	81.5	13.3	1.2	4.0
West Plateau	78.3	12.9	2.9	5.9
West Plains	79.9	11.6	1.1	7.4
South Forest	79.1	9.2	3.9	7.8
URBAN/RURAL				
Yaounde/Douala	80.3	8.6	1.2	9.8
Urban Cameroon*	79.3	10.1	2.9	7.7
Rural Cameroon	79.3	12.9	2.2	5.6
TOTAL CAMEROON	78.8	12.6	2.4	6.2

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 39

PERSON CARING FOR CHILD - BY AREA
Percentage Distribution (w)

PROVINCE	Mother	Father	G'mother	Sibling	Other
Central South*	81.2	2.1	8.6	2.9	5.3
East	80.7	4.5	7.0	2.6	5.3
North	89.8	1.8	2.9	2.5	3.1
N. West	85.4	5.2	3.8	0.9	4.7
West	80.2	6.7	5.3	4.7	3.1
S. West	91.1	4.2	1.2	2.2	1.4
Littoral*	83.2	6.2	2.1	3.1	5.4
Total Provinces*	86.3	3.0	4.4	2.6	3.7
ECOLOGICAL					
North	88.7	1.9	3.3	3.0	3.2
Central Savannah	90.9	2.7	2.4	1.4	2.6
West Plateau	82.8	5.9	4.6	2.8	3.9
West Plains	87.7	5.0	1.6	2.6	3.1
South Forest	80.0	2.6	8.9	2.7	5.7
URBAN/RURAL					
Yaounde/Douala	86.6	1.4	2.0	2.0	7.0
Urban Cameroon*	86.6	2.9	3.7	1.7	5.1
Rural Cameroon	86.8	2.8	4.3	2.8	3.4
TOTAL CAMEROON	86.2	2.8	4.2	2.5	4.3

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 40

BIRTH ORDER OF INDEX CHILD - BY AREA
Percentage Distribution (w)

PROVINCE	1-2	3-4	5-6	7-8	9-10	11+
Central South*	36.8	24.1	17.2	12.1	6.4	3.3
East	36.6	26.2	16.9	12.0	5.9	2.3
North	36.8	30.3	18.2	10.3	3.8	0.8
N. West	36.2	31.2	21.6	7.6	2.5	0.9
West	34.4	34.8	18.1	7.8	3.5	1.3
S. West	38.0	19.6	19.2	9.2	3.4	0.6
Littoral*	33.2	23.9	25.2	11.3	5.2	1.3
Total Provinces*	36.5	29.1	18.5	10.3	4.3	1.4
ECOLOGICAL						
North	36.0	30.5	18.6	10.4	3.9	0.7
Central Savannah	40.5	26.8	18.5	9.3	3.7	1.2
West Plateau	35.2	33.1	19.9	7.7	3.0	1.1
West Plains	35.8	27.1	21.8	10.3	4.1	0.9
South Forest	36.9	15.3	15.3	12.2	6.3	3.9
URBAN/RURAL						
Yaounde/Douala	43.1	23.4	18.9	12.0	3.6	0.8
Urban Cameroon*	37.1	29.5	19.7	8.6	3.7	1.5
Rural Cameroon	36.6	28.2	18.5	10.8	4.5	1.3
TOTAL CAMEROON	36.8	28.6	18.5	10.4	4.3	1.4

*Excluding Yaounde and Douala
(w) Weighted Percentage

TABLE 41

BIRTHPLACE OF INDEX CHILD - BY AREA
Percentage Distribution (w)

PROVINCE	Hospital	Home (TBA)**	Home (No TBA)	Other
Central South*	67.9	12.4	19.4	0.3
East	39.8	29.7	30.4	0.1
North	16.6	43.6	39.8	0.0
N. West	73.4	12.0	14.2	0.5
West	88.2	6.5	5.3	0.0
S. West	77.6	13.5	8.5	0.4
Littoral*	92.8	6.7	0.5	0.0
Total Provinces*	44.4	28.2	27.3	0.1
ECOLOGICAL				
North	12.7	44.6	42.7	0.0
Central Savannah	43.0	29.9	27.2	0.0
West Plateau	80.8	9.2	9.8	0.2
West Plains	84.1	10.5	5.2	0.2
South Forest	63.6	17.4	18.6	0.4
URBAN/RURAL				
Yaounde/Douala	98.7	0.4	0.6	0.3
Urban Cameroon*	94.4	1.9	3.7	0.0
Rural Cameroon	34.5	33.7	31.7	0.1
TOTAL CAMEROON	49.8	25.4	24.7	0.1

* Excluding Yaounde and Douala
** TBA - Traditional Birth Attendant
(w) Weighted Percent

9.13 HOUSEHOLD CHARACTERISTICS

a. Usual Occupation Household Head (Table 42)

The occupation codes strictly followed those derived for the 1976 Population Census and are listed in detail in Appendix 16 .

It should be noted that "agriculture" represents primarily subsistence farmers whereas "planter" includes those farmers with a cash crop or with livestock. Both groups are farmers.

Approximately three quarters (75.8%) of the household heads of the index child in Cameroon were primarily farmers. The proportion of farmers in rural areas was much higher (86.8%) than in urban areas (36%).

In all provinces but one, the planters were in greater proportions than those with subsistence farming (agriculture). The striking exception was in the North. In this province not only was there the highest prevalence of farmers (89%) but subsistence farmers comprised over 80% of all farmers.

The West Plains area had the greatest proportion of laborers (22.2%) other than Yaounde/Douala (34.7%). This is probably because of the huge industrial agricultural corporation (SOCOCAM) in that area.

The North contributes by far the least percentage of professional people (2.8%) throughout the country.

b. Household Size (Table 43)

Forty percent of all households surveyed had between five and seven members. Small households (up to four members) were common in Cameroon (19.2%). The highest prevalences of such numbers were in the North, South-West Province and rural Cameroon. In these areas larger households (11+) were less frequent than for other parts of the country (approximately 10% vs. 20%).

c. Type of House (Table 44)

The description of the house was graded into four types beginning with the thatched traditional and ranging through improved, semi-concrete to concrete (see Appendix 14).

Traditional houses where the index child lived were most common in the North (88.4%) and East Province (67.6%). About 60% of the houses in the West and Littoral Provinces were "improved". Semi-concrete and concrete houses were most frequent in Yaounde/Douala (65.1%) and the West (34.9%). These houses were rare in the East and North Province.

TABLE 42

PERCENTAGE FREQUENCY DISTRIBUTION

USUAL OCCUPATION HOUSEHOLD HEAD BY AREA (w)

PROVINCE	Agriculture	Planter	Laborer	Unemp. H'wife	Professional	Commercial	Services	Military Police	Sample Size
Central South*	16.5	57.2	7.2	2.3	10.6	3.0	0.6	2.5	526
East	18.9	60.7	6.5	0.4	7.2	4.8	0.6	0.9	539
North	74.3	14.7	3.8	0.8	2.8	2.7	0.1	0.8	781
N. West	27.1	48.2	7.2	0.0	9.6	7.6	0.0	0.4	251
West	17.6	47.1	10.9	1.4	13.6	7.7	0.0	1.8	221
S. West	12.3	47.7	20.0	1.2	7.1	8.3	0.0	3.4	325
Littoral*	22.5	32.6	25.6	1.8	13.2	2.6	0.4	1.3	227
Total Provinces*	48.0	32.2	7.0	1.1	6.3	3.9	0.2	1.3	2870
ECOLOGICAL AREA									
North	80.3	11.3	2.9	0.5	2.1	2.0	0.2	0.8	654
Central Savannah	41.0	34.2	8.2	1.4	7.4	6.4	0.2	1.3	400
West Plateau	22.7	47.7	8.9	0.6	11.4	7.6	0.0	1.1	472
West Plains	16.6	41.5	22.2	1.5	9.6	6.0	0.2	2.5	590
South Forest	9.2	66.9	7.3	2.1	9.2	3.3	0.5	1.5	754
URBAN/RURAL									
Yaounde/Douala	0.8	0.4	34.7	3.6	32.5	18.1	3.0	7.1	513
Urban Cameroon*	9.9	26.1	27.6	1.2	19.0	10.7	0.5	4.9	488
Rural Cameroon	54.3	32.5	4.5	1.1	4.2	2.5	0.2	0.7	2382

TABLE 43

PERCENTAGE FREQUENCY DISTRIBUTION - HOUSEHOLD SIZE (w)

PROVINCE	-4	5-7	8-10	11-15	16-20	21+	Sample Size
Central South*	11.6	34.9	27.5	18.4	4.6	3.1	527
East	13.7	34.8	28.3	16.8	4.5	2.1	537
North	24.4	41.2	21.5	9.5	2.7	0.8	781
N-West	14.0	40.2	23.5	12.0	6.4	4.0	251
West	17.4	37.7	20.0	15.0	4.1	6.0	222
S-West	23.1	39.8	22.8	10.5	2.8	0.9	324
Littoral*	8.4	48.9	18.9	18.1	4.0	1.8	227
Total Provinces*	19.6	39.6	23.0	12.4	3.5	2.0	2869
ECOLOGICAL AREA							
North	24.3	41.1	21.6	9.5	2.8	0.8	654
Central Savannah	21.1	40.8	24.2	10.5	2.4	1.0	400
West Plateau	15.5	39.1	21.9	13.4	5.3	4.8	471
West Plains	17.1	43.5	21.2	13.6	3.3	1.3	589
South Forest	10.7	34.6	27.7	18.9	4.8	3.3	753
URBAN/RURAL							
Yaounde/Douala	13.3	36.8	29.6	15.5	3.9	0.9	512
Urban Cameroon*	11.3	37.3	24.8	17.5	4.7	4.3	487
Rural Cameroon	20.8	40.7	22.8	11.5	3.2	1.2	2382
TOTAL CAMEROON	19.2	39.4	23.4	12.6	3.6	1.9	3381

*Excluding Yaounde and Douala
(w) Weighted Percentage

TABLE 44
PERCENTAGE DISTRIBUTION:
TYPE OF HOUSE

PROVINCE	Traditional	Improved	Semi-Strong	Strong	Sample Size
Central South*	33.0	43.6	15.2	8.2	342
East	67.6	20.1	8.8	3.5	343
North	88.4	5.2	2.7	3.7	438
N-West	42.2	39.8	13.0	5.0	161
West	4.6	60.5	23.7	11.2	152
S-West	36.1	37.7	19.9	6.3	191
Littoral*	16.1	58.0	14.0	11.9	143
Yaounde/Douala	1.5	33.4	29.9	35.2	341

*Excluding Yaounde/Douala

9.14 FAMILY CHARACTERISTICS

a. Method of Cooking in Family (Table 45)

Almost invariably throughout all provinces, wood was the source of fuel for cooking. In Yaounde/Douala, a substantial proportion of families used kerosene (30%) and gas (13.2%).

b. Animals Owned by Family (Tables 46-51)

The frequency of families owning at least one animal is shown in Table 51. Cattle, sheep and goats were most commonly owned in the North, as compared with other provinces. Pigs were kept most frequently in the West, South-West and Central South Provinces. Between 60% and 80% of families in the Central South, East, North and North-West owned at least one type of poultry.

Other than poultry, it was uncommon for families to have more than ten animals of one type. In the North Province, 16.9% of families had more than five cattle, 18.7% had more than five sheep and 19% more than five goats.

c. Family Sale of Cash Crops (Table 52)

More than half of the families in the South-West and Littoral Provinces and almost three-quarters of families in the other provinces, sold cash crops. Family sale of cash crops was rare in Yaounde/Douala (3.2%).

TABLE 45

PERCENTAGE DISTRIBUTION:

METHOD OF COOKING IN FAMILY - BY PROVINCE

PROVINCE	Wood	Coal	Kerosine	Gas	Electricity
Central South*	97.4	0.0	0.9	1.7	0.0
East	99.1	0.0	0.3	0.6	0.0
North	99.1	0.0	0.5	0.4	0.0
N-West	100.0	0.0	0.0	0.0	0.0
West	99.3	0.7	0.0	0.0	0.0
S-West	94.8	0.5	4.7	0.0	0.0
Littoral*	97.2	0.0	2.1	0.7	0.0
Yaounde/Douala	56.7	0.6	30.0	13.2	0.5

*Excluding Yaounde/Douala

TABLE 46
PERCENTAGE DISTRIBUTION:
NUMBER OF CATTLE OWNED BY FAMILY - BY PROVINCE

PROVINCE	Number of Cattle						
	0	1	2	3-4	5-10	10+	UNK.
Central South*	100.0	0.0	0.0	0.0	0.0	0.0	0.0
East	97.3	0.0	0.3	0.0	0.6	1.8	0.0
North	62.8	6.4	4.3	9.1	8.2	8.7	0.5
N-West	87.7	1.2	1.2	3.1	1.2	5.6	0.0
West	98.6	0.7	0.0	0.7	0.0	0.0	0.0
S-West	99.5	0.0	0.0	0.0	0.5	0.0	0.0
Littoral*	99.3	0.7	0.0	0.0	0.0	0.0	0.0
Yaounde/Douala	99.4	0.0	0.0	0.0	0.0	0.3	0.3

TABLE 47

PERCENTAGE DISTRIBUTION:

NUMBER OF SHEEP OWNED BY FAMILY - BY PROVINCE

PROVINCE	Number of Sheep						
	0	1	2	3-4	5-10	10+	UNK.
Central South*	82.1	5.3	4.4	5.0	3.2	0.0	0.0
East	87.4	4.7	1.5	4.1	1.5	0.8	0.0
North	59.4	3.2	7.3	11.2	12.6	6.1	0.2
N-West	90.1	1.9	0.6	4.3	0.6	1.9	0.6
West	92.0	2.7	0.7	3.3	0.0	1.3	0.0
S-West	93.2	1.1	3.1	1.0	1.0	0.6	0.0
Littoral*	95.1	4.9	0.0	0.0	0.0	0.0	0.0
Yaounde/Douala	97.7	0.6	0.0	0.9	0.3	0.3	0.2

*Excluding Yaounde/Douala

TABLE 48

PERCENTAGE DISTRIBUTION:

NUMBER OF GOATS OWNED BY FAMILY - BY PROVINCE

	Number of Goats						
PROVINCE	0	1	2	3-4	5-10	10+	UNK.
Central South*	70.7	8.6	8.9	8.0	3.5	0.3	0.0
East	81.9	6.7	3.5	4.1	2.6	1.2	0.0
North	52.6	4.6	7.3	16.3	14.4	4.6	0.2
N-West	80.9	2.5	4.3	3.7	5.6	1.8	1.2
West	82.7	3.3	8.0	4.6	0.7	0.7	0.0
S-West	83.8	4.2	4.7	4.2	3.1	0.0	0.0
Littoral*	84.6	6.3	2.8	4.2	2.1	0.0	0.0
Yaounde/Douala	95.9	1.4	0.9	0.6	0.6	0.3	0.3

TABLE 49

PERCENTAGE DISTRIBUTION:

NUMBER OF PIGS OWNED BY FAMILY- BY PROVINCE

	Number of Pigs						
PROVINCE	0	1	2	3-4	5-10	10+	UNK.
Central South*	76.6	8.9	3.0	5.0	4.7	1.5	0.3
East	84.5	4.7	3.8	3.8	2.9	0.3	0.0
North	97.3	0.9	0.0	0.2	0.9	0.5	0.2
N-West	83.3	8.7	4.3	1.9	1.2	0.0	0.6
West	62.4	24.1	9.4	2.7	0.7	0.7	0.0
S-West	75.9	14.1	4.1	4.2	1.0	0.0	0.5
Littoral*	95.1	4.2	0.0	0.7	0.0	0.0	0.0
Yaounde/Douala	97.9	0.3	0.6	0.0	0.9	0.0	0.3

*Excluding Yaounde/Douala

TABLE 50

PERCENTAGE DISTRIBUTION:

NUMBER OF POULTRY OWNED BY FAMILY - BY PROVINCE

PROVINCE	0	1	2	3-4	5-10	10+	UNK.
Central South*	27.9	5.9	9.7	14.4	25.0	15.0	2.1
East	29.2	6.4	7.9	17.6	22.8	15.2	0.9
North	33.9	4.3	11.7	10.1	22.6	17.2	0.2
N-West	40.4	1.2	8.1	11.8	18.0	20.5	0.0
West	52.3	5.3	7.3	12.6	13.2	8.0	1.3
S-West	58.6	3.2	7.3	13.6	8.4	8.4	0.5
Littoral*	67.1	5.6	6.3	6.3	12.6	2.1	0.0
Yaounde/Douala	78.6	1.8	3.8	3.2	6.4	5.3	0.9

*Excluding Yaounde/Douala

TABLE 51

PERCENTAGE DISTRIBUTION

ANY ANIMALS OWNED BY FAMILY - BY PROVINCE

	Animals				
PROVINCE	Cattle	Sheep	Goats	Pigs	Poultry
Central South*	0.0	17.9	29.3	23.3	71.6
East	2.7	12.6	18.1	15.5	70.5
North	37.0	40.5	47.3	2.5	66.0
N-West	12.3	9.4	18.8	16.2	59.6
West	1.4	8.0	17.3	37.6	47.1
S-West	0.5	6.8	16.2	23.7	41.2
Littoral*	0.7	4.9	15.4	4.9	32.9
Yaounde/Douala	0.3	2.3	3.8	2.1	21.4

* Exclduing Yaounde/Douala

TABLE 52

FAMILY SALES OF CASH CROPS - BY PROVINCE

PROVINCE	% YES	% NO
Central South*	73.2	26.8
East	74.0	26.0
North	70.5	29.5
N-West	72.8	27.2
West	71.6	28.4
S-West	57.3	42.7
Littoral*	54.9	45.1
Yaounde/Douala	3.2	96.8

* Excluding Yaounde/Douala

9.15 MATERNAL CHARACTERISTICS

a. Present at Interview

Approximately 80% of the mothers were present for interview. Their total numbered 3350.

b. Age of Mother Present (Table 53)

The age of the mother present for interview was categorized in three groups: under 21, 21-40 and over 40 years. It should be noted that usually there was no means to verify the ages, so that a certain overlap between groups may be expected.

Approximately 80% of all mothers present were between 21-40 years of age and 17.1% were less than 21 years. Mothers over 40 years were rare (3.6%). For this reason only two major age groups were adopted in the analysis of mothers' results: under 21 and over 21 years, as well as total mothers.

Within the constraints of low sample size for some areas, the distribution by age was generally uniform throughout all provinces and areas of the country.

c. Usual Occupation of Mothers (Table 54)

The occupation codes for mothers were the same as for household heads (see Appendix 16 for details).

Almost 60% of Cameroon mothers were both farmers and housewives as the usual occupation. The remainder were invariably housewives. The North-West had the highest frequency of farming mothers (84.3%). As expected there was twice the proportion of mothers involved in agriculture in rural areas as compared with that of urban areas (66.6% vs. 30.6%).

Throughout all areas, it was extremely rare for a mother of a young child to be involved primarily in cash crop farming or owning livestock. In most of these countries livestock is a family property.

Only in Yaounde was there an important proportion of mothers who were professionals (9.0%).

d. Mothers' Ability to Read Languages (Tables 55-56)

One quarter of all mothers in Cameroon were able to read either French or English (Table 55). Only a minority read English (3.9%). As expected the highest proportion of mothers reading French were in Yaounde, Douala and Central South Province, and those reading English were in South-West, North-West and Yaounde. Very few mothers in the North read either French or English.

Languages other than French or English were read by 11.9% of the sample of Cameroon mothers (Table 56). The Central South mothers were able to read a variety of languages including Boulou (9.7%), Beti (8.4%) and Bassa (6.5%). (Table 56). In Yaounde, the predominant language other than French or English was Beti (17.6%) and in Douala, it was Douala (12.7%) and Bassa (8.2%). These reflect ethnic preponderance in these respective areas.

e. Marital Status of Mother of Index Child (Tables 57-58)

Mothers belonging to polygamous families were almost as common as those who were monogamous (40.4% vs. 52.4%). Seven percent of all mothers in Cameroon were unmarried (Table 57).

The proportion of unmarried mothers aged under 21 years was higher than for those aged over 21 years (16.1% vs. 5.4%). More striking was the high prevalence of young unmarried mothers in the Central South (46%) East Provinces (34.1%), and in Yaounde/Douala (32.8%). The rarity in the North (0.7%) was very remarkable. (Table 58).

TABLE 53

AGE DISTRIBUTION OF MOTHERS PRESENT BY AREA (w)

PROVINCE	Age in years -21 %	-21 N	21-40 %	21-40 N	41+ %	41+ N	TOTAL N
Central South*	19.0	(102)	75.3	(405)	5.7	(31.)	538
East	15.9	(86)	76.2	(412)	7.9	(43.)	541
North	18.5	(145)	79.2	(621)	2.3	(18.)	784
N-West	10.0	(25)	88.0	(219)	2.0	(5.)	249
West	14.3	(33)	79.7	(184)	6.0	(14.)	231
S-West	17.9	(51)	79.6	(226)	2.5	(7.)	284
Littoral*	8.4	(19)	84.9	(191)	6.7	(15.)	225
Total Provinces*	17.2	(461)	79.2	(2258)	3.6	(133.)	2852
ECOLOGICAL AREA							
North	17.5	(116)	79.9	(528)	2.6	(17.)	661
Central Savannah	19.4	(74)	75.3	(287)	5.3	(20.)	381
West Plateau	12.0	(58)	84.0	(403)	4.0	(19.)	480
West Plains	13.4	(72)	82.1	(445)	4.5	(24.)	541
South Forest	17.9	(141)	75.4	(595)	6.7	(53.)	789
URBAN/RURAL							
Yaounde	22.4	(47)	75.2	(158)	2.4	(5.)	(210)
Douala	12.3	(36)	86.0	(251)	1.7	(5.)	(292)
Urban Cameroon*	14.2	(68)	80.7	(403)	5.1	(23.)	(494)
Rural Cameroon	17.6	(393)	79.1	(1851)	3.3	(110.)	(2354)
TOTAL CAMEROON	17.1	(544)	79.3	(2663)	3.6	(143.)	(3350)

*Excluding Yaounde and Douala
(w) Weighted Percentage

TABLE 54

PERCENTAGE FREQUENCY DISTRIBUTION

USUAL OCCUPATION - MOTHER OF INDEX CHILD BY AREA (W)

PROVINCE	Agriculture	Planter	Laborer	Unemp. H'wife	Professional	Commercial	Services	Military Police	Sample Size
Central South*	58.6	0.4	0.6	37.5	2.2	0.7	0.0	0.0	538
East	67.3	0.2	0.0	30.3	1.3	0.7	0.2	0.0	541
North	59.6	0.0	0.3	38.7	0.1	1.3	0.0	0.0	784
North-West	84.3	0.0	0.4	13.3	1.6	0.4	0.0	0.0	249
West	61.9	0.0	0.9	35.9	0.4	0.9	0.0	0.0	231
South-West	54.8	0.4	0.7	39.2	0.4	4.6	0.0	0.0	284
Littoral*	61.3	0.0	0.0	36.9	1.3	0.4	0.0	0.0	225
Total Provinces*	61.6	0.1	0.4	36.0	0.8	1.2	0.0	0.0	2852
ECOLOGICAL AREA									
North	65.6	0.0	0.0	32.7	0.2	1.5	0.0	0.0	661
Central Savannah	45.6	0.2	1.1	51.7	1.1	0.5	0.0	0.0	381
West Plateau	73.5	0.0	0.6	24.2	1.0	0.6	0.0	0.0	480
West Plains	57.7	0.2	0.4	38.1	0.8	2.7	0.0	0.0	541
South Forest	58.9	0.0	0.4	38.7	1.1	0.8	0.1	0.0	789
URBAN/RURAL									
Yaounde	1.0	0.0	0.0	84.8	9.0	4.3	0.0	1.0	(210)
Douala	0.0	0.0	0.0	93.5	2.7	3.4	0.0	0.3	(292)
Urban Cameroon*	30.6	0.0	0.5	64.1	2.0	2.7	0.1	0.0	(494)
Rural Cameroon	66.6	0.1	0.4	31.4	0.5	1.0	0.0	0.0	(2354)
TOTAL CAMEROON	58.3	0.1	0.3	38.9	1.0	1.3	0.0	0.0	(3350)

* Excluding Yaounde and Douala

(w) Weighted Percent

TABLE 55
PERCENTAGE FREQUENCY OF MOTHER'S ABILITY TO READ LANGUAGES (w)

PROVINCE	English	French	Either French or English	Other than French or English	French or English with Other	No Language Read
Central South*	2.4	61.3	61.7	28.6	24.5	33.8
East	0.9	32.0	32.2	6.3	4.6	66.4
North	0.1	4.1	4.2	8.5	1.3	88.1
N-West	15.3	2.0	16.9	2.0	2.0	83.1
West	1.3	34.2	34.6	2.6	2.2	64.9
S-West	29.9	3.2	33.1	1.4	1.1	64.6
Littoral*	2.2	38.1	40.0	8.0	8.0	59.8
Total Provinces*	3.4	19.4	22.4	10.9	6.1	72.6
ECOLOGICAL AREA						
North	0.2	4.6	4.8	6.4	1.5	90.2
Central Savannah	0.3	13.1	13.3	13.6	5.2	68.5
West Plateau	8.5	17.5	25.4	2.3	2.1	74.4
West Plains	17.6	18.8	36.6	5.5	5.2	61.2
South Forest	2.3	58.0	58.2	19.4	16.5	45.9
URBAN/RURAL						
Yaounde	18.1	88.6	90.0	39.5	37.1	7.6
Douala	9.2	70.5	71.2	27.7	24.0	25.7
Urban Cameroon*	8.8	34.7	42.2	14.6	7.8	51.3
Rural Cameroon	2.8	17.5	20.0	10.1	6.0	75.6
TOTAL CAMEROON	3.9	22.4	25.2	11.9	7.2	69.9

Special Group
*Excluding Yaounde and Douala
(w) Weighted Percentage

TABLE 56

PERCENTAGE FREQUENCY OF MOTHER'S ABILITY TO READ LANGUAGES (OTHER THAN ENGLISH AND FRENCH) (w)

PROVINCE	Beti	Foulbe Arabe	Bamalike Bamoun	Bassa	Douala	Boulou	Unclass-ified	Total Other
Central South*	8.4	0.2	0.0	6.5	0.4	9.7	3.5	28.6
East	2.6	0.2	0.0	0.0	0.0	1.3	2.2	6.3
North	0.0	6.6	0.0	0.0	0.0	0.1	1.8	8.5
N. West	0.0	0.0	0.0	0.0	0.8	0.0	1.2	2.0
West	0.4	0.0	1.7	0.0	0.0	0.0	0.4	2.6
S. West	0.0	0.0	0.4	0.0	0.4	0.4	0.4	1.4
Littoral*	0.9	0.0	0.0	4.4	1.8	0.0	0.4	8.0
Total Provinces*	1.8	3.6	0.2	1.4	0.2	2.0	1.9	10.9
ECOLOGICAL AREA								
North	0.0	4.1	0.0	0.0	0.0	0.2	2.1	6.4
Central Savannah	1.8	7.1	0.0	0.3	0.5	1.0	2.9	13.6
West Plateau	0.2	0.0	0.8	0.0	0.4	0.0	0.8	2.3
West Plains	0.7	0.0	0.4	1.8	0.9	0.2	1.5	5.5
South Forest	6.3	0.0	0.0	4.3	0.0	7.0	1.8	19.4
URBAN/RURAL								
Yaounde	17.6	2.9	3.8	2.9	1.4	1.4	9.5	39.5
Douala	2.1	0.0	0.0	8.2	12.7	0.7	4.1	27.7
Urban Cameroon*	1.4	5.7	1.0	2.0	1.1	1.3	2.1	14.6
Rural Cameroon	1.9	2.9	0.0	1.3	0.1	2.1	1.7	10.1
TOTAL CAMEROON	2.0	3.4	0.2	1.6	0.7	1.9	2.1	11.9

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 57
PERCENTAGE FREQUENCY FOR MARITAL STATUS MOTHER OF INDEX CHILD (w)
ALL MOTHERS- BY AREA

PROVINCE	Marital Status Monogamous	Polygamous	Not Married
Central South*	53.0	24.7	22.3
East	53.8	36.9	9.3
North	52.8	46.1	1.2
N. West	49.8	44.9	5.3
West	37.4	57.8	4.8
S. West	55.5	32.4	12.1
Littoral*	56.7	34.8	8.5
Total Provinces*	51.8	41.3	6.9
ECOLOGICAL AREA			
North	52.1	46.6	1.2
Central Savannah	56.3	39.3	4.4
West Plateau	43.8	51.2	5.0
West Plains	56.0	33.4	10.6
South Forest	53.1	27.4	19.5
URBAN/RURAL			
Yaounde/Douala	62.8	23.5	13.6
Urban Cameroon*	46.1	44.9	9.0
Rural Cameroon	54.4	38.6	7.0
TOTAL CAMEROON	52.4	40.4	7.2

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 58

PERCENTAGE FREQUENCY FOR MARITAL STATUS
MOTHER OF INDEX CHILD - By Area and Age (w)

	Mothers Aged Under 21				Mothers Aged 21+			
PROVINCE	Mono-gamous	Poly-gamous	Not Married	Sample Size	Mono-gamous	Poly-gamous	Not Married	Sample Size
Central South*	37.0	17.0	46.0	102	56.7	26.5	16.7	436
East	38.8	27.1	34.1	86	56.6	38.7	4.6	455
North	61.8	37.5	0.7	145	50.7	48.0	1.3	639
N. West/West	8.3	32.7	19.0	58	43.2	53.7	3.1	422
S. West/Littoral*	1.4	18.5	27.1	70	56.4	35.8	7.8	439
Total Provinces*	53.7	30.9	15.4	461	51.5	43.4	5.1	2391
ECOLOGICAL AREA								
North	61.7	37.4	0.9	116	50.8	48.1	1.1	545
Central Savannah	62.1	31.9	6.0	74	54.8	41.0	4.2	307
West Plateau	48.3	32.8	19.0	58	44.0	52.8	3.3	422
West Plains	54.4	18.5	27.1	72	55.9	36.2	7.9	469
South Forest	31.4	19.1	49.5	141	57.2	29.8	13.1	648
URBAN/RURAL								
Yaounde/Douala	52.1	15.1	32.8	83	64.9	25.0	10.0	419
Urban Cameroon*	35.2	41.3	23.5	68	48.0	45.5	6.6	426
Rural Cameroon	57.5	27.4	15.1	393	53.8	41.0	5.3	1961
TOTAL CAMEROON	53.6	30.2	16.1	544	52.1	42.5	5.4	2810

* Excluding Yaounde and Douala
(w) Weighted Percent

9.16 MORTALITY ASSOCIATED WITH MEASLES

a. Introduction

Mortality associated with measles was investigated because of its extreme importance in health and nutrition policies. Care was taken to obtain essential information which could be readily acquired from the mother. The questions were brief and simple and based on a short time span (past 12 months) to be within her expected memory range.

The following questions were asked to the mother about child deaths in her own family:

1. How many children were born alive (cried) during past 12 months or since last Christmas (1976) or Ramadan (Dec., 1976)? The latter was asked if rural mother could not identify 12 months ago.
2. How many children aged up to 5 years, died during the past 12 months (or last Christmas, etc.)?
3. Of those who died, what was the age of death (in months)?
4. How many children aged up to 5 years, had measles during the past 12 months?
5. How many of these children with measles in the past 12 months died with the disease?

The total number of children aged up to 5 years (i.e., 0-4 years) was the sum of the children born alive (item 1 above) and the number of children aged 12-59 months (i.e., 1-4 years) who were measured in the families of the interviewed mothers.

It should be noted that, because of the unreliability of reporting the correct age of death (Item 3, above), age-specific mortality rates are not presented in this report.

The following rates, pertaining to measles and non-measles mortality were calculated, using the data from Central South Province as an example (Table 59):

- Percent of children aged 0-4 years with measles the past year (Measles Incidence) Column 3 in Table 59

$$\frac{\text{Number with Measles}}{\text{Total Number}} \times 100 = \frac{206}{814} \times 100 = 25.3\%$$

- Measles Case Fatality Rate (MCFR) Column 6

Percentage of children 0-4 years who died from measles

$$\frac{\text{Number of Deaths with Measles}}{\text{Number with Measles}} \times 100 = \frac{8}{206} \times 100 = 3.9\%$$

- Non-Measles Case Fatality Rate (NMCFR) Column 7

Percentage of children 0-4 years who died from other diseases, measles excluded.

$$\frac{\text{Number of Deaths from Other Diseases}}{\text{Total Number without Measles Deaths}} \times 100 = \frac{31}{814-8} \times 100 = 3.8\%$$

- Percentage of all deaths of children 0-4 years due to measles Column 8

$$\frac{\text{Number of Deaths with Measles}}{\text{Total Number of Deaths}} \times 100 = \frac{8}{39} \times 100 = 20.5\%$$

It should be noted that in the tables only the rates are weighted, the raw data is not. The raw data is included to indicate the actual sample sizes.

TABLE 59

MEASLES PREVALENCE AND MORTALITY DURING PAST YEAR FOR CHILDREN (AGED 0-4 YEAR) IN INDEX FAMILY BY AREA (w)

PROVINCE	Children Aged 0-4 Years: Number With Measles (1)	Number With No Measles (2)	% With Measles (3)	Number Died Measles (4)	Number Died No Measles (5)	Percentage Case Fatality Rate Measles (6)	Percentage Case Fatality Rate No Measles (7)	Percentage Deaths Due to Measles (8)
Central South*	206	608	25.3	8	31	3.9	3.8	20.5
East	144	665	17.8	2	37	1.4	4.6	5.1
North	132	1011	11.5	13	37	9.8	3.3	26.0
North West	68	314	17.8	1	9	1.5	2.4	10.0
West	73	303	19.4	2	9	2.7	2.4	18.2
South West	42	386	9.8	5	4	11.9	0.9	55.6
Littoral*	56	285	16.4	3	4	5.4	1.2	42.9
Total Provinces	721	3572	16.6	34	131	6.0	2.8	24.5
ECOLOGICAL								
North	116	846	12.1	13	28	11.2	2.9	31.7
Central Savannah	51	477	7.5	1	22	0.4	4.3	1.4
West Plateau	141	617	18.6	3	18	2.1	2.4	14.3
West Plains	142	678	19.6	11	8	8.1	0.9	53.0
South Forest	271	952	24.1	6	55	2.6	4.4	12.9
URBAN/RURAL								
Yaounde/Douala	152	680	18.3	3	19	2.0	2.3	12.8
Urban Cameroon	120	638	12.5	5	21	4.1	2.5	17.0
Rural Cameroon	721	2814	17.0	29	110	6.2	2.9	23.5
TOTAL CAMEROON	993	4132	16.8	37	150	5.6	2.7	23.4

b. Results

i/Measles Mortality for Cameroon

Approximately one in six children aged 0-4 years in this study had measles during the past year. The Case Fatality Rate for measles was 5.6% and for conditions other than measles was 2.7%. One quarter of all deaths in young children were due to or associated with measles.

ii/Measles Mortality Rates Within Cameroon

Because of the relatively low sample sizes, all results should be reviewed with caution. For example, those for North-West and West should be considered together, as well as South-West and Littoral Provinces. Results for Central Savannah should be regarded with special caution. In spite of these limitations, a general overview of measles mortality rates throughout Cameroon is possible.

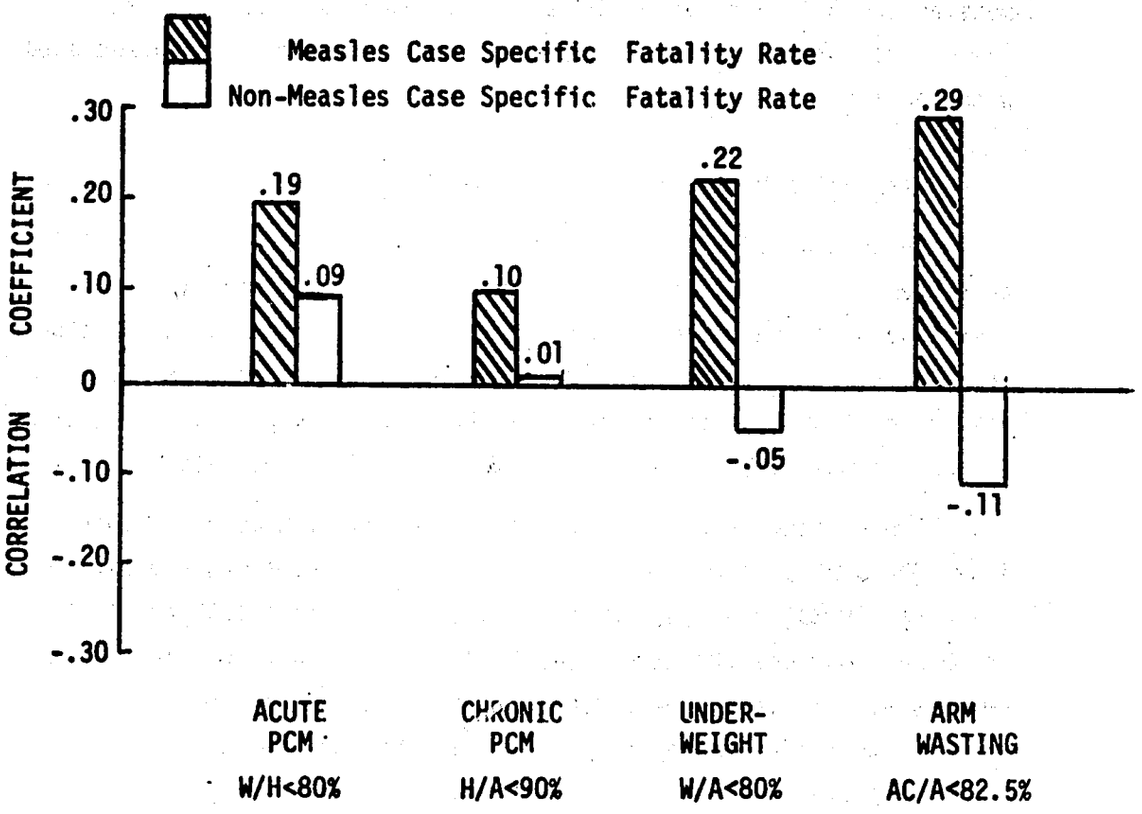
The percentage of children under 5 years with measles ranged from 10% to 25%. The Case Fatality Rate for measles was highest in the North (9.8%) and South West/Littoral Provinces (11.9% and 5.4%). In these provinces the Case Fatality Rate for conditions other than measles was far less. The percentage of deaths due to measles varied greatly, the major reason being possibly the low sample size for deaths reported. However, it is illustrative of the importance of measles in young child mortality throughout Cameroon.

Measles mortality rates were consistently higher in Rural Cameroon as compared with Urban areas. The differences were usually not marked. Measles was common, occuring in 18.3% of all children under 5 years. Case-specific mortality rate for measles in Yaounde/Douala was relatively low (2.0%), as compared to the rest of the country.

With regards to the Ecological areas, both the North and West Plains had the highest case-specific mortality rate for measles.

Figure 7

CORRELATION COEFFICIENTS ACCORDING TO AVERAGE VALUES BY SITE OF UNDERNUTRITION (PCM) PREVALENCE RATES WITH CASE SPECIFIC FATALITY RATES FOR MEASLES AND NON-MEASLES



Explanation

Each column represents the correlation coefficient ('r' value) for the 190 sites, between the particular type of undernutrition and the Case Specific Fatality Rates for Measles and Non-Measles (i.e. those children not having measles).

Although the 'r' values are rather weak for undernutrition with measles fatality rates (ranging from .10 to .29), they are consistently positive. This suggests that the higher the undernutrition rate per site, the higher the measles fatality rate is likely to be. On the other hand, there is no such consistent relationship between undernutrition and non-measles fatality rates.

c. Discussion

Measles commonly occurred, and more important was a very common cause of death in children under 5 years. This occurs in populations where undernutrition is common (53) due to the interaction of malnutrition and infection (54). Deaths from measles are much rarer in well nourished populations. Based on this survey data, it would appear that approximately 15,000 children in Cameroon aged 0-4 years died in the past year from complications of measles.

An immunization program for measles had been recently commenced by the Government of Cameroon through the Organisation de Coordination pour la lutte contre les Endemies en Afrique Centrale (OCEAC). It would be useful to review this survey's data with those of OCEAC. The need and importance of such a program is highlighted by the results from this survey.

Measles mortality rates reflect the general health of the young child populations, facilities of health care (e.g., MCH services for child delivery and later care), general socio-economic factors and other factors, such as nutritional status. Such rates comprise only one piece of evidence in the total assessment of health care.

A clear although weak relationship emerged between measles mortality and nutritional status, where a consistently positive correlation was found (Figure 7). The higher the case specific fatality rate for measles, the higher the prevalence rate of undernutrition (acute, underweight and arm wasting) in the index children of the same families.

The high measles mortality rate for the North province (and particularly the North ecological area) therefore confirms the higher prevalence rates for undernutrition reported earlier (pp 80). Conversely, the low measles mortality rates for Yaounde/Douala tend to confirm the relatively better nutritional status in these cities. However, better health services could also explain the low mortality rates for children.

d. Problems in Methodology

Certain problems in data collection, analysis and interpretation should be noted.

1. There were inconsistencies in the period defined, i.e., the past 12 months. This would probably pertain more to the rural areas. The survey continued for 2 months, so that areas visited towards the latter part of the survey (Western Provinces, Douala) might tend to have a different rate than areas visited earlier.

2. Non-attendance of mothers or children.

- Mother not present but child present (in about 20% of cases), in which case no mortality information was requested.
- Mother present, child absent (probably about 10% of cases).
- Both mother and child under 5 years absent (unknown numbers).

3. The survey included only those mothers who had a child under 5 years at the time of the interview. It would miss mothers with young child deaths during the past year and no child under 5 years remaining alive. It would also exclude mothers whose youngest child at the time of interview was over 5 years i.e. 59-71 months, who had a chance of dying during the past year. The number of these children was not known.

9.17 HEALTH CHARACTERISTICS

a. Health of Child Past Week (Tables 60&61)

Sickness, diarrhea or fever with children aged 3-23 months (for at least two days) was common throughout all provinces (17.1-31.2%) as well as in Yaounde/Douala (22%). (Table 60). A combination of all three occurred in approximately 10% of children, ranging from 6.9% in the Littoral Province to 17.4% in the South-West. (Table 61). The absence of any of these conditions was noted in 63.8% to 77.5% of young children.

b. Measles

See section on Measles Mortality p. 136.

9.18 WATER AVAILABILITY

a. Source of Water (Table 62)

The source of water was categorized in five groups ranging from the least to the most convenient and protected.

A river was the most frequent water source throughout all provinces. Unprotected wells were fairly common in the Central South, East and North Provinces (20.2 to 26.9%). Water from protected sources, pumps and private taps was collected most frequently in the South-West and Littoral Provinces (40-45%) followed by Central-South and East (28-31%) and the remainder (about 25%).

In Yaounde/Douala, approximately 88% of the families obtained water from either a pump or private source.

b. Distance Away from Water (Table 63)

In all provinces, 80-90% of the families had ready access to water (within 30 minutes away). In the North and South-West approximately 5% of the families had to travel one to three hours to reach water. Throughout all Cameroon it was extremely rare for a family to be found at any greater distance away from water.

TABLE 60

PERCENTAGE DISTRIBUTION OF INDIVIDUAL SYMPTOMS
FOR PAST WEEK - BY PROVINCE

Child Group 3-23 Months

PROVINCE	% Sick	% Diarrhea	% Fever
Central South*	20.1	13.0	21.9
East	17.1	16.8	16.0
North	17.3	14.4	19.0
N-West	22.4	18.1	24.7
West	22.8	24.0	25.1
S-West	31.2	22.4	34.4
Littoral*	17.1	11.4	19.0
Yaounde/Douala	22.0	16.4	24.5

* Excluding Yaounde/Douala

TABLE 61

PERCENTAGE DISTRIBUTION OF COMBINED SYMPTOMS
FOR PAST WEEK - BY PROVINCE

Child Group Aged 3-23 Months

PROVINCE	% Sick, Diarrhea & Fever	% Sick, Fever No Diarrhea	% No Symptoms	% Other Combinations
Central South*	11.4	7.4	75.5	5.7
East	8.9	4.3	77.5	9.3
North	9.4	5.5	76.3	8.8
N-West	13.2	7.4	72.6	6.8
West	13.7	5.7	65.1	15.5
S-West	17.4	12.1	63.8	6.8
Littoral*	6.9	6.3	75.5	11.3
Yaounde/Douala	9.0	9.2	68.2	13.6

*Excluding Yaounde/Douala

TABLE 62

PERCENTAGE DISTRIBUTION:

WATER SOURCE OF FAMILY - BY PROVINCE

PROVINCE	River	Well	Source: Protected	Pump	Private	Other
Central South*	51.9	20.2	14.1	13.2	0.6	0.0
East	46.1	23.0	19.8	11.1	0.0	0.0
North	46.7	26.9	0.5	23.9	0.9	1.1
N-West	71.6	2.5	12.3	11.7	1.9	0.0
West	66.0	0.0	8.0	23.3	2.7	0.0
S-West	43.2	8.3	0.0	41.2	3.1	4.2
Littoral*	56.6	0.7	4.2	35.7	2.8	0.0
Yaounde/Douala	5.9	6.0	1.5	57.2	29.0	0.0

*Excluding Yaounde/Douala

TABLE 63

PERCENTAGE DISTRIBUTION:

DISTANCE AWAY FROM WATER - BY PROVINCE

PROVINCE	-5 Min.	5-29 Min.	30-60 Min.	1-3 Hours	-Half Day	Unk.
Central South*	31.0	59.0	9.4	0.3	0.0	0.3
East	21.0	70.2	8.8	0.0	0.0	0.0
North	45.2	38.1	10.7	5.5	0.5	0.0
N-West	25.3	57.4	16.7	0.6	0.0	0.0
West	25.3	66.0	6.7	2.0	0.0	0.0
S-West	26.7	58.6	4.2	6.3	0.0	4.2
Littoral*	33.6	48.2	18.2	0.0	0.0	0.0
Yaounde/Douala	59.5	29.6	9.4	1.2	0.0	0.3

*Excluding Yaounde/Douala

9.19 MILK* RECEIVED BY CHILD

a. Breast Feeding (Table 64 and Figure 8)

Almost all infants are breast fed up to 9 months of age (6-11 months group). By 15 months (12-17 months group), the proportion breast fed varies considerably throughout the country, being highest in the North, North-West and East provinces (each approximately 90%) and lowest in the Central South (68.7%) and Yaounde/Douala (52.4%). Even by 21 months, breast feeding is still common throughout all provinces (51-71%) except the Central South and Yaounde/ Douala (each about 15%). The North had the highest breast feeding rates for children 18-23 months of age (71%).

b. Milk Other Than Breast Milk (Tables 65 and 66)

The consumption of fresh milk by young children was limited entirely to the North, although the prevalence was low (6.7%-7.6%) (Table 65).

Artificial*milk feeding was a rare practice throughout Cameroon. However, in Yaounde/Douala almost 25% of all children from 3-11 months received this milk. (Table 66).

c. No Milk of Any Type (Table 67)

Almost all infants in Cameroon from 3-5 and 6-11 months of age received some form of milk. By 15 months of age almost 30% of children in the Central South and 36% in Yaounde/ Douala did not receive any milk. By the end of the second year, most of the children in all provinces except the Central South had milk. This result is particularly striking in the North (80%), North-West and West Provinces (72%). There was little difference between urban and rural children with regards to the proportions having milk.

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* See Appendix 14 for definitions of types of milk
Artificial refers to non-fresh milk.

d. Bottle Feeding and Condition of Bottle (Tables 68 and 69)

Throughout Cameroon, bottle feeding was relatively uncommon. However, in Yaounde/Douala and the Central South Province, it was particularly practiced for infant feeding. In the North bottles were very rarely used (Table 68). Almost all bottles used for feeding were reported to be as clean or sterile (Table 69). This result must be viewed with great caution. The concept of a sterile, clean or dirty bottle may be subjective and the interpretation open to error.

9.20 FOOD RECEIVED BY THE CHILD

a. Family (Common) Food (Table 70)

Family or common food represents the food that is shared by the family with the child.

For Cameroon, almost one in ten children (10.9%) aged 3-5 months, just over one-half (55.9%) aged 6-11 months and the vast majority from 12-23 months (88.0-95.9%) received family food.

Children in the Central South Province had the highest frequency in the infant age groups (3-5 and 6-11 months) and children in the North, the lowest. Even by 12-17 months only 80% of North children received family food (i.e. 20% did not receive).

There were no differences between Yaounde/Douala,urban and rural areas.

b. Special Food (Table 71)

Special food represents food specially prepared for the child, such as gruel and bouillie and commercial foods such as Cerelac.

In Cameroon, provision of special foods for children 3-5 months was quite common (39%), remained much the same (41.1%) for children aged 6-11 months and decreased gradually during the second year of life.

In the North, although the proportion of children aged 3-5 months receiving special foods was relatively low compared with most other provinces, during the latter half of infancy and in the second year the proportion became much higher.

Well over half the infants in Yaounde/Douala and urban areas had special food, which was much higher than those in rural areas.

c. Any Food (Table 72 and Figures 9 and 10)

From 3-5 months of age, the proportion of children receiving any food apart from milk in Cameroon was just under 50%, but varied greatly throughout the provinces. It was less for the North and East (29-38%) compared with all other provinces (57-77%).

From 6-11 months of age, about 70% of children in the North and East had some type of non-milk food (i.e. 30% still did not), as compared with over 90% for each other province.

During the second year, almost all children in each province had some type of food.

A much greater percent of infants in urban areas and Yaounde/Douala received food as compared with those in rural areas (Figure 10).

Discussion

The percent of children receiving milk and food, according to age group and province is conveniently summarized in Figure 11, page 163. The figure provides estimate rates for general weaning patterns. For example, with regards to children in the North Province, of those aged six months, approximately 100% had breast milk, 50% had food of some type (any food), 40% had special food, 20% had family (common) food and just under 10% received fresh milk. Even at 12 months of age, only 60% of these children had family food as compared with 80-90% for each other province.

Although each provincial grouping has a fairly unique pattern for milk and food received, certain common features are apparent between the North and East Province, between the Western Provinces, and between Central South Province and Yaounde/Douala.

The practice of breast feeding is still very common during the first year of life throughout the whole country. Breast feeding is the optimal mode of infant feeding and its common practice throughout the country must not be discouraged in the future.

Considering the relatively high percent of cattle and goats in the North, there may be potential for increasing the proportion of children in this province receiving fresh milk.

Bottle feeding is often a dangerous practice for several reasons. An unsanitary feeding bottle filled with overdiluted milk (in order to make the expensive formula last longer) often leads to diarrhea, a potent cause of undernutrition. In view of the uncertain findings in this survey with regards to bottle cleanliness, this condition should be further investigated.

The results indicate that children of the North and East Province in the critical 6-11 month age group, frequently do not receive any supplemental foods along with breast milk. Although breast milk is sufficient to meet a child's nutritional need in the first six months of life, by the sixth month, other foods in addition to breast milk are needed to provide the necessary nutrients required to maintain normal growth. By six months, all children should be receiving other foods, but breast feeding should be continued as well,for as long as possible.

It is noteworthy that children aged 6-11 months, particularly in the North, but also in the East Province frequently do not receive food shared with the family. The actual types of foods received by the children and families are presented in the next in the next section, Qualitative Dietary Recall. However, future investigations concerning weaning pattern problems will be required to clarify the situation further.

TABLE 64
PERCENTAGE OF INDEX CHILDREN BEING BREAST FED
BY AGE GROUP AND AREA (w)

PROVINCE	Age in Months 3-5 %	N	6-11 %	N	12-17 %	N	18-23 %	N
Central South*	98.1	(54)	94.9	(118)	68.7	(115)	14.7	(109)
East	98.4	(61)	95.2	(104)	87.7	(122)	51.1	(92)
North	100.0	(79)	100.0	(180)	90.9	(132)	71.0	(93)
N.West/West	98.1	(54)	98.0	(98)	92.9	(112)	63.2	(86)
S. West/Littoral*	98.5	(69)	100.0	(97)	76.4	(115)	50.5	(91)
Total Provinces*	99.1	(317)	98.5	(597)	85.0	(596)	52.3	(471)
ECOLOGICAL								
North	100.0	(67)	100.0	(146)	89.7	(107)	74.4	(77)
Central Savannah	100.0	(37)	98.8	(78)	93.5	(91)	48.8	(61)
West Plateau	98.1	(54)	98.0	(98)	92.9	(112)	63.2	(86)
West Plains	98.2	(57)	100.0	(102)	76.6	(121)	50.9	(97)
South Forest	97.7	(87)	95.5	(173)	71.1	(164)	19.2	(144)
URBAN/RURAL								
Yaounde/Douala	95.1	(41)	87.2	(133)	52.4	(113)	13.7	(103)
Urban Cameroon*	99.4	(55)	96.1	(93)	77.6	(110)	46.4	(69)
Rural Cameroon	99.2	(247)	99.0	(503)	84.7	(487)	52.1	(404)
TOTAL CAMEROON	99.0	(358)	97.8	(730)	83.1	(709)	49.8	(574)

* Excluding Yaounde and Douala
(w) Weighted Percent
N Sample Size

TABLE 65

PERCENTAGE OF INDEX CHILDREN RECEIVING FRESH MILK
(OTHER THAN BREAST OR ARTIFICIAL)-BY AGE GROUP AND AREA(w)

	Age in Months		
PROVINCE	3-5	6-11	12-23
Central South*	0.0	0.0	0.0
East	0.0	0.0	0.0
North	7.6	7.2	6.7
N. West/West	0.0	0.0	0.5
S. West/Littoral*	0.0	0.0	0.4
Total Provinces*	3.9	4.0	3.1
ECOLOGICAL			
North	9.0	8.9	5.9
Central Savannah	0.0	0.0	5.2
West Plateau	0.0	0.0	0.5
West Plains	0.0	0.0	0.5
South Forest	0.0	0.0	0.0
URBAN/RURAL			
Yaounde/Douala	0.0	0.0	0.5
Urban Cameroon*	0.0	0.0	0.7
Rural Cameroon	4.7	4.8	3.7
TOTAL CAMEROON	3.7	3.8	2.9

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 66

PERCENTAGE OF INDEX CHILDREN RECEIVING ARTIFICIAL MILK-BY AGE GROUP AND AREA(w)

	Age in Months				
PROVINCE	3-5	6-11	12-17	18-23	Sample Size
Central South*	11.1	1.7	0.9	0.0	376
East	3.3	0.0	0.8	0.0	379
North	0.0	0.6	1.5	1.1	484
N. West/West	9.3	6.1	1.8	8.0	357
S. West/Littoral*	3.6	2.8	2.5	3.4	366
Total Provinces*	3.9	1.6	1.5	2.1	1982
ECOLOGICAL					
North	0.0	0.7	1.9	1.3	397
Central Savannah	1.3	0.0	0.0	0.0	267
West Plateau	9.3	6.1	1.8	8.0	357
West Plains	3.7	3.1	2.6	3.3	377
South Forest	11.1	1.7	1.2	0.0	568
URBAN/RURAL					
Yaounde/Douala	23.4	25.4	11.7	7.7	390
Urban Cameroon*	3.6	6.4	2.9	1.0	332
Rural Cameroon	3.5	0.9	1.1	1.9	1650
TOTAL CAMEROON	4.7	3.1	2.0	2.5	2372

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 67

PERCENTAGE OF INDEX CHILDREN RECEIVING NO MILK OF ANY TYPE-BY AGE GROUP AND AREA (w)

	Age in Months			
PROVINCE	3-5	6-11	12-17	18-23
Central South*	0.0	5.1	29.8	83.8
East	0.0	1.9	9.8	46.7
North	0.0	0.0	6.8	20.7
N. West/West	0.0	0.0	3.6	27.9
S. West/Littoral*	0.0	0.0	18.4	40.7
Total Provinces*	0.0	1.0	12.3	41.1
ECOLOGICAL AREA				
North	0.0	0.0	7.5	20.8
Central Savannah	0.0	0.7	6.5	37.0
West Plateau	0.0	0.0	3.6	27.9
West Plains	0.0	0.0	18.4	40.2
South Forest	0.0	3.9	26.5	78.7
URBAN/RURAL				
Yaounde/Douala	0.0	2.2	36.2	80.8
Urban Cameroon*	0.0	1.9	18.8	47.5
Rural Cameroon	0.0	0.9	12.5	41.3
TOTAL CAMEROON	0.0	1.1	13.7	43.8

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 68

PERCENTAGE OF INDEX CHILDREN BEING BOTTLE FED
BY AGE GROUP AND AREA (w)

	Age in Months			
PROVINCE	3-5	6-11	12-17	18-23
Central South*	24.1	6.8	0.9	0.0
East	6.8	2.0	0.8	1.1
North	1.3	2.2	1.5	2.2
N. West/West	9.4	9.4	2.7	1.2
S. West/Littoral*	11.5	14.8	3.9	1.0
Total Provinces*	7.9	5.0	1.8	1.3
ECOLOGICAL				
North	1.5	2.1	1.9	2.6
Central Savannah	7.3	3.7	0.0	0.0
West Plateau	9.4	9.4	2.7	1.2
West Plains	11.1	14.5	4.3	1.2
South Forest	17.2	3.7	1.2	0.3
URBAN/RURAL				
Yaounde/Douala	32.0	29.0	16.0	3.9
Urban Cameroon*	10.7	11.9	4.5	0.0
Rural Cameroon	7.1	4.0	1.5	1.5
TOTAL CAMEROON	8.8	6.4	2.6	1.5

TABLE 69

CONDITION OF BOTTLE USED FOR FEEDING INDEX CHILD
(Aged 3-23 Months)

PROVINCIAL GROUPINGS	Sterile	Clean	Dirty	Total Used
Total Provinces*	51 %	46 %	3 %	67
Yaounde/Douala	72 %	28 %	0 %	68
Total Sample	53 %	45 %	0.2%	135

* Excluding Yaounde/Douala
Percentages are weighted

TABLE 70

PERCENTAGE OF INDEX CHILDREN RECEIVING FAMILY FOOD
BY AGE GROUP AND AREA(w)

	Age in Months			
PROVINCE	3-5	6-11	12-17	18-23
Central South*	25.9	81.4	94.7	98.1
East	17.2	59.4	94.2	96.7
North	2.5	38.0	80.0	93.5
N. West/West	17.0	75.3	91.8	95.4
S. West/Littoral*	11.0	78.4	96.3	98.7
Total Provinces*	10.7	55.2	87.6	95.7
ECOLOGICAL				
North	3.0	35.2	80.0	93.5
Central Savannah	7.7	49.4	87.2	94.2
West Plateau	17.0	75.3	91.8	95.4
West Plains	11.4	78.4	96.5	98.9
South Forest	24.4	83.3	93.1	98.4
URBAN/RURAL				
Yaounde/Douala	17.4	66.2	92.5	98.9
Urban Cameroon*	10.1	62.8	88.5	96.4
Rural Cameroon	10.3	54.3	88.1	96.1
TOTAL CAMEROON	10.9	55.9	88.0	95.9

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 71

PERCENTAGE OF INDEX CHILDREN RECEIVING SPECIAL FOOD
BY AGE GROUP AND AREA(w)

	Age in Months				
PROVINCE	3-5	6-11	12-17	18-23	Sample Size
Central South*	40.7	28.8	14.3	9.3	396
East	25.0	28.4	14.2	12.1	379
North	27.8	45.6	40.8	34.8	484
N. West/West	66.0	41.7	14.5	16.1	357
S. West/Littoral*	51.6	34.4	17.5	11.5	366
Total Provinces*	38.0	40.2	26.8	21.5	1982
ECOLOGICAL					
North	23.9	42.5	40.0	36.4	397
Central Savannah	44.0	52.6	28.6	22.0	267
West Plateau	66.0	41.7	14.5	16.1	357
West Plains	52.9	34.0	18.0	12.4	377
South Forest	30.6	24.9	16.0	8.4	568
URBAN/RURAL					
Yaounde/Douala	64.3	55.4	39.3	14.0	390
Urban Cameroon*	62.8	58.6	31.7	26.1	332
Rural Cameroon	32.0	35.7	25.8	19.8	1650
TOTAL CAMEROON	39.0	41.1	27.4	20.9	2372

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 72

PERCENTAGE OF INDEX CHILDREN RECEIVING ANY FOOD (OTHER THAN MILK) -BY AGE GROUP AND AREA (w)

	Age in Months			
PROVINCE	3-5	6-11	12-17	18-23
Central South*	59.3	95.8	94.8	97.2
East	37.7	72.1	94.3	96.7
North	29.1	69.4	90.2	96.8
N. West/West	77.8	93.9	94.6	97.7
S. West/Littoral*	57.3	93.5	94.1	95.4
Total Provinces*	45.1	79.6	92.5	96.9
ECOLOGICAL				
North	25.4	65.1	90.7	97.4
Central Savannah	49.1	85.7	90.4	95.0
West Plateau	77.8	93.9	94.6	97.7
West Plains	57.6	93.8	94.0	95.7
South Forest	48.0	90.7	94.1	97.1
URBAN/RURAL				
Yaounde/Douala	74.8	87.0	95.5	98.0
Urban Cameroon*	68.4	94.4	93.6	94.2
Rural Cameroon	38.5	76.7	91.9	97.4
TOTAL CAMEROON	46.3	79.9	92.7	97.0

* Excluding Yaounde and Douala
(w) Weighted Percent

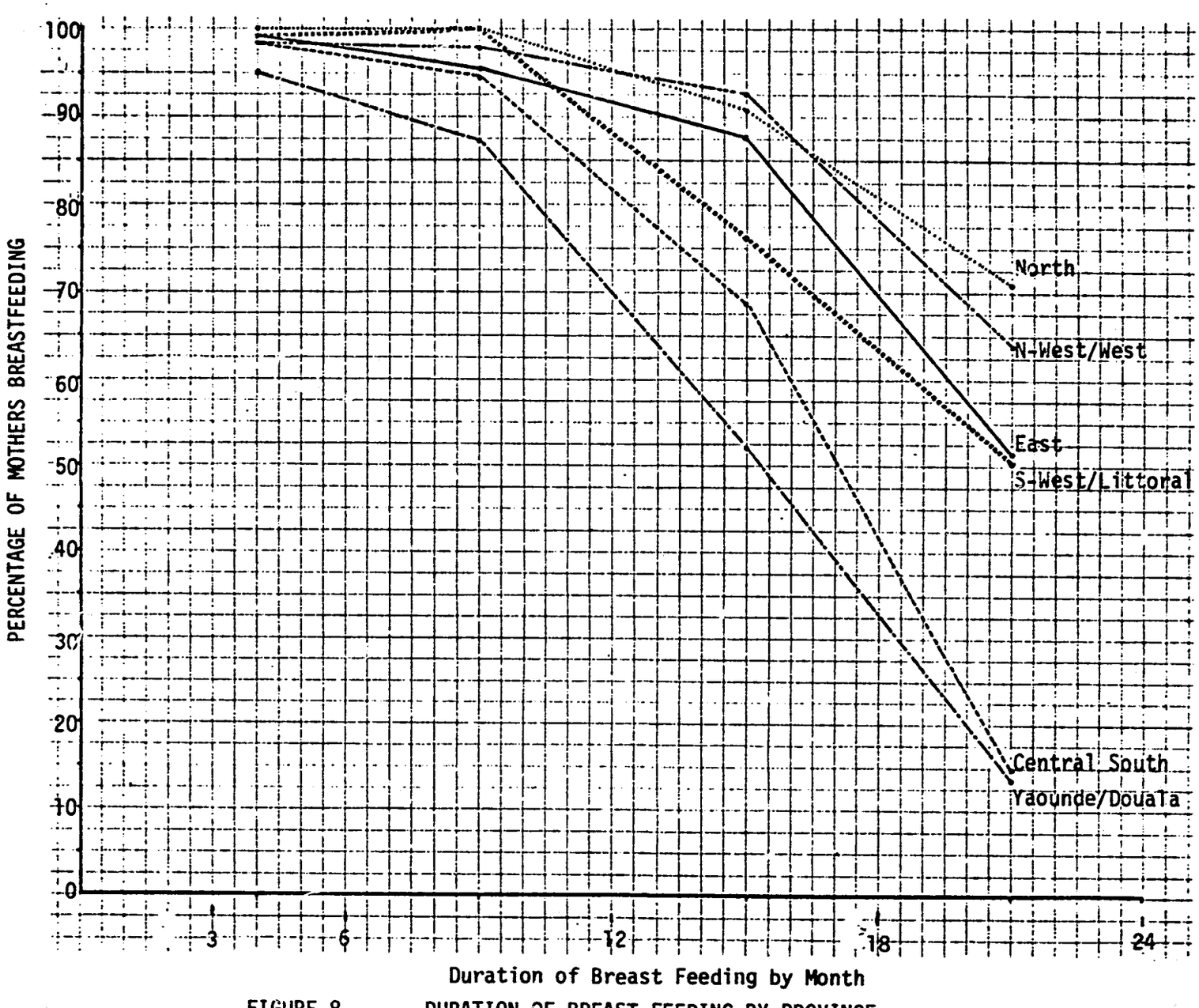


FIGURE 8 DURATION OF BREAST FEEDING BY PROVINCE

Figure 9

PERCENTAGE OF CHILDREN RECEIVING FOOD OTHER THAN MILK-BY AGE AND PROVINCE

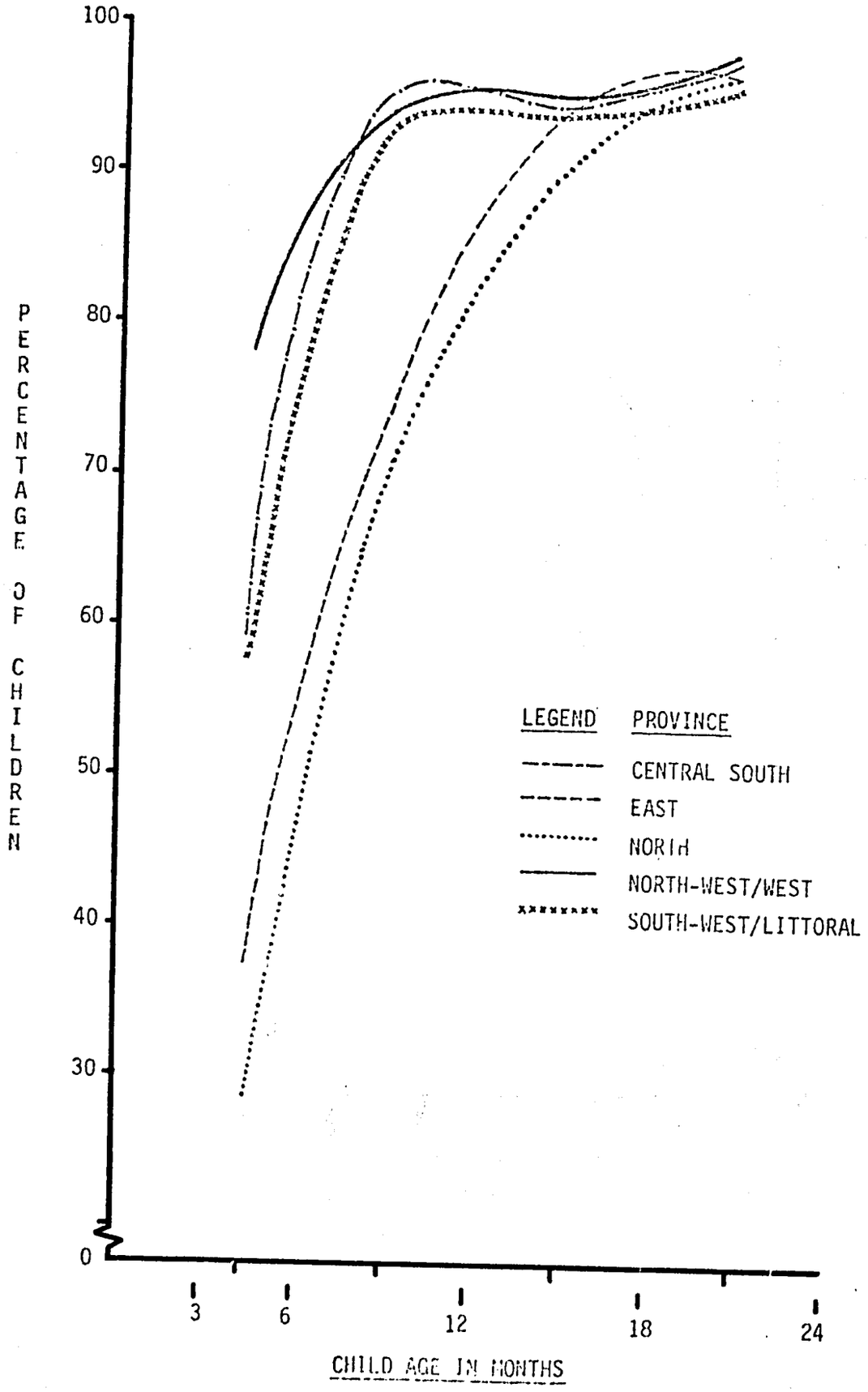


Figure 10

PERCENTAGE OF CHILDREN RECEIVING FOOD OTHER THAN MILK-BY AGE AND AREA

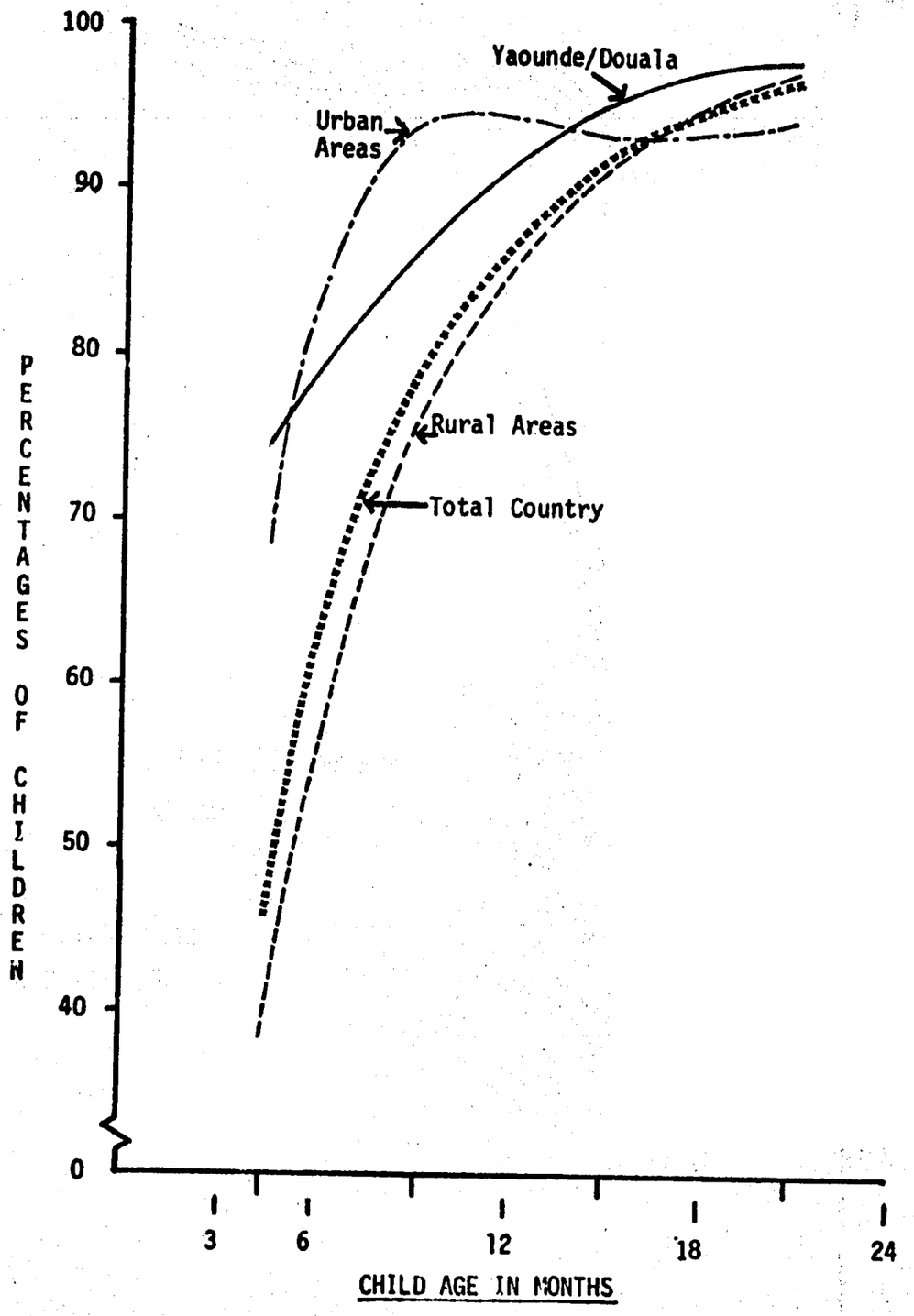
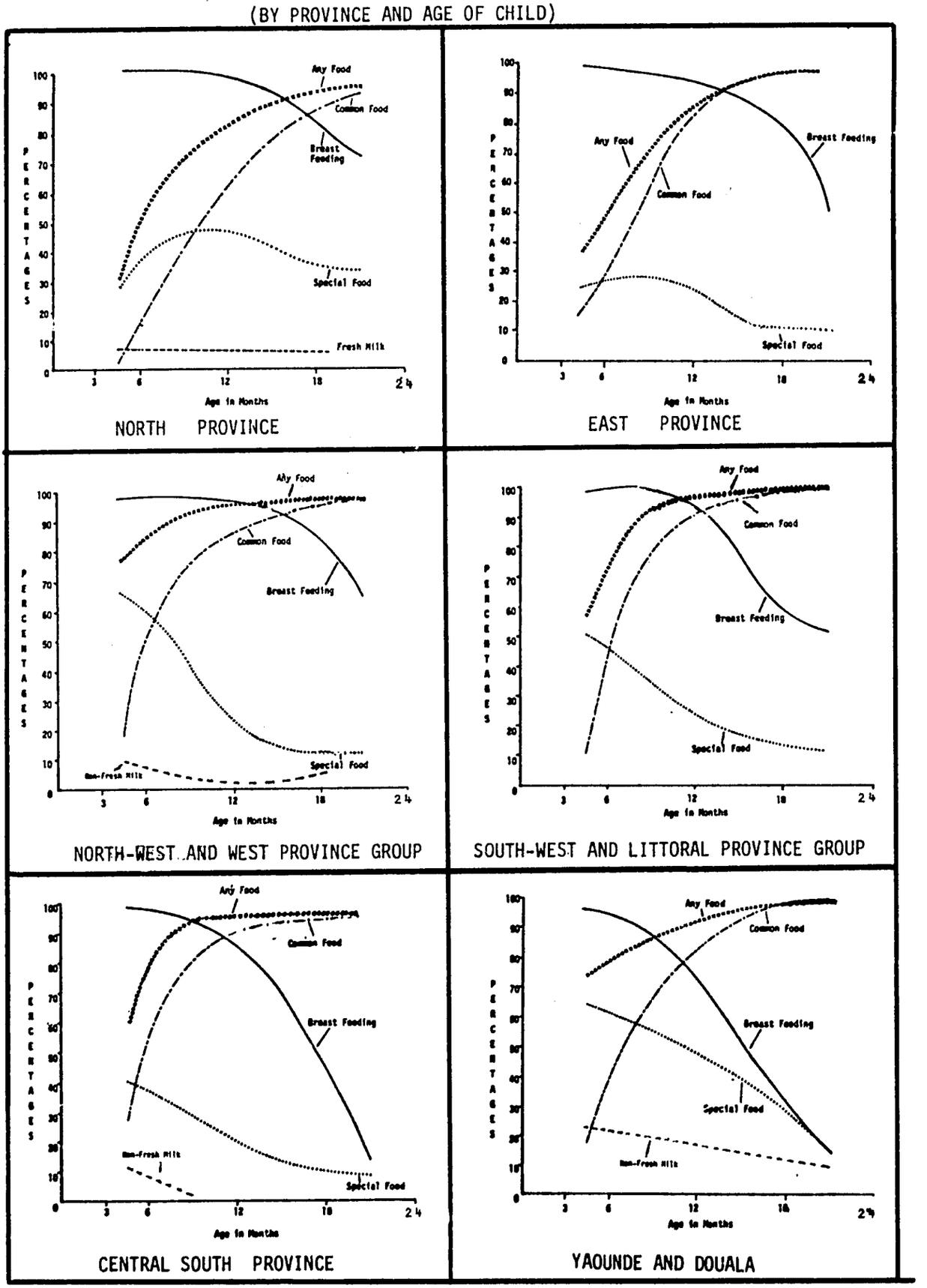


FIGURE 7 PERCENT OF CHILDREN RECEIVING MILK AND FOOD (BY PROVINCE AND AGE OF CHILD)



9.21 DISCUSSION OF FINDINGS WHICH MAY BE RELATED TO NUTRITIONAL STATUS

The findings for various factors which may be related to child nutritional status have been presented in Sections 9.12 to 9.19. These factors are indicators for socio-economic status, demographic patterns, health status and services, and weaning practices according to province and urban/rural distribution. It is useful to compare the prevalence rates for undernutrition with these factors, so that at least a tentative explanation may be offered for the different findings of nutritional status throughout the country. It must be noted there is some overlap as to what some of the indicators represent; for example children born in hospital reflect, among other things, both socio-economic status and access to health services.

The lowest prevalence rates for undernutrition throughout the country were found in Yaounde/Douala. Families in these cities have the best socio-economic status - highest literacy rate for mothers, greatest percent of professional workers and concrete houses, best cooking facilities; best access to health care and services- most birth records and children born in hospital; best health-related factors- least mortality in young children from measles,and best water supply. In addition, compared with the rest of the country, children and mothers in Yaounde/Douala have the most varied diet.* It should be noted, however, that much of the family's income will be required for food since they have no farming. In addition, a common finding in these cities, that of bottle feeding,may be detrimental to the nutritional status of the young child.

The prevalence rates for undernutrition in urban areas of the country were higher than those in Yaounde/Douala but less as compared with rural areas. In general, the socio-economic and other factors presented in the previous paragraph reflect the differences between urban and rural areas of the country.

The highest prevalence rates for undernutrition (acute, underweight and arm wasting) were found in the North Province.

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* See Section 10 - Qualitative Dietary Recall, Scoring Systems p.192

The North Province, as compared with all other provinces in the country (excluding Yaounde in Central South and Douala in the Littoral Province), had the following important findings: greatest percent of agricultural workers as subsistence farmers, lowest literacy rates for mothers, most traditional houses, least access to health care and services (birth records and children born in hospital), highest mortality rate for measles, greatest percent of unprotected wells and with families the farthest distance away from water. With regards to diet, the North Province had the highest percent of children aged 6-11 months receiving no food (other than milk) and the lowest variety of food groups in children aged 6-23 months and their mothers. Families in the North had the most cattle, sheep or goats. These animals are probably used primarily for cash or capital purposes.

Children in the East Province also showed high prevalence rates for undernutrition. Families in the East were characterised by a high percent of traditional houses and with poor access to health care and services. The East Province had a relatively high percent of children aged 6-11 months receiving no food (other than milk) and of children and mothers with a low variety of food groups, as compared with other provinces, the North excluded.

With regards to the West Province, there was no clear explanation according to survey data, for the high prevalence rate of chronic undernutrition found in children. However, it is possible that the high population density and the intense cash cropping in the West may both be detrimental to nutritional status.

The relationship between nutritional status and diet is presented on page 198 and that between nutritional status and other factors discussed in this section, as it pertains to the findings for individual children and families, in Section 14, page 242.

10. QUALITATIVE DIETARY RECALL

10.1 METHODOLOGY

All methodology used for the study of diet was based on the recommendations of the National Academy of Sciences, USA (7), and adapted to Cameroonian needs. This methodology assumes that information on consumption derived for the types of foods eaten throughout a country would be feasible and could provide useful data for nutrition policies and programs.

All teams on the survery applied this methodology. Surveyors were instructed to question the person who fed the child the day before the interview. This turned out to be the mother in 91.4% of cases.

The index child's consumption of 27 different foods was assessed using a modified 24-hour recall method. The person feeding the child was asked to name all the foods the child ate the day before the interview, starting from the time the child first woke up in the morning. After checking the responses with the list in Form II (Table 74 and Appendix 12), further questioning took place which included all the foods on the list not already accounted for. For example, the first question, if required would be, "Did (child's name) eat manioc yesterday?" After the child's diet was assessed and noted, the respondent's diet was obtained in the same way.

Comments were made when modification of the food listed was ingested (e.g., type of baby food). This diet assessment method was easily learned by the interviewer and was rapidly effected in the field.

Information was not collected about the method of food preparation, frequency or quantity of intake. It was not known if the foods reportedly eaten were consumed together or separately, nor were any time intervals assessed between consumption of foods (i.e. whether given together or not).

10.2 SAMPLE SIZE

The diet subsample included every child from 3 up to 24 months of age in the main sample. A total of 2235 dietary listings were analyzed, each from the child and the person feeding that child. As there were 190 sites on the survey, the average number of children with dietary information per site was 12, with a range of 6 to 20. Ninety percent of the sites had from 10 to 17 child dietary recalls.

The distribution by province and age group of child is shown in Table 73 .

10.3 ANALYTIC APPROACH

The child's dietary patterns were described in at least two major age groups and for as many provinces as the sample size permitted.

The age specific groups were selected to coincide with those analysed for the assessment of nutritional status by anthropometry. Since both chronic undernutrition and underweight prevalence rates are lowest in children aged 3-5 months, increase from 6-11 months, and reach a peak from 12-23 months, it was decided to concentrate on the 6-11 months and 12-23 months age groups.

Children usually are seriously taken with infections and diarrheal diseases from 6-11 months. Similar dietary surveys as this one were done for Liberia and Lesotho (46 & 55). They have shown that many children in this age group did not receive any food supplementation with their milk. The same results were evident in this survey. (See 'Food Received by Child' p. 147) Children aged 12-23 months were found on this study to eat generally the same types of food as their families.

Selection was also influenced by the sample size in each subset. While it is obviously not possible to perform the same rigid sample size criteria for anthropometry (30 children from 30 sites for a major description), it is necessary to have a sufficient number in order to make certain conclusions on dietary intake for each age

TABLE 73

PERCENTAGE DISTRIBUTION FOR DIETARY STUDY
BY SPECIFIC AGE GROUPS AND PROVINCE

	Age in Months							
	3-5		6-11		12-23		Total	
PROVINCE	%	N	%	N	%	N	%	N
Central South*	13.0	48	29.5	109	57.5	212	100.0	369
East	16.3	61	26.2	98	57.5	215	100.0	374
North	16.3	77	34.4	162	49.3	232	100.0	471
N-West	13.9	24	29.5	51	56.6	98	100.0	173
West	13.3	22	27.3	45	59.4	98	100.0	165
S-West	16.0	30	25.5	48	58.5	110	100.0	188
Littoral*	13.2	20	56.7	39	61.1	93	100.0	152
Yaounde/Douala	10.8	37	32.9	113	56.3	193	100.0	343
TOTAL	14.3	319	29.8	665	55.9	1251	100.0	2235
TOTAL (Main Sample)	14.5	343	30.9	729	54.6	1286	100.0	2358

* Excluding Yaounde and Douala

group and area.

For example, the total sample size of 665 for children aged 6-11 months (Table 73), indicates that each of 190 sites usually contributed three or four child dietary histories for that particular age group. (i.e. 665 ÷ 190). The average number of child dietary recalls by site for children aged 12-23 months was seven, and for children aged 3-5 months, it was less than two.

Two basic assumptions regarding the acceptance of these low sample sizes are that the types of food eaten by a young child and family vary little within each site, and that there is no bias in the method of sampling within the site. This uniformity pattern is more likely to be the case in the provinces than in Yaounde and Douala where food patterns within a small area may vary greatly with socio-economic status. In addition, it is assumed that by the random method of sampling, each subset (i.e., age group) is distributed fairly evenly throughout individual provinces, so that results should reflect the qualitative consumption patterns.

In summary, the results for food consumption are presented by province and for age groups 6-11 and 12-23 months. In view of the low sample size, results for N. West and West provinces (Plateau area) are combined as well as S. West and Littoral (Plains area excluding Ocean Division) and Yaounde and Douala.

10.4 REASONS FOR EXCLUDING DIETARY RECALLS

For the whole sample 123 dietary recalls had to be excluded prior to the analysis for various reasons. First, a diet recall was not taken for the child (11 cases); second, it was not taken from the person feeding the child (69 cases); third, a dietary recall was done, but not from the person feeding the child (43 cases). It should be noted that only those recalls considered valid for both the child and corresponding adults were included in the analysis.

10.5 RESULTS

a. Introduction

Results are first presented according to food groups, then by the cumulation of these groups into scoring systems. After this, results for certain individual foods are considered in each province, and finally, associations between diet and undernutrition established through anthropometry, are investigated.

b. Food Groups

To simplify presentation of results, foods with similar nutrient values are grouped together (Table 74). Results are presented by food group and indicate whether at least one of the foods in that particular group was eaten the day before.

In figures 13-19 the bar diagrams* show a profile of the percentages of children and families in each province consuming at least one type of food in that group the day before the interview. In this presentation "family food" is defined as that food which is consumed by the child, or the person feeding the child, or both. It is evident that at least someone in the family is receiving that food. This may be considered as an index of food availability for the child, since any food eaten by the family is also potentially food for the child.

It should be noted that family food is often, but not always, similar to that eaten by the person feeding the child. Notable exceptions were observed for weaning foods, cereals, tubers and dark green leafy vegetables.

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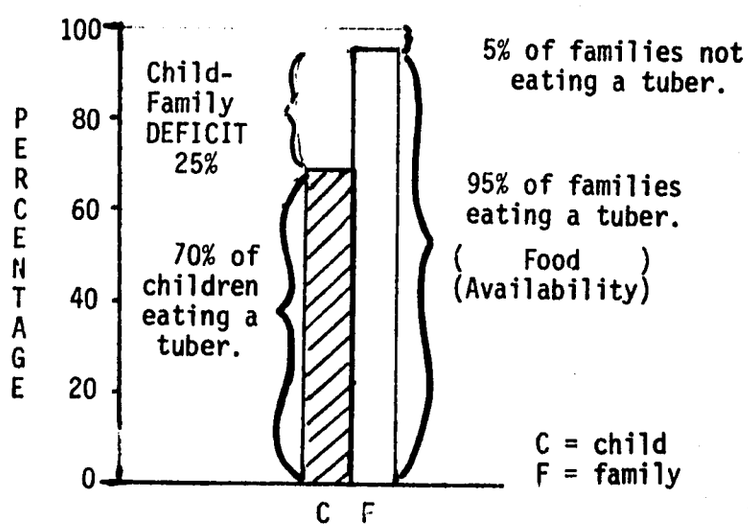
*The data from which these bar diagrams are derived are in the series of tables listed in Appendix 21 .

TABLE 74
FOODS AND THEIR GROUPS

INDIVIDUAL FOODS	GROUPS
Cassava Cassava Gruel Other Tubers Plantain/Banana	TUBERS
Corn/Corn Flour/Fritters Corn Gruel Rice/Rice Flour Rice Gruel Millet/Sorghum/Fritters Millet Gruel Wheat/Bread/Fritters	CEREALS
Ground Nuts/Bambara/Fritters Squash Seeds/Sesame Dried Beans/Fritters	BEANS, SEEDS, NUTS
Green Leaves	DARK GREEN LEAFY VEGETABLES
Dried or Fresh Fish All kinds of Meat Eggs	MEAT, FISH, EGGS
Mother's (breast) milk Milk or Milk derivatives	MILK
Baby Food (Guigoz, Cerelac)	COMMERCIAL WEANING FOODS
Fruits/Vegetables Red Pepper	FRUITS - VEGETABLES
Palm Oil/Palm Nuts Other oils/Butter	OILS
Sugar/Beverages	

The first two columns in Figure 12 with explanatory text are reproduced below and show that about 70% of the sample children aged 6-11 months in the Central South Province had at least one type of tuber (A), compared with about 95% of their corresponding families (B). In other words, almost 3/4 of these children and almost all their families had at least one tuber.

Figure 12 Explanatory Bar Diagram Showing Relationship of Food Availability with Child/Family Consumption and Deficit



A - Percent of children eating tuber (70%)

B - Percent of families eating tuber (95%) (Food Available)

C - (B minus A) Percent of children not eating tuber when available to family (Child - Family difference or deficit 95-70% = 25%)

D - Percent of families not eating tuber (Food unavailable 100-95% = 5%)

The difference (C) between the family bar and that of the child (shaded column), in this case for tubers, indicates the percent of children aged 6-11 months who did not receive that food when it was available (eaten) in the family.

The terms "food availability" and "child-family deficit" or "deficit" are used in this report on the basis of the above explanations. In this example, improvement solely in the intra-family distribution of a tuber with regards to the young child would reduce this deficit and enable more children to receive tubers. This child-family deficit is one possible explanation for certain proportions of children not receiving a particular food or group. In other situations, it may be related to food unavailability with or without a deficit. In other words there are two major "reasons" why a young child does not receive a particular food. The food may not be available to the family or the food is available to the family but for various reasons (palatability, socio-cultural, time constraints in preparation) is not given to the child.

i/PROPORTION OF CHILDREN AND FAMILIES CONSUMING CERTAIN FOOD GROUPS

Tubers (Figure 13)

Tubers were commonly consumed by families in Yaounde/Douala and all provinces with the exception of the North. However, the child aged 6-11 months consistently received a tuber 20%-40% less often than the family. The maximum deficit occurred in the East.

For children aged 12-23 months, the vast majority received at least one type of tuber almost as frequently as the family.

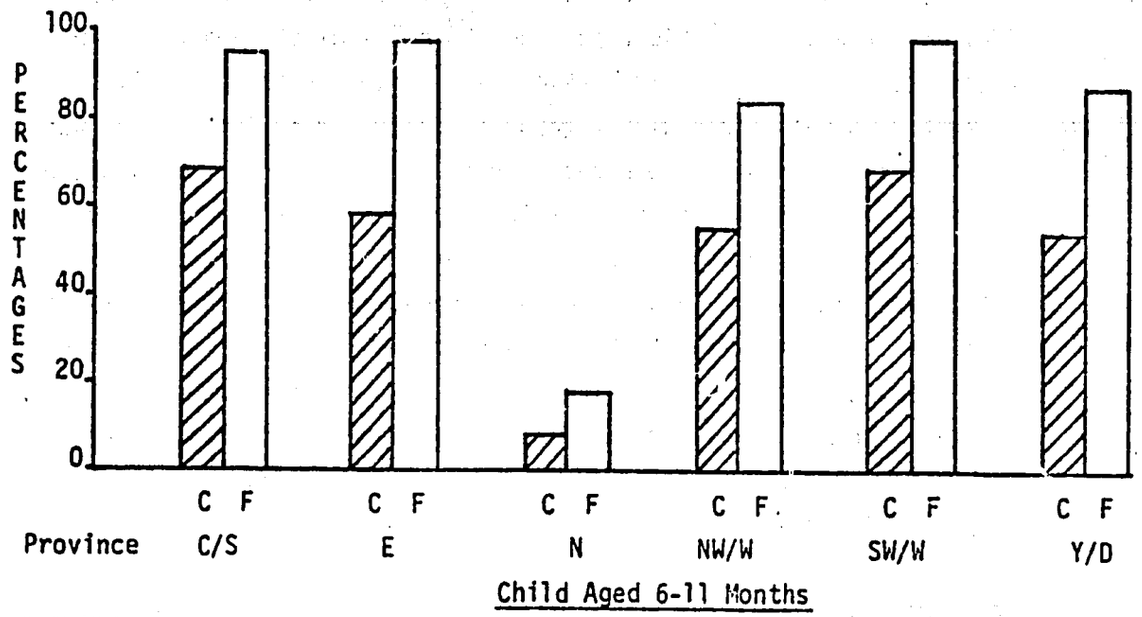
Cereals (Figure 14)

Cereals were consumed by families most commonly in the North, North-West and West Provinces and Yaounde/Douala. They were consumed least in the East. Children aged 6-11 months received at least one type of cereal almost as frequently as their families in all areas (i.e., Provinces and Yaounde/Douala) except the North, where the deficit was high (47% = 98% minus 51% child).

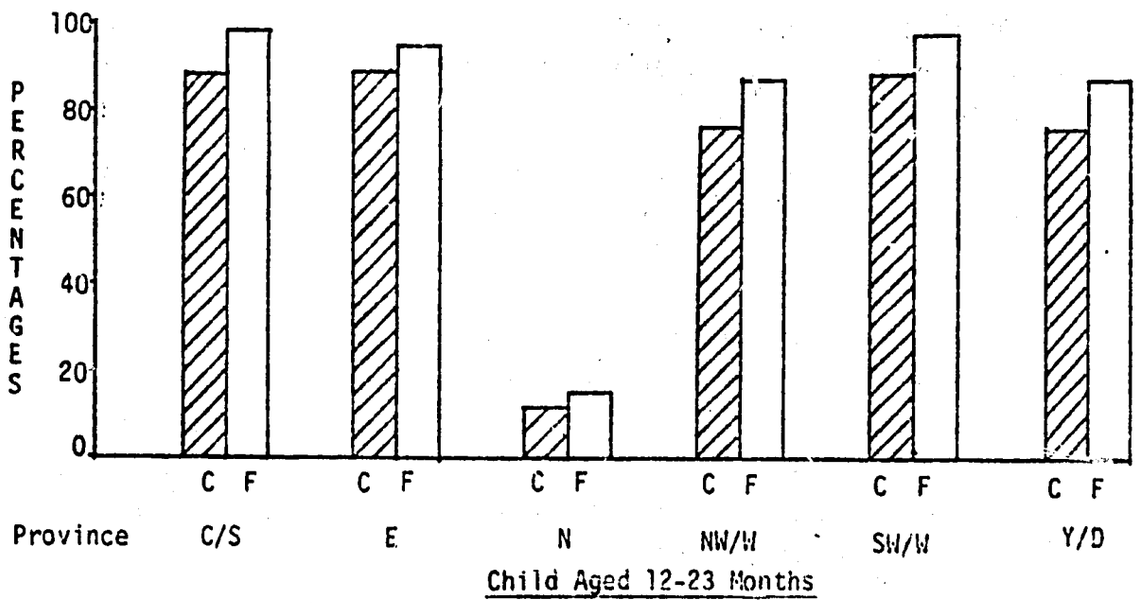
As with tubers, the child deficit was much less in children aged 12-23 months than that in the younger age group.

Figure 13 *

PERCENTAGE OF CHILDREN OF SPECIFIC AGE GROUPS AND FAMILIES EATING TUBERS - BY PROVINCE



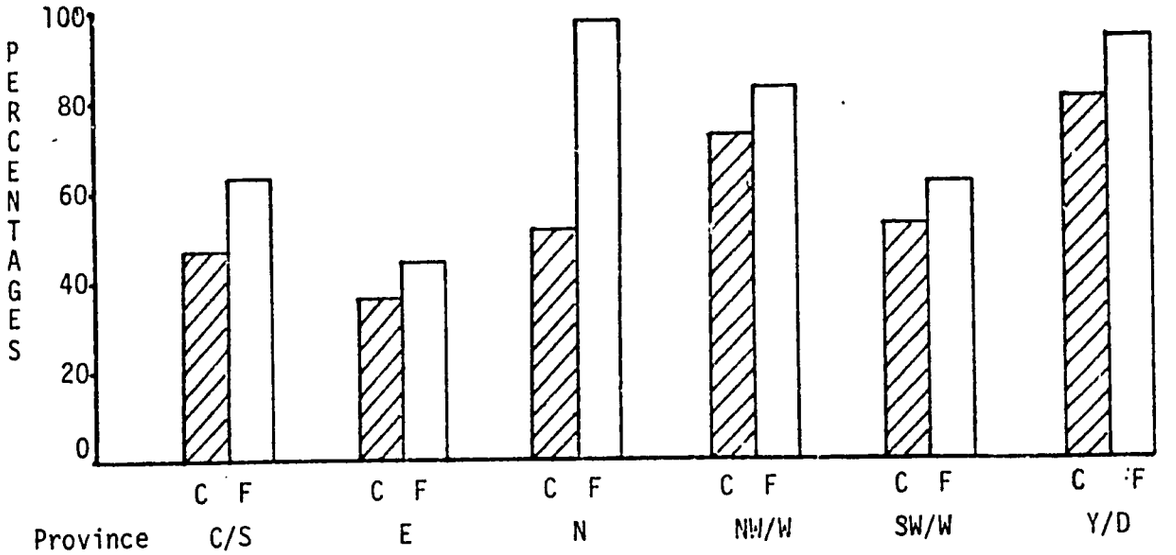
C=Child, F=Family



* In this Figure, as well as Figures 14-19,
the shaded column on the left (C) represents the percentage of children receiving the food group and
the unshaded column on the right (F) represents the percentage of families receiving the food group (i.e. Tubers for Figure 13)

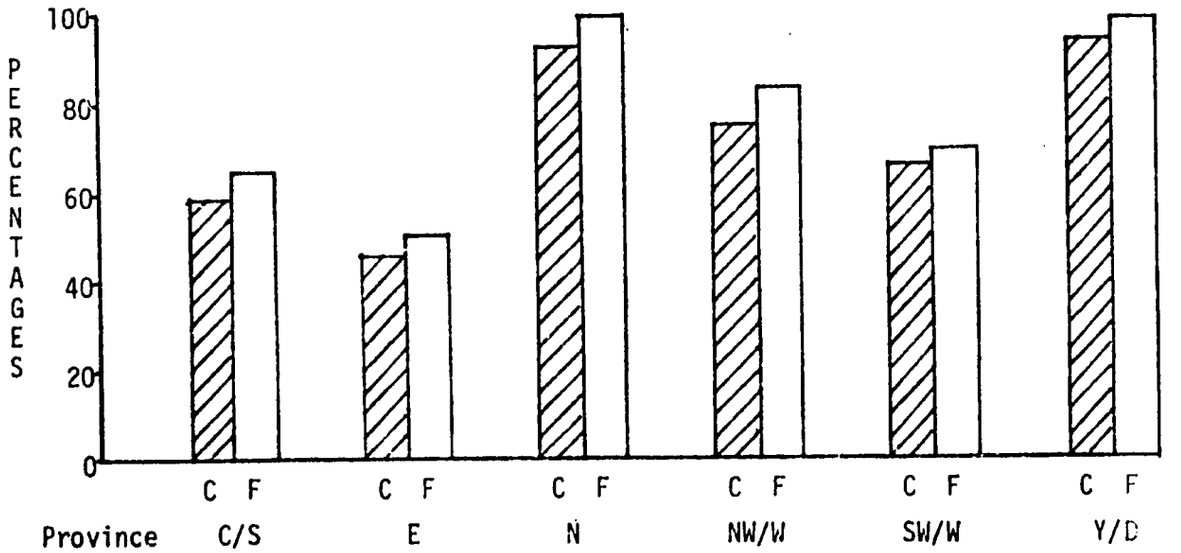
Figure 14

PERCENTAGE OF CHILDREN OF SPECIFIC AGE GROUPS AND FAMILIES EATING CEREALS - BY PROVINCE



Child Aged 6-11 Months

C=Child, F=Family



Child Aged 12-23 Months

Beans, Seeds and Nuts (Figure 15)

In all areas at least one type of bean, seed or nut was eaten by 60%-88% of the families, and the lowest number being in the North and the highest in the East. However, in all areas children aged 6-11 months received this food group considerably less often than their families; for example , in the East and North there was more than a 40% deficit.

The deficit was far less for the children aged 12-23 months. However, more than 50% of the children in the North and 25-35% in the other areas did not receive any beans, seeds or nuts.

Dark Green Leafy Vegtables (DGLV) (Figure 16)

Only 9% of the children aged 6-11 months in the North and 15%-28% in other areas received any dark green leafy vegetables. The proportion of families consuming any DGLV was also low, ranging from 30% (Yaounde/Douala) to 53% (East).

The deficit for children aged 12-23 months was far less than the younger ones, but proportional consumption (i.e. percentage consuming the foods) for both children and families was low in all areas.

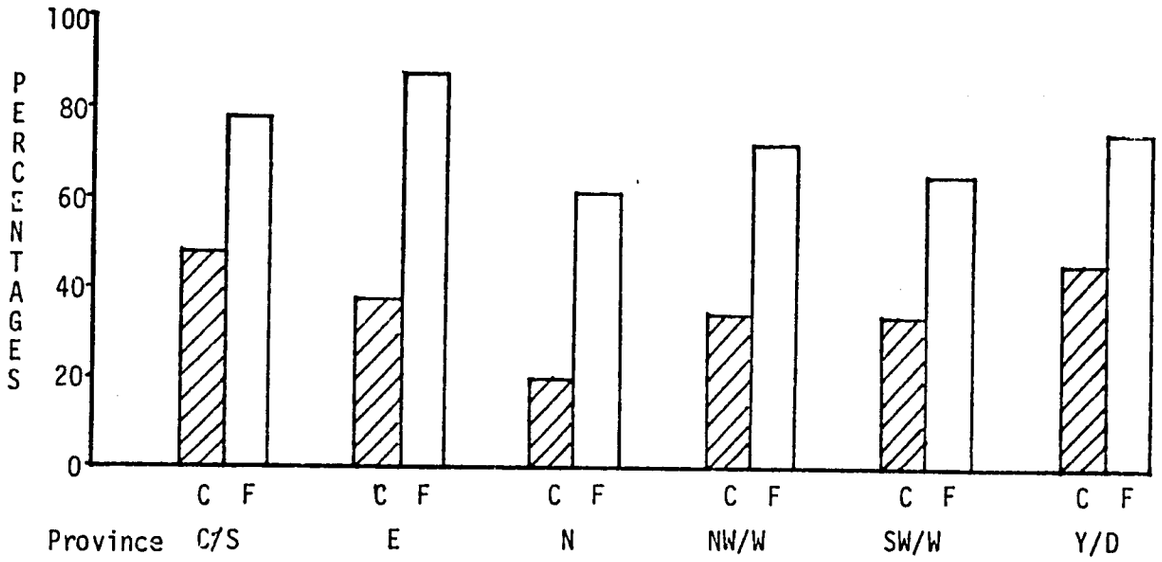
Meat, Fish and Eggs (Figure 17)

The consumption of the meat, fish and egg group was most frequent in the South-West/Littoral Provinces and Yaounde/Douala, both for families (88%) and their children aged 6-11 months (about 50%). In other areas, while proportional consumption by families was 60%-75%, the deficit for children aged 6-11 months was more striking, in that only 14%-30% received any of these foods.

Children aged 12-23 months consumed meat, fish and eggs almost as frequently as their families. An exception was in the North where the child frequency intake was 45% and the child's deficit was therefore higher.

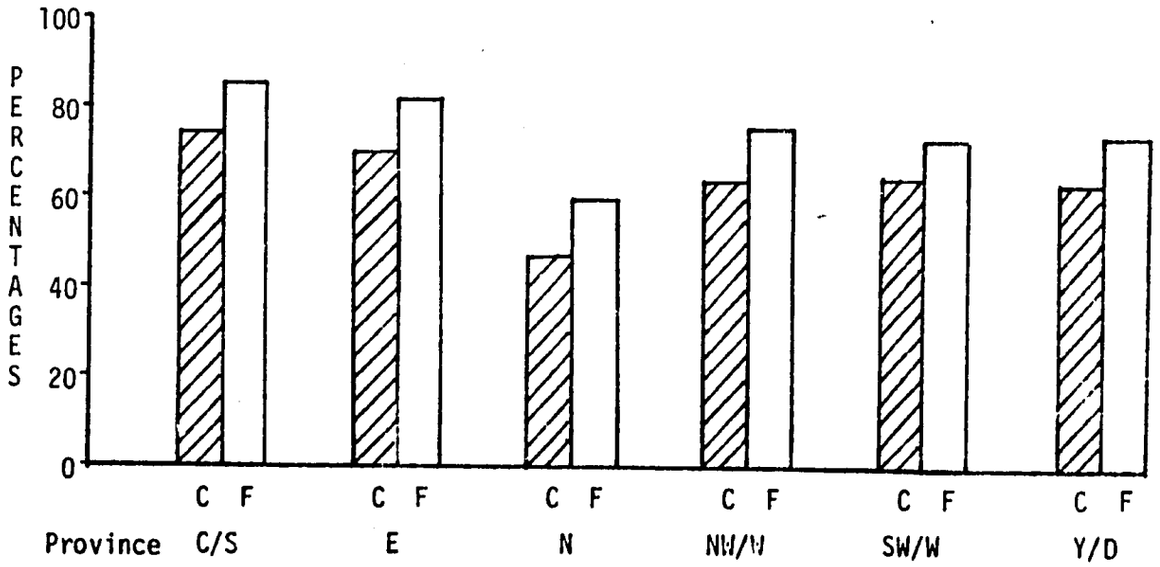
Figure 15

PERCENTAGE OF CHILDREN OF SPECIFIC
AGE GROUPS AND FAMILIES EATING
BEANS, SEEDS AND NUTS GROUP - BY PROVINCE



Child Aged 6-11 Months

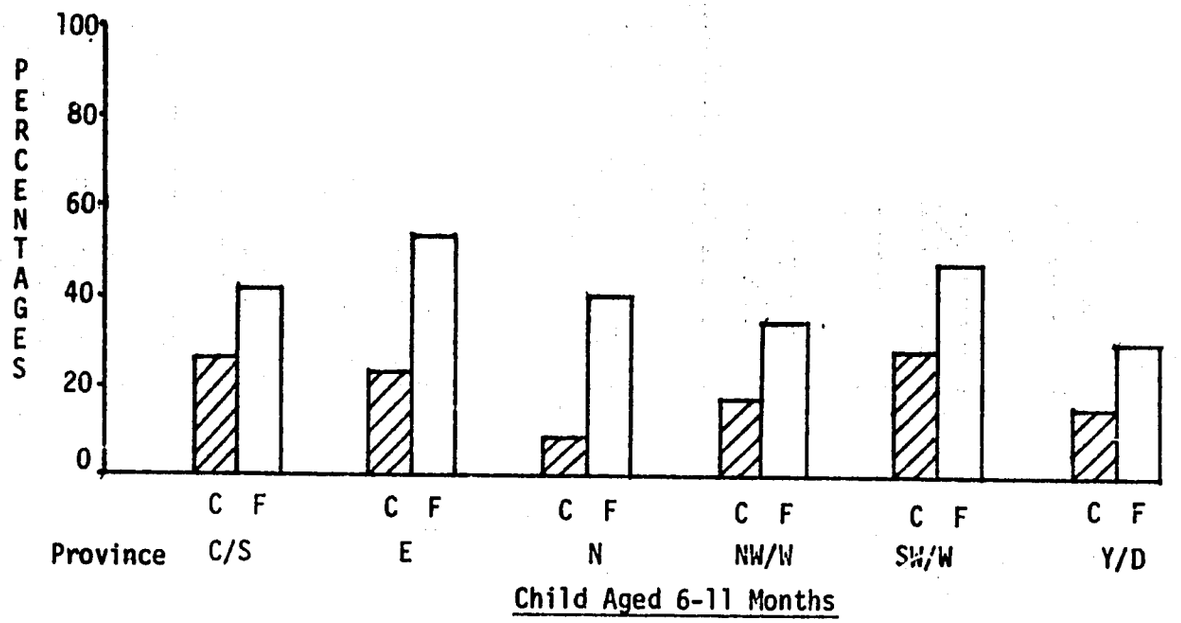
C=Child, F=Family



Child Aged 12-23 Months

Figure 16

PERCENTAGE OF CHILDREN OF SPECIFIC AGE GROUPS AND FAMILIES EATING DARK GREEN LEAFY VEGETABLES - BY PROVINCE



C=Child, F=Family

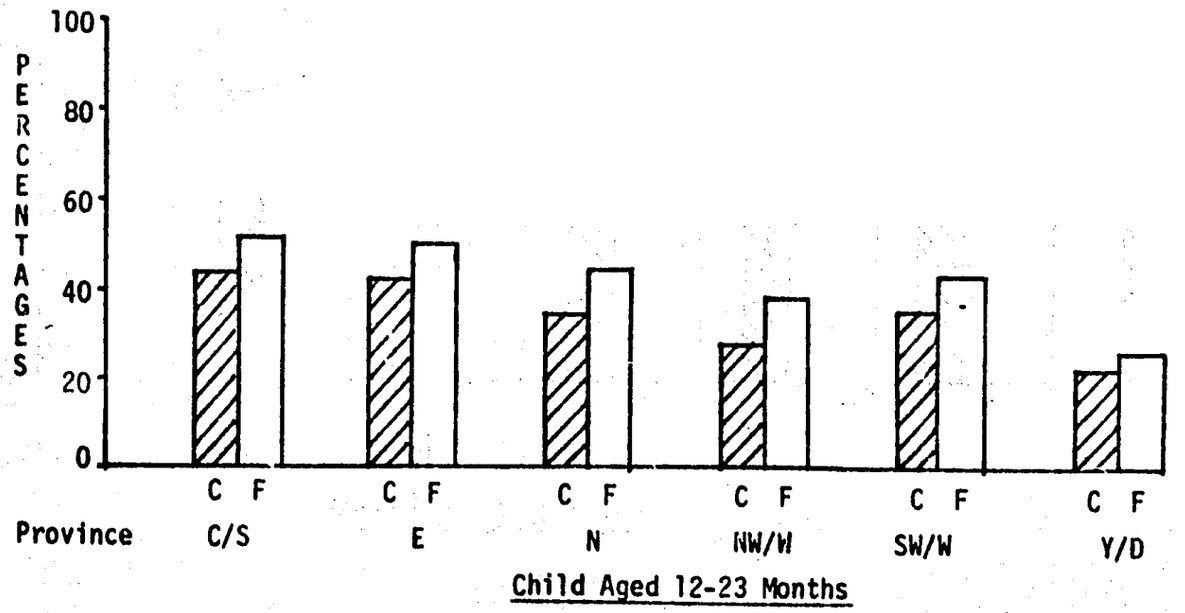
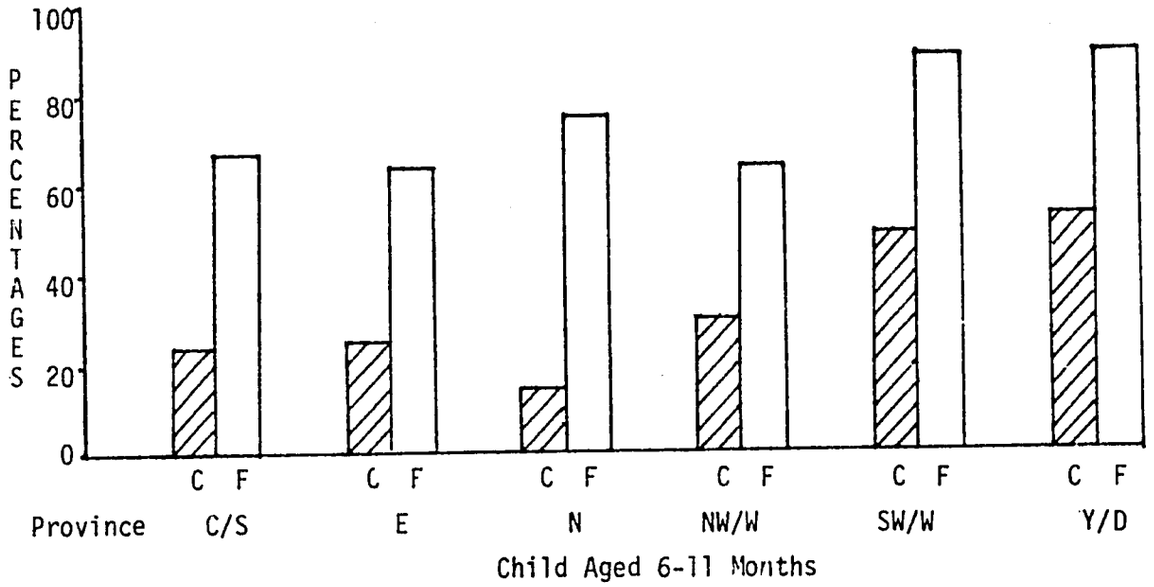
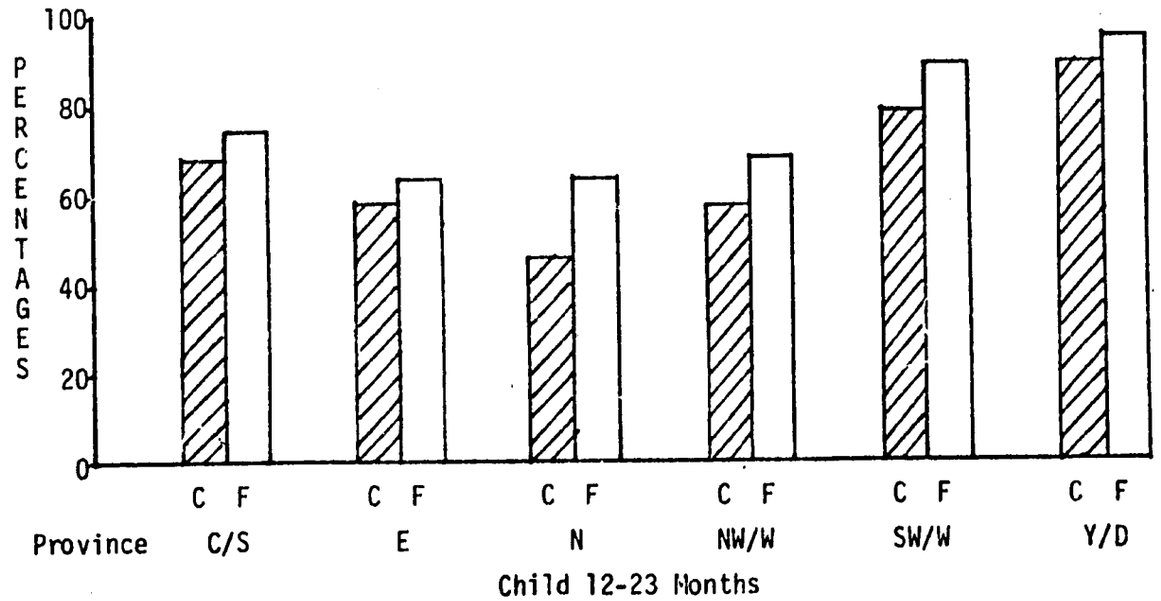


Figure 17

PERCENTAGE OF CHILDREN OF SPECIFIC
AGE GROUPS AND FAMILIES EATING
MEAT, FISH AND EGGS GROUP - BY PROVINCE



C=Child
F=Family



Fruits and Vegetables (Figure 18)

Fruits and vegetables were most commonly eaten by families in Yaounde/Douala (80%) when compared with all other areas (about 50%). In the North the proportional consumption for children aged 6-11 months was only 11%, while for other provinces it was 20%-32%.

As with other food groups, children aged 12-23 months received fruits and vegetables almost as often as their families, the highest proportion being in Yaounde/Douala (76%).

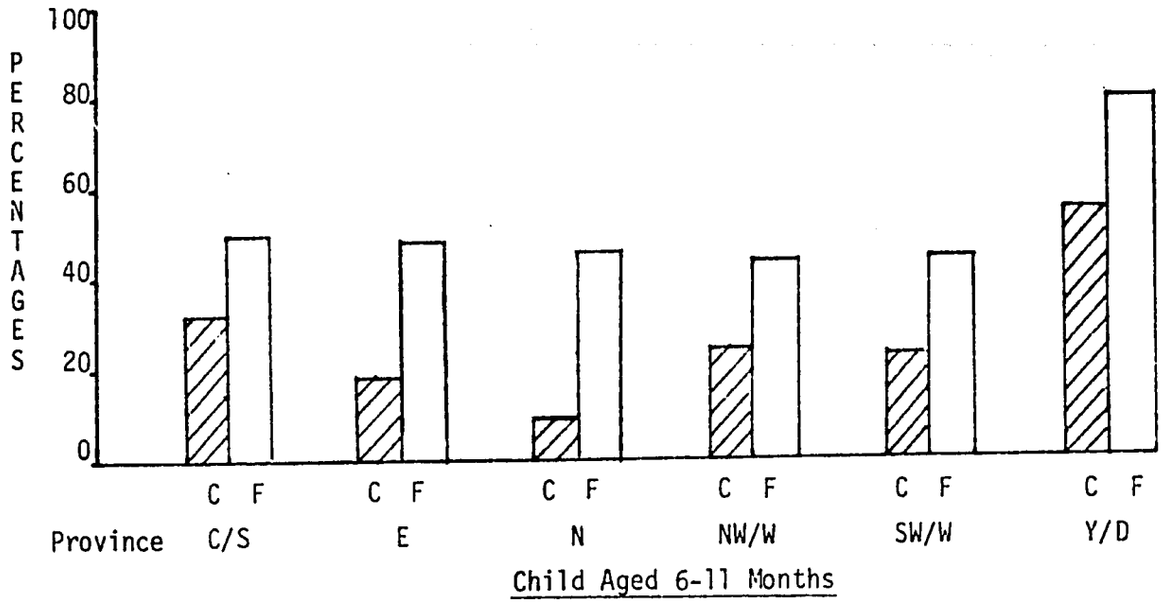
Oils (Figure 19)

There was great variation throughout the country in the percentages of children and families consuming any oil (palm oil and/or other oils, butter). The highest occurred in Yaounde/Douala and the Western Provinces (about 90%) and the Central South Province (75%). The lowest occurred in the East and North (40-50%). In all areas there was a considerable deficit in the percentage of children aged 6-11 months who received any oil, so that the trend of variation throughout the country for the children who received oil coincided with that for the families, but described a much lower frequency pattern.

The percentage of children aged 12-23 months consuming any oil approximated that of their families.

Figure 18

PERCENTAGE OF CHILDREN OF SPECIFIC
AGE GROUPS AND FAMILIES EATING
FRUITS AND VEGETABLES GROUP - BY PROVINCE



C=Child, F=Family

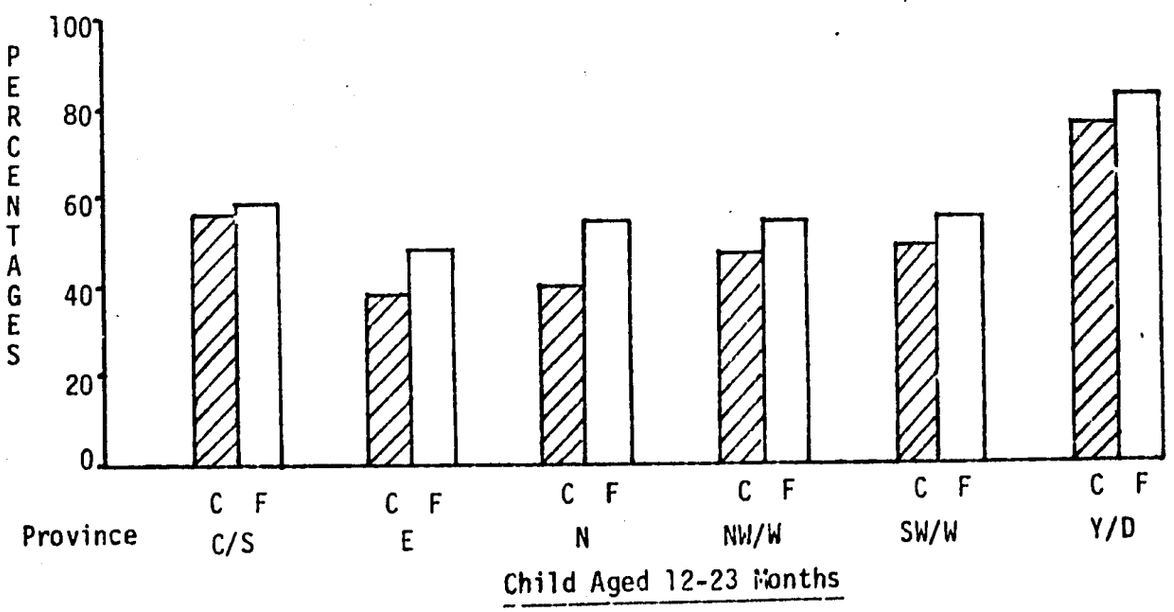
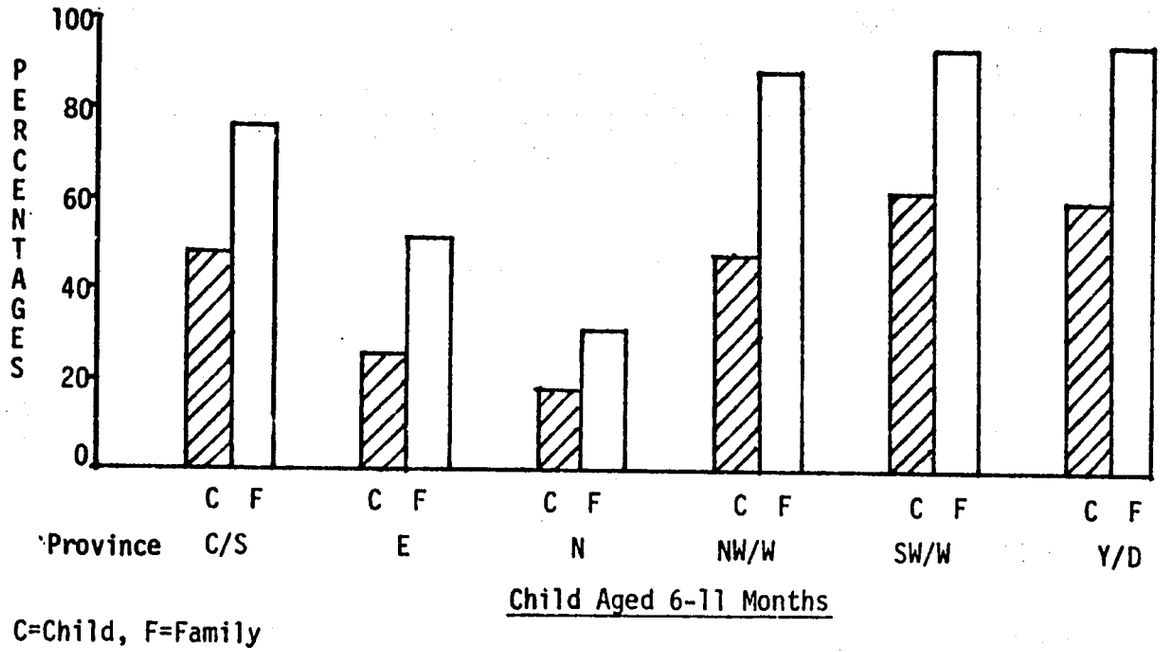
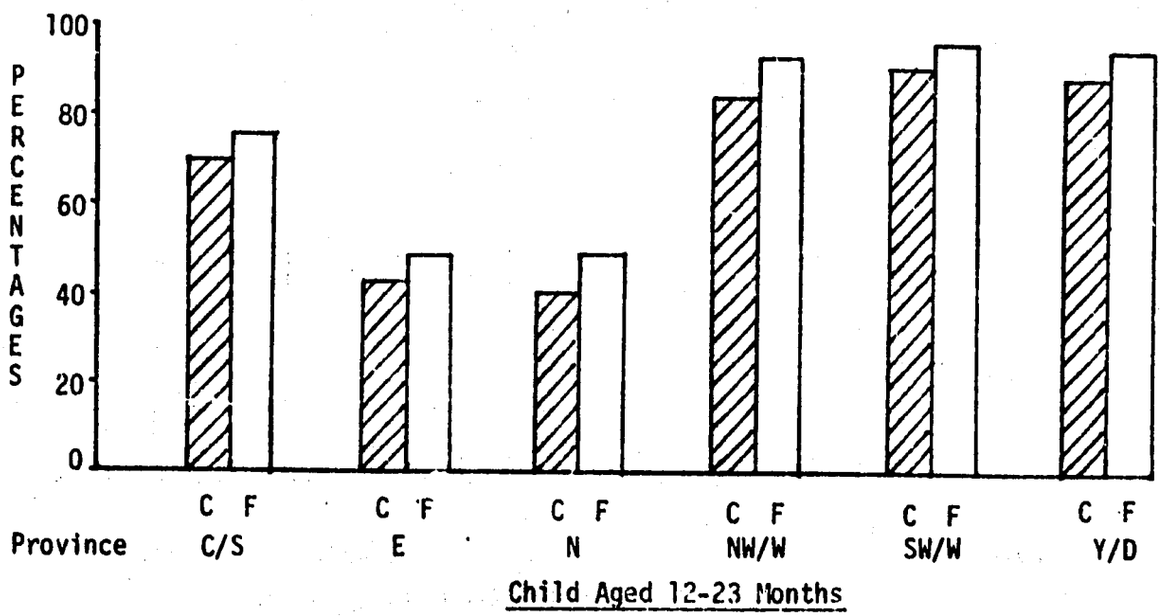


Figure 19

PERCENTAGE OF CHILDREN OF SPECIFIC AGE GROUPS AND FAMILIES EATING OILS - BY PROVINCE



C=Child, F=Family



SUMMARY

Staples (Tubers, Cereals)

Tubers were a major staple for families in all areas except the North. Cereals were also commonly eaten by families in Yaounde/Douala (95%), the North-West/West (82%), South-West/West and South Central Provinces (60%) and least of all in the East (50%). Almost 100% of families in the North had at least one type of cereal (Millet or Sorghum).

Throughout the country, 60%-70% of children aged 6-11 months received tubers when they were eaten by the family. A much higher proportion of children received cereals (70%-87%), except in the North (52%).

Protein-Rich Foods

Although 60%-90% of the families throughout the country consumed beans, seeds or nuts, and 60%-88% ate the meat, fish and egg group, far fewer children aged 6-11 months, particularly in the North, had any of these foods.

Dark Green Leafy Vegetables (DGLV)

Throughout the country, the proportion of families eating these vegetables was only 30%-60%. The proportion of 6-11 month old children consuming DGLV's was even less (10%-30%).

Fruits and Vegetables

Although about 50% of families within each province consumed any fruit or vegetable, far less of their children aged 6-11 months received any, particularly in the North.

Oils

The percentage of families consuming any oils varied greatly throughout the country, with the lowest in the East and particularly in the North. This was also reflected in the low numbers of children aged 6-11 months in these provinces having any oils.

OVERVIEW

The following food groups are listed by area, where food availability for families was relatively low. The percentage of families eating the particular food are included.

Beans, Seeds, Nuts - North (Eaten by 60% of families).

Dark Green Leafy Vegetables - All areas (30%-50%).

Meat, Fish and Eggs - All areas (60%-70%) except South West/ Littoral and Yaounde/Douala (90%).

Fruits or Vegetables - All areas (50%) except Yaounde/Douala (80%).

Oils - East (50%), North (40%).

The following list presents the food groups by area, where the proportion of children aged 6-11 months receiving foods was relatively low.

Tubers - All areas (Eaten by 50%-70% of children aged 6-11 months).

Cereals - All areas (36%-52%) apart from North-West/West and Yaounde/Douala (72%-80%). The figure of 50% for the North is a critically low percentage for children aged 6-11 months in the North who eat these foods, as they rarely have a tuber as a staple. In all other areas, it appeared that either a cereal or a tuber generally supplemented milk.

Beans, Seeds or Nuts - All areas (30%-50%), but lower in the North (20%).

Dark Green Leafy Vegetables - All areas (20%-30%) except South West/ Littoral and Yaounde/Douala. Lowest in North (15%).

Fruits and Vegetables - All areas (20%-30%) except Yaounde and Douala. Lowest in North (11%).

Oils - South Central (25%) and North (18%).

It appeared that considerable improvement is required in both food availability to the family and in the distribution within the family of food to the younger child, especially those 6-11 months old.

In the North Province the problem of distribution of a suitable staple (a cereal) to the child group aged 6-11 months appeared striking. In all food groups other than staples, both low availability and distribution was common. Again, the North often showed the lowest percentages.

Children aged 12-23 months

The proportion of children aged 12-23 months having a particular food group, in most instances approaches that of the family. It must be noted that the 12-23 months age group is centered around 18 months. Furthermore, it is expected that the percentage of children aged 12-17 months receiving a food group would be less than those aged 12-23 months and more than the 6-11 month old group. For example, in the North Province the proportional consumption of meat, fish and egg group was 15% for children 6-11 months and 56% for children 12-23 months. Thus, approximately 35%-40% of children aged 12-17 months may have received this food group.

Comments on Validity

The question of inadequate probing may leave unexplained in part the low proportion of children and adults consuming dark green leafy vegetables (DGLV), nuts and oils.

DGLV's are usually eaten as an ingredient in soups/sauces. Common soups would contain bitter leaf (Ndole is the fanciest and most time-consuming form in which bitter-leaves are prepared), cassava leaf in the rain-forest and in the North, "folleree". In the North, most leaves would be purchased in the dried form in February but they would still be in the soups. This may not have been correctly probed.

Groundnuts (peanuts) are a Northern staple. Fritters, expecially those including groundnuts and beans are commonly sold at the markets by women, as well as lentils. Fritters were relatively cheap, 2 for 5 CFA. It is possible that some families did not possess the extra money. In every village the dietary consultant visited during November, 1977 vendors were selling groundnuts and their products. The groundnut harvest was around that time. Further possibilities should be considered : first that groundnuts were less available at the time of the survey (February) or that they are primarily a cash crop in many families and as such are not consumed by the families.

Oils are commonly added to soups/sauces and may have been missed during probing. Palm oil, unlike other oils mentioned on the survey, was commonly recorded for families and children in most provinces (apart from the North). Therefore, probing appeared sufficient for this oil.

The actual types of oil (apart from palm oil) were frequently not recorded by the teams, hence it was not possible to report the findings for types the data were incomplete.

It should be noted that the same teams reported on diet throughout the country. The variation among provinces for beans, seeds, and nuts, and perhaps oils may be a true variation. This is because teams would be expected to probe in a similar fashion throughout the whole survey. An exception might be in the North, where very few teams were conversant with Northern food habits. On the other hand, because the proportion of families reportedly consuming DGLV was low throughout the whole country, it is more likely this food was not probed for adequately.

A further consideration is that food items which are part of a composite mixture (e.g. in soups/sauces) and which were missed through lack of probing are perhaps more likely to be present in relatively small amounts.

It is difficult to determine the relative importance of the probing problem and seasonal factors in explaining the low proportion of children and adults eating DGLVs, nuts, fruits or vegetables.

ii/DISTRIBUTION OF FOOD WITHIN THE FAMILY TO THE YOUNG CHILDREN

The child/family difference or deficit (C) has been defined as C = B - A (see page 170), where B is the percentage of families eating the food and A is the percentage of children in the same families eating that food.

The results for this deficit for all food groups have been presented (Figures 13-19). A low deficit (e.g., less than 20%) indicates that the children received the food almost as often as their families, while a high deficit (e.g. greater than 40%) indicates that children infrequently had the food as compared to their families.

A further concept describing the degree of distribution within the family is the child-family distribution ratio. (D.R.)

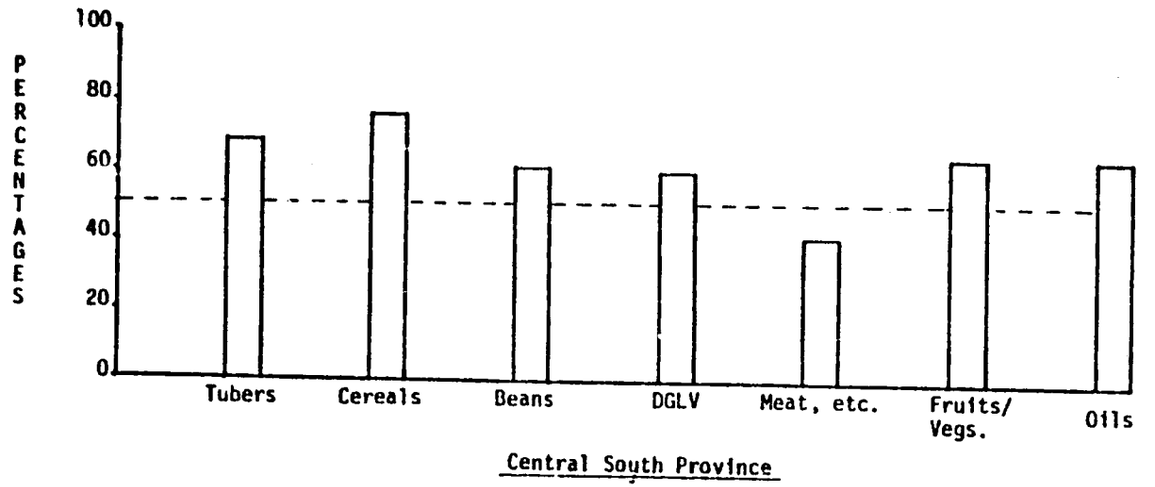
D.R. = $^{A}/_{B}$ (see page 170), where A and B are the same as described in the prior formula.

The distribution ratio complements child-family deficit. While the deficit is the absolute percentage difference between the percentage of children receiving a food compared with the family receiving, the ratio is the proportion of these child/family results.

In the above example, the deficit (B-A) is 95%-70%=25% and the ratio $^{A}/_{B}$ is $^{70}/_{95}$ = 74%. Thus, 74% of children ate a tuber when this food was eaten by the same families. A high distribution ratio has the same implication as a low deficit and vice versa. The implications of these measures are presented further in the discussion.

The distribution ratios were lowest in most food groups for the 6-11 month old child in the North Province, followed by the East (see Figure 20). The ratio is not presented when less than 25% of the families consumed the food (e.g. tubers for North). This ratio has little meaning when few families receive the food.

Figure 20
DISTRIBUTION RATIO (CHILD/FAMILY) BY PROVINCE AND TYPE OF FOOD



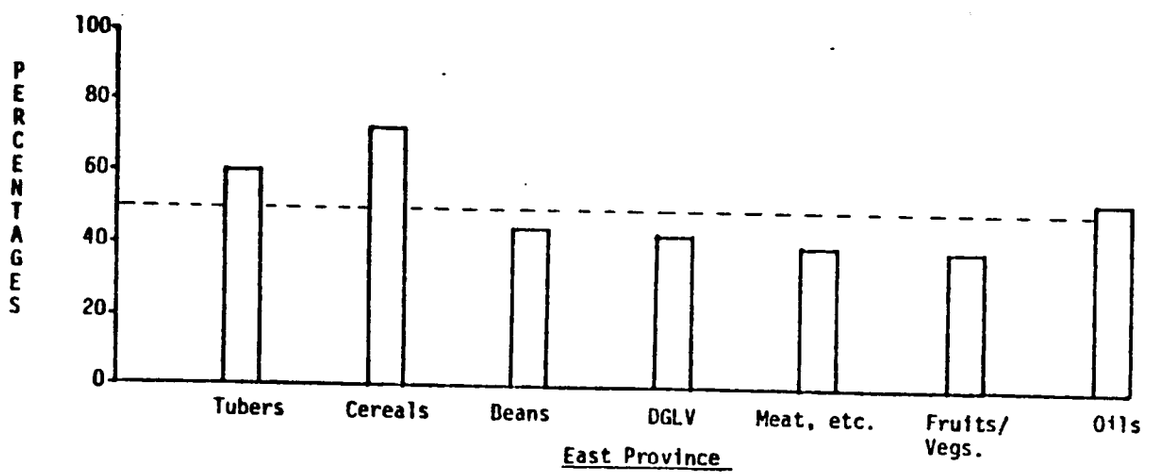
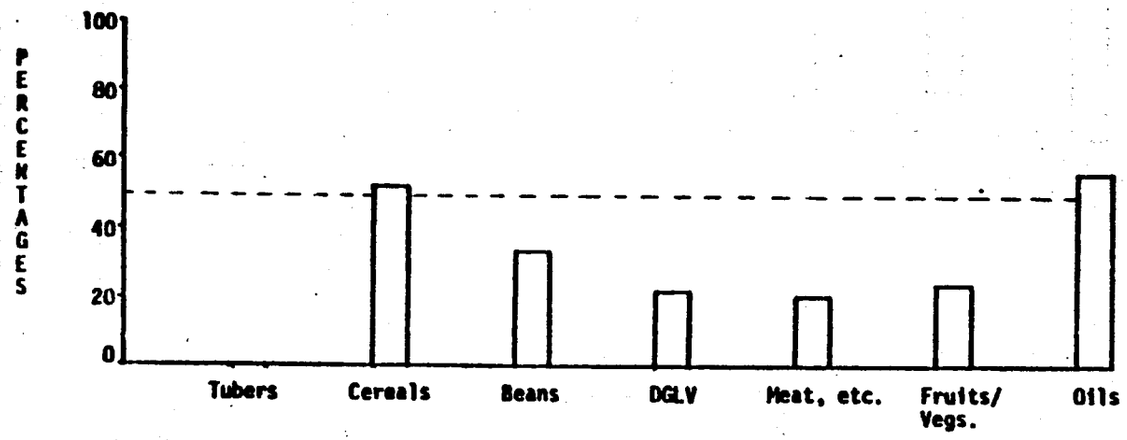
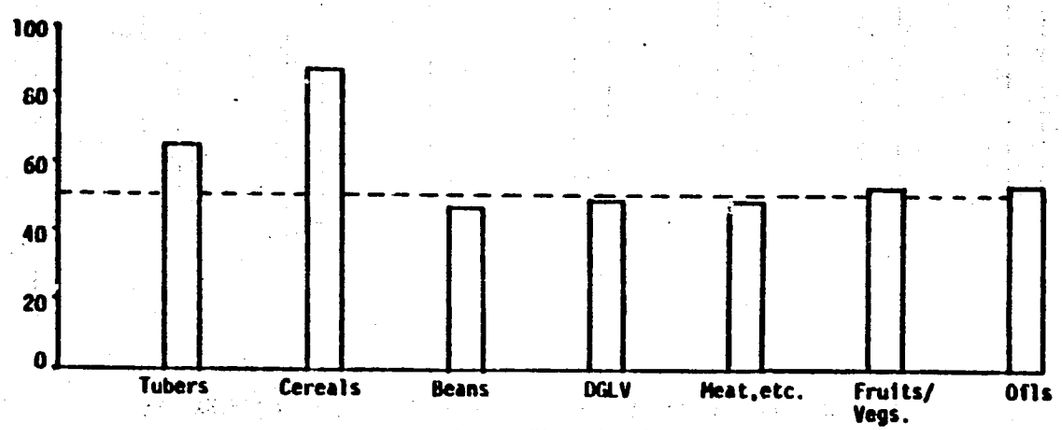


Figure 20 (cont.)

DISTRIBUTION RATIO (CHILD/FAMILY) BY PROVINCE AND TYPE OF FOOD



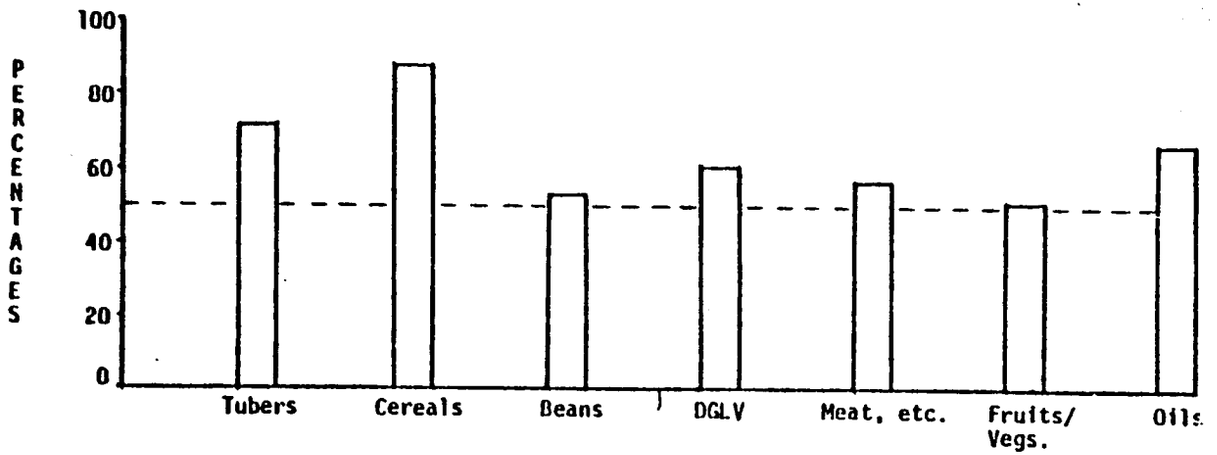
North Province



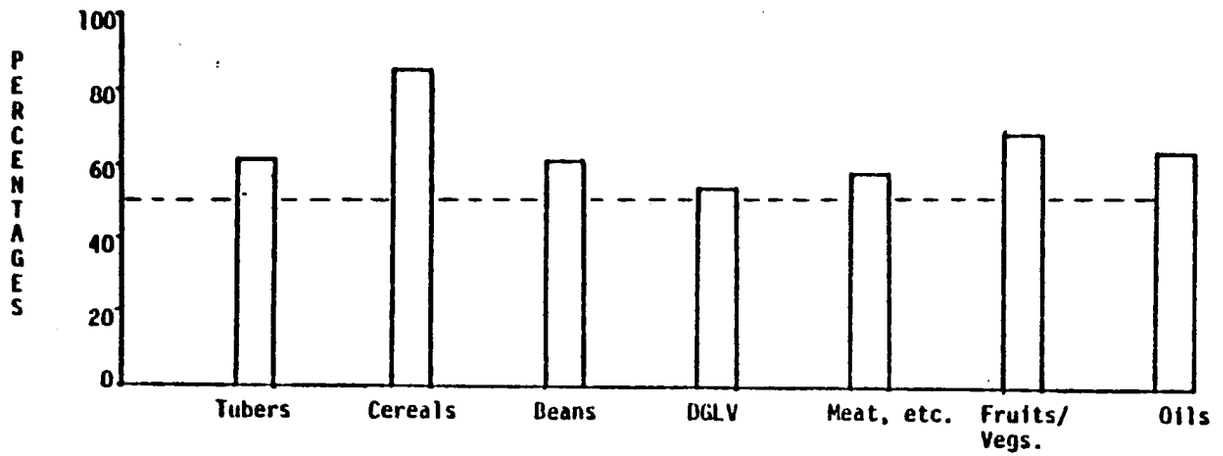
North West/West Provinces

Figure 20 (cont.)

DISTRIBUTION RATIO (CHILD/FAMILY) BY PROVINCE AND TYPE OF FOOD



South West/Littoral Provinces



Yaounde/Douala

TABLE 75

RANK ORDER OF FOOD GROUPS BY FAMILY, BY CHILDREN AGED 6-11 MONTHS AND BY DISTRIBUTION RATIOS

FAMILY	Tubers	Cer-eals	Beans	DGLV	Meat	Fruits/ Vegs.	Oils
Central South	3	4	2	3	3	2	4
East	1	6	1	1	5	3	5
North	6*	1	6	4	4	4	6
N-West/West	5	3	4	5	5	4	3
S-West/Littoral	1	5	5	2	2	4	2
Yaounde/Douala	4	2	3	6	1	1	1
CHILD 6-11 Months							
Central South	1	5	1	2	3	2	3
East	3	6	3	3*	5*	5*	5
North	6*	4	6*	6*	6*	6*	6*
N-West/West	4	2	4	4*	4	3*	4
S-West/Littoral	1	3	4	1	2	4*	1
Yaounde/Douala	5	1	2	5*	1	1	2
DISTRIBUTION RATIO							
Central South	1	4	1	1	4	2	2
East	5	5	5	5	5	5	5
North	6	6	6*	6*	6*	6*	4
N-West/West	3	1	4	4	3	3	5
S-West/Littoral	2	1	3	1	2	4	1
Yaounde/Douala	4	3	1	3	1	1	3

(Ranking Number asterisked where % frequency of consumption less than 25%).

The percentage frequency of intake of food for children has two components:

1. Availability factor (based on the family intake)
2. Distribution factor (based on what is available and distributed to the children).

If the family intake frequency is high and distribution low for the child, considerable improvement in child intake may be expected by improving the distribution. On the other hand, where the family intake is low, only marginal improvement of intake for the child may be expected if the distribution is improved. It becomes more a problem of availability for the family. Often both improvement in availability and distribution is required.

iii/AREA COMPARISON OF PROPORTIONAL CONSUMPTION BY RANK ORDER (Table 75)

The relationship between the percentages of children and family receiving a food and its distribution within the family may also be elicited by means of ranking areas, from the area with the highest percentage (having a rank of 1) to the lowest (rank of 6). For example, the Central South Province had the third highest frequency of tubers for the family, while for the ranking it was first (i.e. highest frequency) for the child aged 6-11 months. The distribution ratio for the child was also first. The ranking number is asterisked where the percentage of a group consuming food is less than 25%.

The percentage of children aged 6-11 months in the North consuming foods was lowest for all food groups other than cereals, in spite of the higher ranking for families in some of the food groups. Furthermore with cereals, the North had the highest ranking for families, but a low ranking of four (4) for the child. Consequently, the distribution ratio ranking for almost all foods (including cereals) was lowest in the North compared with other provinces.

TABLE 76

BASIS OF SCORES FOR FOOD GROUPS

VARIETY SCORE	ENERGY SCORE	PROTEIN SCORE
Tubers	Tubers OR Cereals	Cereals
Cereals		Beans,Seeds,Nuts
Beans,Seeds,Nuts		Dark Green Leafy Vegs
Dark Green Leafy Vegs.		Meat,Fish,Eggs
Meat, Fish, Eggs		Breast Milk OR Other Milk OR Comm. Weaning Foods
Breast Milk	Breast Milk OR Other Milk OR Commercial Weaning Foods	
Other Milk		
Commercial Weaning Foods		
Fruits,Vegetables	Fruits,Vegetables	
Palm Oil/Nuts	Palm Oil/Nuts	
Other Oils/Butter	Other Oils/Butter	
1 POINT EACH	1 POINT EACH	1 POINT EACH
MAXIMUM = 11	MAXIMUM = 5	MAXIMUM = 5

iv/SCORING SYSTEMS (Tables 76-79)

The National Academy of Sciences, USA recommended that scoring systems be devised to assess the variety of important food groups eaten by the child and mother (7). A score of zero indicates none of the food groups listed was consumed, a score of one means one was consumed. The higher the score, the greater the variety of food groups, but not necessarily foods.

Although somewhat arbitrary, the selection of different food groups for the purpose of scoring is based on the nutrient value of each group. However, this selectivity is crude and cannot take into account the quantity of food eaten. It should be noted that the food groups were not necessarily eaten at the same time and cannot be considered as mixes (56).

The actual groups selected and the basis for their variety, energy and protein score is listed in Table 76. The variety score simply indicates the total number of different food groups consumed, while the other scores are more specifically related to groups having the indicated nutrients (e.g. protein score) or calories (energy score). Certain groups are included in all scores; they are milk, cereals and commercial weaning foods.

In all tables the distribution, mean and mode (most frequent: asterisked) scores are presented.

Variety Scores (Table 77)

Approximately 50% of all children aged 3-5 months received more than one food (i.e. breast milk), the number of foods varied greatly throughout the country. The foods other than milk were most often commercial weaning foods or pap. (See Table 81). Children in the North had the least variety, only 25% having an added milk source or cereals (See p. 195). This was followed by the East where 36% had a food other than breast milk, usually a commercial weaning food, local cereal or tuber.

The same pattern was observed for children aged 6-11 and 12-23 months as well as for adults (less variety in the North and East Provinces and the greatest variety in Yaounde/Douala).

Energy Scores (Table 78)

As with the case for variety scores, energy scores were lowest for all ages in the North and East Province and highest in Yaounde/Douala. This was particularly evident for children aged 6-11 months. It should be noted that one point each was given for palm oil/nuts and other oils. This is because oils are a particularly important form of energy for young children; being a highly concentrated form of calories.

Protein Scores (Table 79)

The differences between North and East with the other provinces are clearcut only in the 6-11 month old age group. In other age groups and families, the distribution and mode are fairly similar throughout the country. With regards to adults, the North result was highest when compared with other provinces and the East the lowest. This supports, in an indirect way, the findings of the 1958 surveys which indicated low calorie and protein in the East, and low calorie and adequate protein intake (apart from the hungry season) in the North.

TABLE 77

PERCENTAGE DISTRIBUTION OF VARIETY SCORE
FOR CHILDREN AND THEIR FAMILIES - BY AGE AND PROVINCE

Child 3-5 Months	Variety Score						
	1	2	3	4	5-8	8+	Mean Score
Central South	40*	33	17	6	4	-	2.0
East	62*	21	5	7	5	-	1.8
North	75*	18	5	2	0	-	1.3
S-West/Littoral	44*	36	10	2	8	-	2.0
N-West/West	30	35*	24	9	2	-	2.2
Yaounde-Douala	22	40*	14	8	16	-	2.7
Total	50%*	29%	11%	5%	5%	-	1.9

Child 6-11 Months	Variety Score								
	1	2	3	4	5	6	7	8	Mean Score
Central South	9	16	9	18	21*	19	8	-	4.1
East	25*	21	13	9	12	14	6	-	3.3
North	35*	32	12	8	7	2	3	1	2.4
S-West/Littoral	3	15	14	18	22*	13	10	5	4.4
N-West/West	7	26*	15	14	13	13	8	4	3.9
Yaounde-Douala	6	8	12	11	13	15	19*	16	5.1
Total	16%	20%*	12%	13%	14%	12%	9%	4%	3.8

Child 12-23 Months	Variety Score								
	1	2	3	4	5	6	7	8	Mean Score
Central South	2	2	7	18	32*	20	15	4	5.2
East	3	6	11	25*	22	21	10	2	4.7
North	5	15	11	28*	18	13	8	2	4.2
S-West/Littoral	3	2	7	10	25*	21	22	10	5.5
N-West/West	5	4	5	16	23	24*	16	7	5.2
Yaounde-Douala	2	1	2	7	18	36*	23	11	5.9
Total	3%	5%	7%	18%	23%*	22%	16%	6%	5.1

Person Feeding Child	Variety Score								
	1	2	3	4	5	6	7	8	Mean Score
Central South	-	3	14	22	32*	22	6	1	4.7
East	1	5	20	31*	26	12	5	-	4.3
North	1	6	35*	30	19	8	1	-	3.9
S-West/Littoral	-	2	11	26	29*	23	9	-	4.9
N-West/West	1	2	13	24	27*	24	8	1	4.8
Yaounde-Douala	-	1	4	15	30	31*	16	3	5.5
Total	1%	3%	17%	25%	27%*	19%	7%	1%	4.6

*Mode value

TABLE 78

PERCENTAGE DISTRIBUTION OF ENERGY SCORE
FOR CHILDREN AND THEIR FAMILIES - BY AGE AND PROVINCE

Child 3-5 Months	Energy Score							
	0	1	2	3	4	5	6	Mean Score
Central South	-	59*	29	6	4	-	2	1.6
East	-	67*	25	5	3	-	-	1.4
North	-	79*	16	5	-	-	-	1.3
S-West/Littoral	-	58*	26	8	4	4	-	1.7
N-West/West	-	39	41*	15	3	2	-	1.9
Yaounde/Douala	-	52*	24	8	8	8	-	2.0
Total	-	61*	26	8	3	2	0	1.6

Child 6-11 Months	Energy Score							
	0	1	2	3	4	5	6	Mean Score
Central South	1	13	16	21*	19	23	7	3.4
East	-	28*	23	15	19	14	1	2.7
North	-	40*	31	17	8	4	-	2.0
S-West/Littoral	-	10	17	29*	21	10	13	3.4
N-West/West	-	9	27*	18	20	18	8	3.4
Yaounde/Douala	-	10	15	11	19	27*	18	3.9
Total	-	20	22*	18	17	15	8	3.1

Child 12-23 Months	Energy Score							
	0	1	2	3	4	5	6	Mean Score
Central South	-	3	6	26	32*	24	9	3.9
East	-	5	10	30	32*	20	3	3.6
North	-	8	24	28*	22	16	2	3.2
S-West/Littoral	-	2	4	18	27*	31	18	4.3
N-West/West	-	6	4	11	29*	26	14	3.8
Yaounde/Douala	1	2	3	8	27	45*	15	4.5
Total	0	5	9	20	28*	28*	10	3.9

Person Feeding Child	Energy Score							
	0	1	2	3	4	5	6	Mean Score
Central South	-	2	15	31	36*	16	0	3.5
East	-	3	26	37*	26	8	0	3.1
North	-	7	37*	33	18	4	1	2.8
S-West/Littoral	-	1	13	32*	32*	21	1	3.6
N-West/West	-	1	8	27	40*	24	0	3.8
Yaounde/Douala	-	0	4	17	38*	36	5	4.2
Total	0	3	18	30	31*	17	1	3.4

* Mode value

TABLE 79

PERCENTAGE DISTRIBUTION OF PROTEIN SCORE
FOR CHILDREN AND THEIR FAMILIES - BY AGE AND PROVINCE

Child 3-5 Months	Protein Score						
	Nil	1	2	3	4	5	Mean No. of Food Groups
Central South	-	79*	11	6	4	-	1.3
East	-	76*	16	3	5	-	1.4
North	-	84*	16	-	-	-	1.2
N-West/West	-	50*	41	7	2	-	1.6
S-West/Littoral	-	62*	30	4	4	-	1.5
Yaounde-Douala	-	51*	30	16	3	-	1.7
Total	-	69*	23	5	3	-	1.4

Child 6-11 Months	Protein Score						
	Nil	1	2	3	4	5	Mean No. of Food Groups
Central South	1	23	23	34*	18	2	2.5
East	1	40*	24	16	14	5	2.2
North	-	46*	27	16	8	3	1.9
N-West/West	-	18	40*	18	19	5	2.5
S-West/Littoral	-	19	29*	25	21	6	2.7
Yaounde/Douala	-	14	25	26*	26*	9	2.9
Total	-	29	28*	21	17	5	2.4

Child 12-23 Months	Protein Score						
	Nil	1	2	3	4	5	Mean Score
Central South	-	8	26	36*	25	5	2.9
East	-	11	23	35*	25	6	2.9
North	-	8	18	33*	30	11	3.2
N-West/West	2	10	18	32*	28	10	3.0
S-West/Littoral	1	12	14	28	30*	15	3.2
Yaounde/Douala	1	3	12	45*	34	5	3.2
Total	1	9	19	34*	29	9	3.1

Person Feeding Child	Protein Score						
	Nil	1	2	3	4	5	Mean Score
Central South	1	10	38*	37	14	-	2.5
East	3	11	36	38*	12	-	2.4
North	-	3	32	44*	20	1	2.8
N-West/West	3	13	30	37*	16	1	2.5
S-West/Littoral	2	14	30	36*	16	2	2.6
Yaounde/Douala	1	4	27	48*	19	1	2.8
Total	2	9	32	40*	16	1	2.6

*Mode value

c. Associations Between Nutritional Status and Diet

The scoring systems were used as a basis for comparing the number of food groups with the anthropometric classifications for undernutrition (See Table 80).

It was apparent that underweight prevalence was significantly greater in children aged 6-11 and 12-23 months who had less numbers of foods (lower variety score), less energy-containing foods (lower energy score), and less numbers of protein-rich foods (lower protein score). The same associations were found with mothers, i.e. a higher prevalence of underweight in children whose mothers had lower scores for variety, energy and protein.

These results suggest that underweight children tended to have a diet less varied in total, in energy and in protein-rich foods. The association between food scores and anthropometry tends to some extent to validate the methodologies used.

TABLE 80

PERCENTAGE UNDERNUTRITION ACCORDING TO FOOD SCORES--BY AGE

CHILD	Score	Sample Size	Chronic H/A 90%	Under-Weight W/A 80%	Arm Wasting AC/A 82.5%
Variety					
3-5 months	1-3	285			
	4-10	40			
6-11 months	1-3	301		23.9%	21.9%
	4-10	357		11.8%	11.8%
12-23 months	1-3	175		36.6%	26.9%
	4-10	978		22.2%	19.0%
Energy					
3-5 months	1-2	272			
	3-4	44			
	5-6	7			
6-11 months	1-2	258	11.2%	26.0%	23.3%
	3-4	239	6.3%	13.4%	15.5%
	5-6	161	4.3%	9.3%	6.8%
12-23 months	1-2	146		38.4%	25.3%
	3-4	553		25.1%	23.1%
	5-6	454		18.9%	15.0%
Protein					
3-5 months	1-2	295			
	3-5	28			
6-11 months	1-2	345	9.9%	22.3%	22.0%
	3-5	313	5.4%	11.8%	10.2%
12-23 months	1-2	315		31.1%	
	3-5	834		21.8%	
MOTHER	Score				
Variety (M) (Mother)	1-3	471		24.8%	19.5%
	4-10	1760		17.7%	15.3%
Energy (M) (Mother)	1-2	470	16.0%	26.6%	22.1%
	3-4	1353	14.1%	18.9%	15.5%
	5-6	402	9.2%	11.9%	11.6%
Protein (M) (Mother)	1-2	948			18.1%
	3-5	1276			14.8%

TABLE 81

PERCENTAGE OF CHILDREN EATING WEANING FOODS

A. 3-5 MONTHS

Province	Commercial	Local Pap	Other
Central South	17	4 (corn)	
East	13	5 (corn)	
North	0	6 (millet, sorghum)	
N-West/West	15	22 (corn)	
S-West/Littoral	8	26 (corn)	
Yaounde/Douala	34	22 (corn)	

B. 6-11 MONTHS

Central South	10	8 (corn)	11 (wheat/bread)
East	7	12 (corn)	
North	2	30 (millet, sorghum)	
N-West/West	3	34 (corn)	
S-West/Littoral	16	22 (corn	
Yaounde/Douala	28	28 (corn)	11 (wheat/bread)

C. 12-23 MONTHS

Central South	2	5 (corn)	10 (wheat/bread)
East	0	6 (corn)	
North	0	45 (millet) 10 (corn)	
N-West/West	1	10 (corn)	9 (Plantain/Banana)
S-West/Littoral	3	6 (corn)	9 (wheat/bread)
Yaounde/Douala	10	18 (corn)	19 (wheat/bread)

d. Selected Individual Foods

i/COMMERCIAL WEANING FOODS (Table 81)

These were purchased for the exclusive use of the young child. Almost all responses on the survey did not indicate the trade name. Such foods were most commonly eaten by children aged 6-11 months in Yaounde/Douala (28% of children) followed by those in S. West/ Littoral (16%) and Central South Provinces. These foods were rarely eaten by children aged 12-23 months, other than in Yaounde/Douala (10%).

ii/LOCAL WEANING FOODS (Table 81)

Separate items on the diet questionnaire form identified the gruels or pap (bouillie) for corn, rice and millet/sorghum. Throughout Cameroon, corn was the commonest source of pap used, with the exception of the North where the pap came from millet/sorghum. The proportion of children 6-11 months of age receiving corn pap varied from 8% in the Central South to 34% in the North-West/West Provinces. For the older age group (12-23 months) corn pap was commonly used only in Yaounde/Douala (18%).

In the North a lower proportion of children aged 6-11 months had millet/sorghum pap than the older group (30% vs. 45%). In addition, a small percentage of children in both age groups received corn pap (6%-10%).

It should be noted that in all provinces, these paps were often not given exclusively to the child, since they were eaten by the adult as well. In many instances, paps were eaten by almost the same percentage of adults as children.

It was not possible to directly assess which special food preparations were eaten other than paps. However, it was possible to determine the proportion of children eating such preparations, when considered as a broad group of foods. The percentage of occasions where this commonly occurred is listed under "Other" in Table 81.

iii/TUBERS

Cassava (manioc) was consumed most commonly by children aged 6-11 months in the East (41%), Central South (31%), South West/ Littoral and Yaounde/Douala (each 21%) and by children aged 12-23 months in the East and South (66%and 61%, respectively).

The other tubers eaten by children aged 6-11 months included macabo (ranging from 11-25% in all provinces except the North) and taro (10-17% in the Western Provinces). The percentages for macabo increased to 18-38% for older children (12-23 months).

Plantains/Bananas were commonly eaten in all provinces other than the North, with the children consuming these ranging from 17-34% in those aged 6-11 months and from 35-51% in the older group.

iv/CEREALS

The cereals eaten by the highest proportion of children are listed in Table 82.

Table 82 Percent of Children Eating Most Common Cereals - By Age and Area *

Area	Age	
	6-11 months	12-23 months
Central South	Bread/Wheat 30%	Bread/Wheat 31%
East	Corn 20% Bread/Wheat 17%	Corn 25%
North	Millet/Sorghum 40-45%	Millet/Sorghum 45+%
North-West/West	Corn 50%	Corn 60%
South-West/Litt.	Corn 30%	Wheat/Bread 41%, Rice 30%
Yaounde/Douala	Wheat/Bread 55%	Wheat/Bread 83%
	Corn 30-40%, Rice 23%	Corn 35-40%, Rice 37%

*Percentages are approximate as they include the paps as well as the regular foods

v/PEPPERS (Table 83)

Peppers were consumed by 32-43% of children aged 6-11 months in all provinces other than the North (16%) and by 61-83% of those aged 12-23 months other than the North (42%). The proportion of families eating peppers was also lowest in the North (60% vs. 76-88%).

TABLE 83

PERCENTAGE OF CHILDREN AND FAMILIES EATING PEPPERS

Province	6-11 months	12-23 months	Family
Central South	42	73	76
East	38	71	87
North	16	42	60
N-West/West	32	61	76
S-West/Littoral	42	83	88
Yaounde/Douala	43	74	79

vi/PROTEIN-RICH FOODS (Table 84)

In this report, protein-rich foods include nuts, beans, seeds, fish, meat and eggs.

The percentage of children eating each of the foods varied greatly by province and age group. For example, nuts and fish were the foods in the group eaten by most children in all provinces and eggs and beans were eaten the least. (Table 84 - ranking order of food).

Nuts* were most commonly eaten by children aged 6-11 months in the Central South, beans in the North West/West, fish in South West/Littoral and meat in Yaounde/Douala. (Table 84 - ranking order according to province).

The proportion of children aged 12-23 months who age all protein rich foods is in general, approximately double that of the younger children. The exception is for eggs, where there was little age difference and the prevalence of its consumption remains relatively low.

*It is assumed most were groundnuts

TABLE 84

PERCENTAGE OF CHILDREN EATING SELECTED PROTEIN-RICH FOODS--BY PROVINCE

Province	6-11 Months						12-23 Months					
	Nuts	Seeds	Beans	Fish	Meat	Eggs	Nuts	Seeds	Beans	Fish	Meat	Eggs
Central South	41	6	2	19	10	8	68	10	1	53	26	6
East	30	9	1	13	11	4	60	18	1	33	30	6
North	12	4	5	9	6	1	33	7	16	32	29	1
N-West/West	20	11	10	20	8	6	40	18	27	41	24	12
S-West/Littoral	25	9	2	41	11	7	47	20	13	65	24	6
Yaounde/Douala	38	8	8	37	19	7	48	19	12	69	32	7
RANKING ORDER ACCORDING TO FOOD												
Central South	1	5	6	2	3	4	1	4	6	2	3	5
East	1	4	6	2	3	5	1	4	6	2	3	5
North	1	5	4	2	3	6	1	5	4	1	2	6
N-West/West	1	3	4	1	5	6	1	5	3	1	4	6
S-West/Littoral	2	3	6	1	4	5	2	4	5	1	3	6
Yaounde/Douala	1	4	4	1	3	6	2	4	5	1	3	6
RANKING ORDER ACCORDING TO PROVINCE												
Central South	1	5	4	3	4	1	1	5	5	3	4	2
East	3	2	6	5	2	5	2	3	5	5	2	2
North	6	6	3	6	6	6	6	6	2	5	2	6
N-West/West	5	1	1	3	5	4	5	3	1	4	5	1
S-West/Littoral	4	2	4	1	2	1	3	1	3	2	5	2
Yaounde-Douala	2	4	2	2	1	1	3	1	4	1	1	2

Discussion

The urban influence with regards to commercial weaning foods is apparent from the results. This is also the case for artificial (non-fresh, commercial) milk. (See Table 66). There was little apparent indication of infant food or milk promotion (such as posters and free samples) by commercial enterprises outside the major urban centers.

Bottle feeding was most common in Yaounde/Douala and in the Central South Province. Such feeding was not uncommon, however, in the Western Provinces and may well increase with urbanization unless efforts to offset this trend are made.

An unexpectedly high proportion of adults ate pap. This may be more likely in the morning or be part of a "sharing" process between the adult (usually the mother) and her young child. This finding requires further investigation. If it is indeed true, it may mean that not only were many mothers preparing pap, but also that this pap was considered an adult food, rather than specifically for the child. For example, paps may be used by adults as a form of light diet energy food, which is easily digested.

It was worthy of note that corn was by far the commonest pap given to infants in the Western Provinces and Yaounde/Douala. Cassava was rarely prepared as a special food, although it was commonly consumed by infants aged 6-11 months in the East and Central South Provinces. The actual amounts of corn pap and cassava consumed by infants were unknown.

Corn pap is the traditional weaning food in most provinces. This may have implication for agricultural planning and perhaps child feeding or nutrition education programs. Its popularity may be related to accessibility, ease of preparation, cultural patterns, palatability, or economic reasons.

Bread consumption was found mainly in urban areas and was probably related to socio-economic level and cultural influences.

The continuance of millet/sorghum pap in Northern children throughout their second year of life, while a higher proportion of children in other areas of Cameroon tend to share family food, clarified further the findings about food sources.

It is important to note the extreme variation throughout the country of the percent of children and families consuming protein-rich foods. This must be taken into account when locally available protein-rich foods are promoted as a component or components of a "food-mix" with the common staple for improving the diet of young children.

The low proportion of families and particularly young children in the North consuming hot peppers may have important implications. Fresh peppers are generally consumed less in the North, availability being mainly the day peppers are in the market. Whether mothers purposely refrained from giving hot peppers (and with it, the family food) to the young child will have to be further investigated. In addition, fresh peppers are an important source of Vitamin C, whereas dry peppers are not.

FINAL DISCUSSION

1. Introduction

The diet methodology was kept as simple as possible, i.e. only the presence or absence of specific foods was asked. The diet co-ordinator together with available Cameroonian technicians, visited all areas of the country during the initial planning and training phase (57). This was to assist the Technical Committee in the questionnaire preparation both on diet and socio-economic status, to clarify some likely field problems-both logistic and technical-and to gather whatever information was available at the time in the country regarding food availability and consumption practices as well as other nutrition related data useful for the survey planning. Initial field trials were carefully reviewed.

The method of interrogation has been outlined (See p.164). It was especially important to let the mother respond on her own at first, with regards to the food eaten the day before. Only after this were specific questions asked. If she was first questioned about each specific food, she will very likely feel that a "yes" answer is expected and should be given. The concept of probing was stressed during the training.

2. Validity

During the field tests, the most frequently forgotten foods were ingredients in a mixture, soup or sauce. These included oils, vegetables, and dark green leafy vegetables (DGLV). In addition, fruits and sugars may have been overlooked.

From the survey results it was apparent that sugars and alcohol were often missed or included in such a way that it was not possible to know thether it was a sugar or sugar drink or alcohol which was consumed. Problems in the analysis concerning DGLV's, oils and vegetable proteins have been discussed. The trade name or type of commercial weaning food was usually not given. It is possible some of these foods may have been milk powder. Occasionally, the definition

of "special" and "weaning" foods was perhaps unclear.

The greatest care was taken that the respondent was in fact always the person who fed the child the day before. Even the mother's response was not accepted, unless she was also the feeder.

Certain data were not exploited for lack of adequate information on some relevant question.

Fruits and vegetables (usually gombo) could not be separated in the analysis. The energy content of these two groups may differ widely.

In summary, information on the milk, breastfeeding, and fish/meat group and peppers appeared to be validly collected. Results for cereals and tubers were also probably valid, but findings for certain vegetable proteins and oils other than palm oil may be suspect. The reporting of DGLV's may have been inadequate on occasions. The sugar/alcohol findings were ambiguous, and hence not presented in the report.

The question of adequate sample sizes for diet recall methods requires further elucidation which is beyond the scope of this report.

3. Results

The types of foods eaten throughout Cameroon is consistent with the ecological backgrounds. However, the importance of the seasonal factor cannot be stressed enough. Results for the "hungry season" will depend on what is stored and more readily available at the time. For example, cassava may be eaten by a higher proportion of children and families in the North in the hungry season. This can only be elucidated by further studies.

It should also be noted that within provinces differences in food consumption patterns do vary. Such data is in general unavailable in this survey, because the entire province results have been described.

A further point to note is that the ultimate concern must be established on the basis of the amount of calories, of protein (and quality), and other nutrients consumed. The types of foods eaten can at best be only a guide to the child's actual intake. However, it may be assumed that a child, for example, who does not eat any of the foods known to be rich in protein is probably not meeting the requirements for protein.

A further example is based on gruels or paps for the young child. Gruels with a high water content contribute relatively little to the young child's requirements. Gruels made with unsanitary water can cause diarrhea. There was evidence on the survey that watery gruels were given to the child by bottle.

11. GOITER IN MOTHERS

11.1 METHODOLOGY

Goiter in mothers was assessed based on the WHO classification (6). (See Appendix 14,Form Clarification). The examination did not involve palpation or tilting of the head. The category "Goiter Evident" refers to a goiter that was seen at a distance of approximately six feet, while "Goiter Seen Close" refers to a goiter that was seen at a distance of approximately one foot away from the mother. "Goiter Obvious" appears only on the following tables and is the sum of percentages of the categories "Goiter Evident" and "Goiter Seen Close." For example, in Table 85, the Eastern Province showed "Goiter Evident" of 8.1%; "Goiter Seen Close" of 8.7% for a total of 16.8% for "Goiter Obvious." Tables should be viewed with caution when the sample size is small (i.e. less than 100). When the sample was very small (i.e. less than 25) the percentages were omitted to avoid misinterpretation.

11.2 FINDINGS

a. Prevalence Rates by Area and Age Group of Mother

Obvious goiter was present in this study in 4.4% of all the mothers examined (Table 85), Obvious goiter prevalence rate for the whole country was similar for mothers aged under 21 years (3.6%) as compared with those aged 21-40 years (4.2%) but perhaps higher in the over 40 years age group (12.5%) (Tables 86 to 88).

The prevalence of goiter in mothers was greatest in the East Province where 16.8% of all mothers observed had obvious goiter.

The prevalence rates for mothers in the East were 8.3% (in those aged under 21 years) and 17.5% in the 21-40 age group.

Although sample size was small, which should be viewed with

caution, there was a suggestion that prevalence of obvious goiter could be of the order of 30% in Eastern mothers of 40 years of age and over (Table 88).

In addition to the high prevalence of goiter on Eastern mothers in this study and in other reports (58,59), other areas of the country showed various prevalence rates for goiter (Table 85). Obvious goiter was found in the North (5.6%), North-West (3.4%) and Central South (3.1%) Provinces. It was very rarely seen in the West(0.4%) and South-West (0.7%); and it was not found at all in the Littoral Provinces nor in Yaounde/Douala. The prevalence rate was perhaps higher in rural when compared with urban areas (4.6 vs. 1.8%).

b. Goiter Prevalence According to Sites (Table 89 and Figures 22-29)

In order to present a more graphic description of goiter within Cameroon, the prevalence of obvious goiter is listed and mapped by site. It should be noted that this is a descriptive but not a statistical presentation with regards to prevalence.

Three broad categories for obvious goiter may be considered:

1. Not present
2. Present but under 10% prevalence rate per site (usually one mother out of a total range of 12 to 24 mothers in the site had obvious goiter).
3. Present in 10-24% of mothers in the site.
4. Present in 25%+ of mothers in the site.

It would appear that prevalence of goiter is particularly important throughout the whole of the East Province, in some scattered areas of the North, near Yoko in Central-South, and in the Bamenda Plateau in the North-West Province.

11.3 DISCUSSION

The purpose of the survey was to identify on a national basis, areas in Cameroon where goiter may be considered a problem. Although goiter in the East province has been known and well documented as a serious problem, its presence and extent in the rest of Cameroon was not clear.

Goiter has been previously described (outside the East) in the Mountains of the Margui-Wandala region in the North, around Bamenda in the North-West,and around Foumban and Foumbot in the West Province.

The methods of this survey make it possible to estimate in a broad sense, numbers of mothers (with young children) who had obvious goiter. Although the actual prevalence rates are highest in the East, the actual number with goiter is highest in the North Province (Table 90 and Figure 21). Some caution is required in the calculation of numbers affected. Because the total numbers of mothers measured in each site was not the same for every site, it was not possible to determine the precision and confidence interval for the prevalence estimates, as was done with undernutrition in children (see page 92). In addition, it is assumed that the mother sample was an indication of the total population prevalence for each Province or at least the adult female population of reproductive age.

The descriptive lists and maps can only provide a clue as to the important areas affected within provinces. Because of the nature of the population sample, only whole provinces can be described.

The question of migration should be considered and may explain some of the results for certain urban or other sites where one mother was found with goiter (e.g., near Victoria, South-West Province). In addition, sporadic (non-endemic) cases of goiter are not uncommon.

It is to be expected that many pockets of goiter do not appear on the map, because they were not visited on the survey.

With these limitations, it would appear that this survey showed significant goiter in the following areas:

1. Almost all of the East Province
2. The North: areas around Bogo, east of Maroua; Garoua, Mandara Mountains near the Mbakan Mountains (Toubora); and perhaps scattered areas in the Adamaoua Plateau, and
3. The Central South: in the Northern part near Yoko; perhaps to the West near Bafia and Bokito.
4. The Western Provinces: North of the Bamenda Plateau;perhaps scattered areas around Bamenda, Dschang and Bafoussam.

It is difficult to compare this study's prevalence rates with those of earlier studies which included Grade I goiter (palpable) as well as other population age groups which are not included in this study. In surveys of this type, perhaps Grade I goiter is present two to four times more often than that of Grade II and III combined. Therefore, the prevalence rates of this study should be considerably less than those of the studies which included all grades of goiter.

A salt iodization program was recommended in 1968 and begun in 1971 in the East Province. However, it did not continue.

A positive correlation in Cameroon has been reported between goiter, cretinism and mental retardation (in children) and sterility in women (60).

The reduction of goiter in Cameroon is recommended as urgent and essential. Examples of programs for this purpose in other countries are presented below.

11.4 EXAMPLES OF METHODS USED IN OTHER COUNTRIES TO REDUCE GOITER

According to WHO, a 5% incidence of Grade I goiter in pre and peri-adolescent children, or a 30% incidence of goiter in the general population, justifies a prophylactic program. If 1% of the population is classified as cretin, then early and urgent action should be taken. Goiter, the enlargement of the thyroid gland due to malutilization of iodine, may result in adverse effects on general metabolism,decreased work capacity, obstructive neck lesions, and eventual development of malignant changes in the gland tumor.

Endemic cretinism and deaf-mutism are generally found where goiter is severe and are associated with lack of iodine during the fetal period and early extra-uterine life. However, there is increasing evidence that even moderate iodine deficiencies in these early periods can have permanent effects on mental development.

Although early treatment of cretinism may help deter major developmental defects and retardation, and treatment of goiter may reduce its size visibly, prevention through avoidance of cretinism and goiter is the most effective way of dealing with them.

Iodine deficiency is one of the major etiologic factors in endemic goiter. Therefore, the most common solution to this problem has been to increase the iodine supply to the affected population. The following is a brief outline of two main types of goiter interventions which have been effectively applied in Latin America;[1] iodization of salt and the use of iodized oil, (including a synoptic evaluation of each). These may be tenable as models for the development of programs aimed at the control and prevention of endemic goiter elsewhere, Cameroon included.

1. Iodization of salt has been shown to be a successful means of goiter intervention in a population whose consumption of salt is extensive. Various Latin American countries have implemented programs. Some were presented at the 1974 PAHO meeting.[2] It is usually the most practical, simple and inexpensive method. Legislation requiring that all locally produced and imported salt be iodized is necessary for areas at high risk of iodine deficiency. Programs are best conceived when the salt industry works in cooperation with the country's government. Ideally, the government and the salt industry should share the price of iodization processes, rather than passing it on to the consumer who may then seek uniodized salt in order to reduce his expenditure. The following are examples of specific programs.

a. Salt Iodization Program and Surveillance in Colombia: In Colombia, the iodization of salt for human consumption was started on an experimental basis in 1950 as a response to the fact that the prevalence of goiter among school children, according to a nationwide survey carried out in 1958, was found to be 53 percent. In seven localities of the Department of Caldas, the average prevalence rate was 83 percent. A national program for iodization of salt, organized under the supervision of the National Institute of Nutrition was initiated in 1963. In order to evaluate its effectiveness, a third survey was undertaken in 1965 in the same seven localities. The result was that the goiter prevalence rate had dropped dramati-

cally to 1.8 percent. In the Colombian case, the cost of salt iodization was absorbed by the national budget and the price of iodized salt was pre-set.

b. Salt Iodization Program in Mendoza, Argentina: Prophylaxis with iodine in Mendoza Province has been in effect for 20 years. A survey conducted in 1940 on school children and army recruits[2] determined that endemic goiter existed in Mendoza and that iodine deficiency was evident both in the environment and in individuals. As a recourse, the Mendoza Government enacted Law 2112 in October 1952, requiring the mandatory use of iodized salt.

Results of the salt iodization program were measured in 1959 and 1960, manifesting that the incidence of goiter among school children decreased from 46 to 3 percent.[3] Further studies indicated that the iodine content of the diet had been increased almost seven times by the introduction of iodized salt and there had been no other dietary changes in the population to account for the increase.

Due to the success of the salt iodization program carried out in Mendoza, a national law requiring the use of iodized salt for human consumption was enacted in Argentina in 1967.

c. Salt Iodization Program in Guatemala: The first complete national survey to determine the existence of goiter in Guatamala was carried out by Munoz in 1952[4] under the direction INCAP. It showed a nation-wide goiter prevalence rate of 38 percent, with some areas as high as 90 percent. As a result of this evidence, the government put into effect a compulsory iodization law in 1956.

Subsequent population-wide surveys to evaluate the results of the salt iodization program were conducted in 1962, 1964 and 1965 and these clearly showed a drop in the goiter prevalence to levels below which it is considered a public health problem.

2. Iodized Oil: Salt iodization programs have proven quite effective in the prophylaxis of endemic goiter, but may be quite difficult to apply in some areas where distribution to the entire population cannot be achieved. In such areas several programs have

been implemented replacing iodized salt with a single intramuscular injection of iodized oil. The size of the dose and the frequency of treatment have varied among the different groups using this method. Results have generally been good, and the correction of iodine deficiency has lasted from two to four and a half years.[5] This method has had the disadvantage, however, of requiring specialized personnel, and several cases of jod-Basedow have been described following its use.

Experience with the injection of iodized oil in New Guinea, as well as Ecuador and Peru, has not been able to reduce the prevalence rate of goiter to the 5 percent level shown in the Guatemalan case.[6] However, experience with the oral administration of iodized oil may offer promising alternatives to intramuscular injection based on a program carried out in the more isolated areas of Western Argentina because it has the advantage of being simpler and requiring less skilled personnel.[7] The following is an example of this type of program.

Program for the Oral Administration of Iodized Oil in Mapuche and Malargue, Argentina: Results from a program for the oral administration of iodized oil were compared with those from intramuscular injections of iodized oil to the same group of 250 subjects in two similar areas of Western Argentina which were both iodine deficient. Both groups showed a marked decrease in goiter size, with proportionate increases in serum and urinary iodine and serum thyroxine. No cases of jod-Basedow were observed in the oral group.[8] Conclusively, the oral route provided levels of iodine which were quite adequate, although lower than those obtained with intramuscular injections.

Oral administration has had the advantage of being easier, as it could be administered by relatively untrained personnel. Thus far, there have not been unfavorable reactions to its administration. More experience with this method in regards to absorption, metabolism and excretion of the oil is needed.

References:

1. Compiled by the Pan American Health Organization (PAHO)/WHO in the report of the IV Meeting of the PAHO Technical Group on Endemic Goiter held in Guaruja Sao Paulo, Brazil, October 1973.

2. Perinetti, et. al., Table 1, pp 213 "Incidence of Goiter in School Children and Army Recruits in Mendoza, 1940;" "Salt Iodization in Mendoza, Argentina,: Endemic Goiter and Cretinism, "Continuing Threats to World Health," PAHO, 1974.

3. Ibid pp 225

4. Munoz, J.A., C. Perez and N.S. Scrimshaw. El bocio edemico en Guatemala. Bol of Sanit Panam 39: pp 458-463, 1955.

5. Watanke, T. Moran D., El Tamer, El, Staneloni, L., Salvaneschi, J., Altschuler, N., Degrossi, O., and Nupominiszcze, H., "Iodized Oil in the Prophylaxis of Endemic Goiter in Argentina," Endemic Goiter and Cretinism: "Continuing Threats to World Health," PAHO,1974

6. Ibid (discussion: Pretell, Eduardo)

7. Ibid, pp. 240

8. Ibid, pp 236, 240.

TABLE 85

PREVALENCE RATES OF OBVIOUS GOITER IN ALL MOTHERS SAMPLED (w) - BY AREA

	TOTAL			
PROVINCE	Goiter Evident	Goiter Seen	Obvious Goiter	Sample Size
Central South*	2.2	0.9	3.1	538
East	8.1	8.7	16.8	528
North	2.6	3.0	5.6	774
N-West	1.6	2.8	3.4	249
West	0.0	0.4	0.4	230
S-West	0.3	0.4	0.7	283
Littoral*	0.0	0.0	0.0	223
Total Provinces*	2.4	2.5	4.9	2825
ECOLOGICAL AREA				
North	2.7	3.0	5.7	656
Central Savannah	4.2	3.5	7.7	381
West Plateau	0.8	1.7	2.5	478
West Plains	0.2	0.2	0.4	537
South Forest	2.6	2.5	5.1	786
URBAN/RURAL				
Yaounde/Douala	0.0	0.0	0.0	493
Urban Cameroon*	0.7	1.1	1.8	479
Rural Cameroon	2.2	2.4	4.6	2346
TOTAL CAMEROON	2.1	2.3	4.4	3318

*Excluding Yaounde and Douala

(w) Weighted Percentage

TABLE 86

PREVALENCE RATES OF OBVIOUS GOITER IN MOTHERS
By Mother's Age and Area (w)

	Age < 21 Years			
PROVINCE	Goiter Evident	Goiter Seen	Goiter Obvious	Sample Size
Central South*	2.0	1.0	3.0	101
East	2.4	5.9	8.3	84
North	2.8	2.1	4.9	142
N. West	0.0	1.7	1.7	25
West				33
S. West	0.0	0.0	0.0	49
Littoral*				19
Total Provinces*	2.1	1.9	4.0	453
ECOLOGICAL AREA				
North	3.6	1.7	5.3	115
Central Savannah	2.3	2.9	5.2	74
West Plateau	0.0	1.7	1.7	58
West Plains	0.0	0.0	0.0	70
South Forest	0.6	2.3	2.9	140
URBAN/RURAL				
Yaounde/Douala	0.0	0.0	0.0	83
Urban Cameroon*	1.8	2.5	4.3	61
Rural Cameroon	1.8	1.6	3.4	392
TOTAL CAMEROON	1.9	1.7	3.6	536

* Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 87

PREVALENCE RATE OF OBVIOUS GOITER IN MOTHERS
By Mother's Age and Area (w)

	Age 21-40 Years			
PROVINCE	Goiter Evident	Goiter Seen	Goiter Obvious	Sample Size
Central South*	2.0	0.7	2.7	403
East	8.5	9.0	17.5	402
North	2.3	2.9	5.2	613
N. West	1.8	2.8	4.6	218
West	0.0	0.5	0.5	184
S. West	0.4	0.4	0.9	226
Littoral*	0.0	0.0	0.0	189
Total Provinces*	2.2	2.4	4.6	2235
ECOLOGICAL AREA				
North	2.3	3.1	5.4	524
Central Savannah	4.3	3.5	7.8	287
West Plateau	1.0	1.7	2.7	402
West Plains	0.2	0.3	0.5	443
South Forest	2.7	2.2	4.9	594
URBAN/RURAL				
Yaounde/Douala	0.0	0.0	0.0	400
Urban Cameroon*	0.6	1.0	1.6	394
Rural Cameroon	2.1	2.4	4.5	1841
TOTAL CAMEROON	2.0	2.2	4.2	2635

*Excluding Yaounde and Douala
(w) Weighted Percent

TABLE 88

PREVALENCE RATE OF OBVIOUS GOITER IN MOTHERS
By Mother's Age and Area (w)

	Age 41+ Years			
PROVINCE	Goiter Evident	Goiter Seen	Goiter Obvious	Sample Size **
Central South*	(6.5)	(3.2)	(9.7)	31
East	(17.5)	(12.5)	(30.0)	42
North				18
N. West				5
West				13
S. West				7
Littoral*				15
Total Provinces*	7.7	6.2	13.9	131
ECOLOGICAL AREA				
North				17
Central Savannah				20
West Plateau				18
West Plains				24
South Forest	7.1	6.1	13.2	52
URBAN/RURAL				
Yaounde/Douala				10
Urban Cameroon*				22
Rural Cameroon	7.7	6.2	13.9	107
TOTAL CAMEROON	6.9	5.6	12.5	141

*Excluding Yaounde and Douala
(w) Weighted Percent

** NOTE SMALL SAMPLE SIZES

TABLE 89

GOITER PREVALENCE RATES OF MOTHERS BY SITE

(ONLY SITES WITH ANY GOITER SEEN ARE LISTED)

Site No.	% Goiter Evident	% Goiter Obviously Seen	% Goiter Total	Sample Size
22	4	0	4	24
23	0	5	5	19
24	0	7	7	15
25	0	6	6	17
27	50	0	50	22
40	0	5	5	19
42	0	7	7	14
44	11	11	22	18
45	0	8	8	13
46	6	0	6	17
47	0	19	19	16
50	29	0	29	21
51	11	11	22	19
52	20	5	25	20
53	0	25	25	12
55	11	5	16	19
56	0	31	31	16
57	23	23	46	13
58	11	0	11	19
59	0	10	10	21
60	6	6	12	17
61	5	11	16	19
62	33	0	33	12
63	10	14	24	21
64	54	0	54	13
65	6	22	28	18
67	5	0	5	19
68	0	6	6	18
69	0	5	5	19
70	16	5	21	19
71	5	26	31	19
72	5	21	26	19
74	0	6	6	18
75	0	5	5	21
78	6	0	6	18
79	4	4	8	25
80	0	12	12	16
81	21	0	21	14
83	4	0	4	24

Sites	
14-43	Central South Province
44-73	East Province
74-113	North Province

TABLE 89 (Cont.)

Site No.	% Goiter Evident	% Goiter Obviously Seen	% Goiter Total	Sample Size
88	53	26	79	24
90	0	14	14	22
91	10	0	10	21
94	0	6	6	16
96	0	12	12	17
105	5	0	5	22
108	0	5	5	19
111	0	6	6	16
113	0	14	14	22
114	0	6	6	17
117	14	5	19	22
119	0	5	5	19
120	0	5	5	20
125	6	6	12	16
127	0	6	6	17
190	0	5	5	21
139	0	6	6	16
157	6	0	6	17
163	0	9	9	11

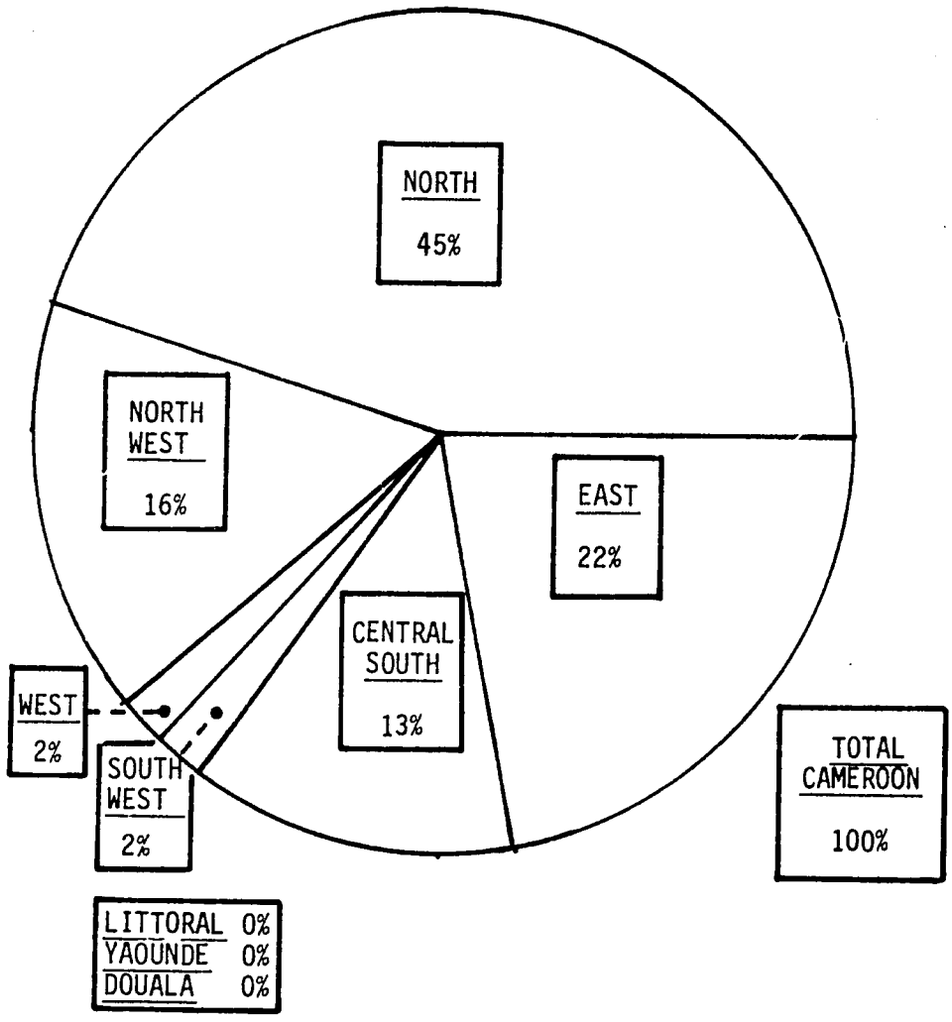
Sites		
	74-113	North Province
	114-127, 190	N-West Province
	128-142	West Province
	156-172	S-West Province

TABLE 90

NUMBER OF MOTHERS HAVING OBVIOUS GOITER
(APPROXIMATION)

AREA	% Obvious Goiter	Approximate Numbers With Obvious Goiter*	% Obvious Goiter (Numbers Affected)
Central South	3.1	7,000	13%
East	16.8	12,000	22%
North	5.6	25,000	45%
N-West	4.4	9,000	16%
West	0.4	1,000	2%
S-West	0.7	1,000	2%
Littoral	0.0	NIL	-
Total Provinces	4.9	55,000	
Yaounde/Douala	0.0	NIL	-
Total Cameroon	4.4	55,000	100%

*Equals Prevalence x 0.2 x Total Population assuming mothers with young children are 20% of total population; e.g. Central South = $\frac{3.1}{100}$ x 0.2 x 1,155,000. = 7,000.



PERCENT CONTRIBUTION OF MOTHERS WITH OBVIOUS GOITER TO TOTAL CAMEROON.

Figure 21

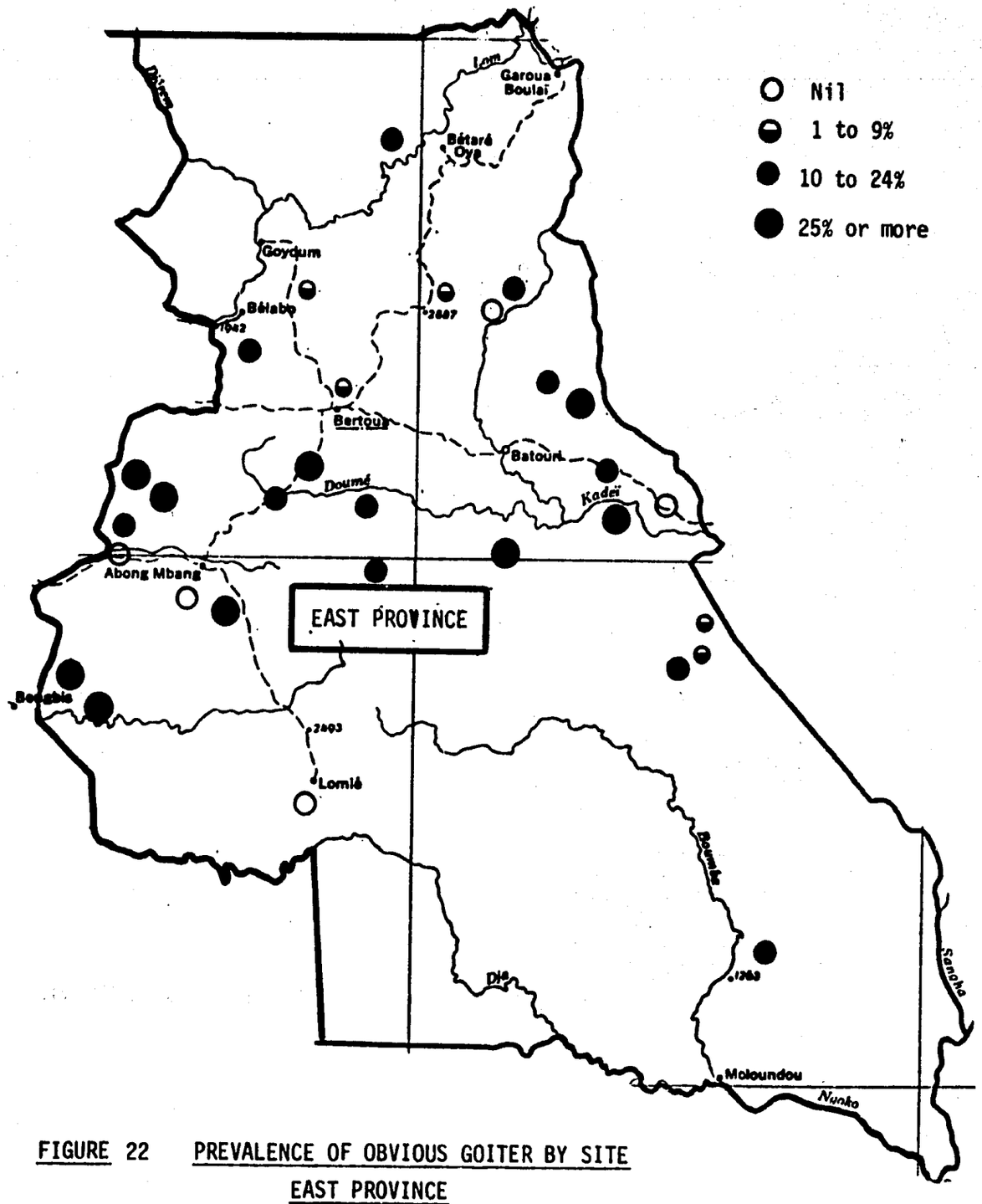


FIGURE 22 PREVALENCE OF OBVIOUS GOITER BY SITE
EAST PROVINCE

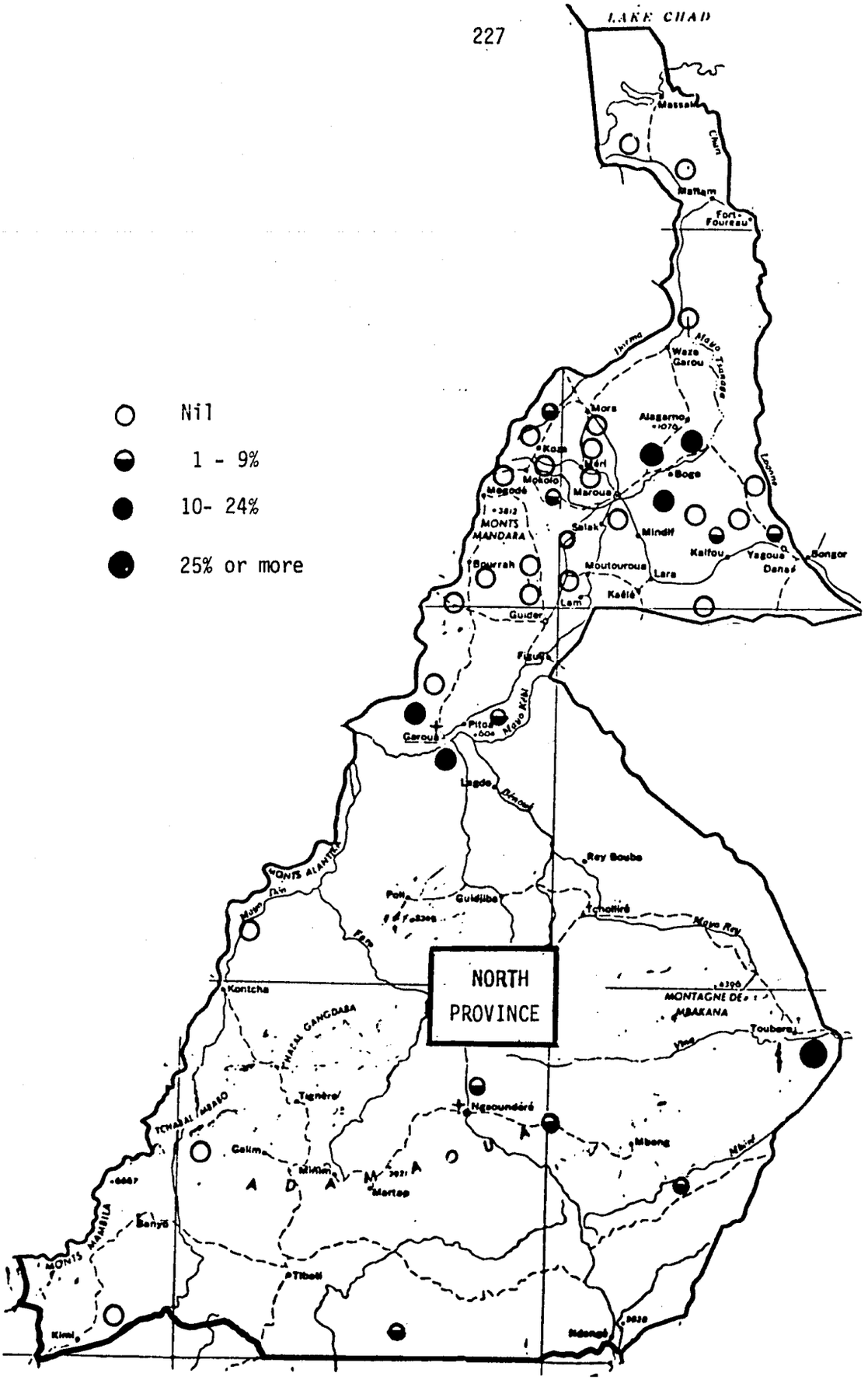


FIGURE 23 PREVALENCE OF OBVIOUS GOITER BY SITE- NORTH PROVINCE

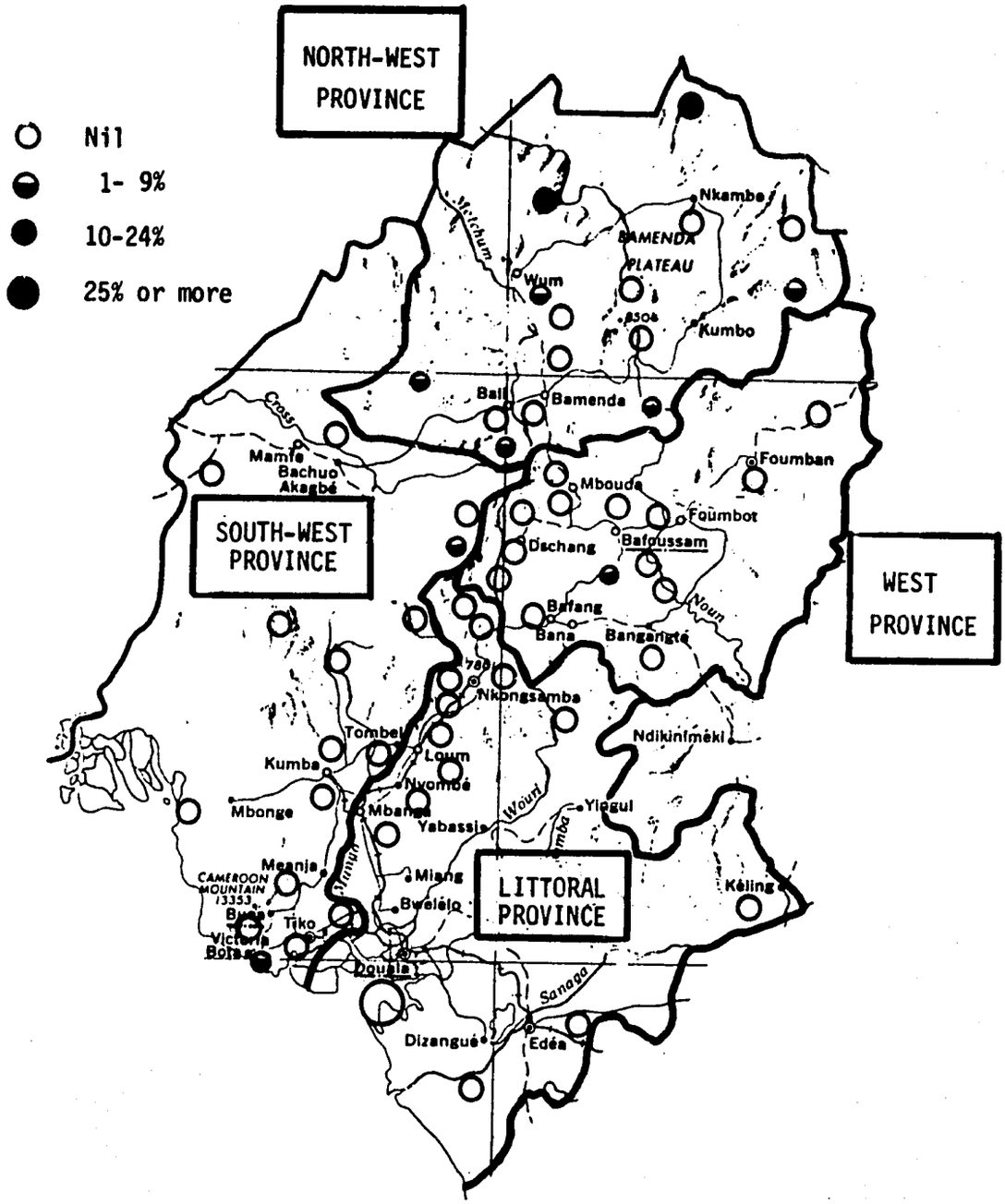


FIGURE 24 PREVALENCE OF OBVIOUS GOITER BY SITE

NORTH-WEST, WEST, SOUTH-WEST AND LITTORAL PROVINCES

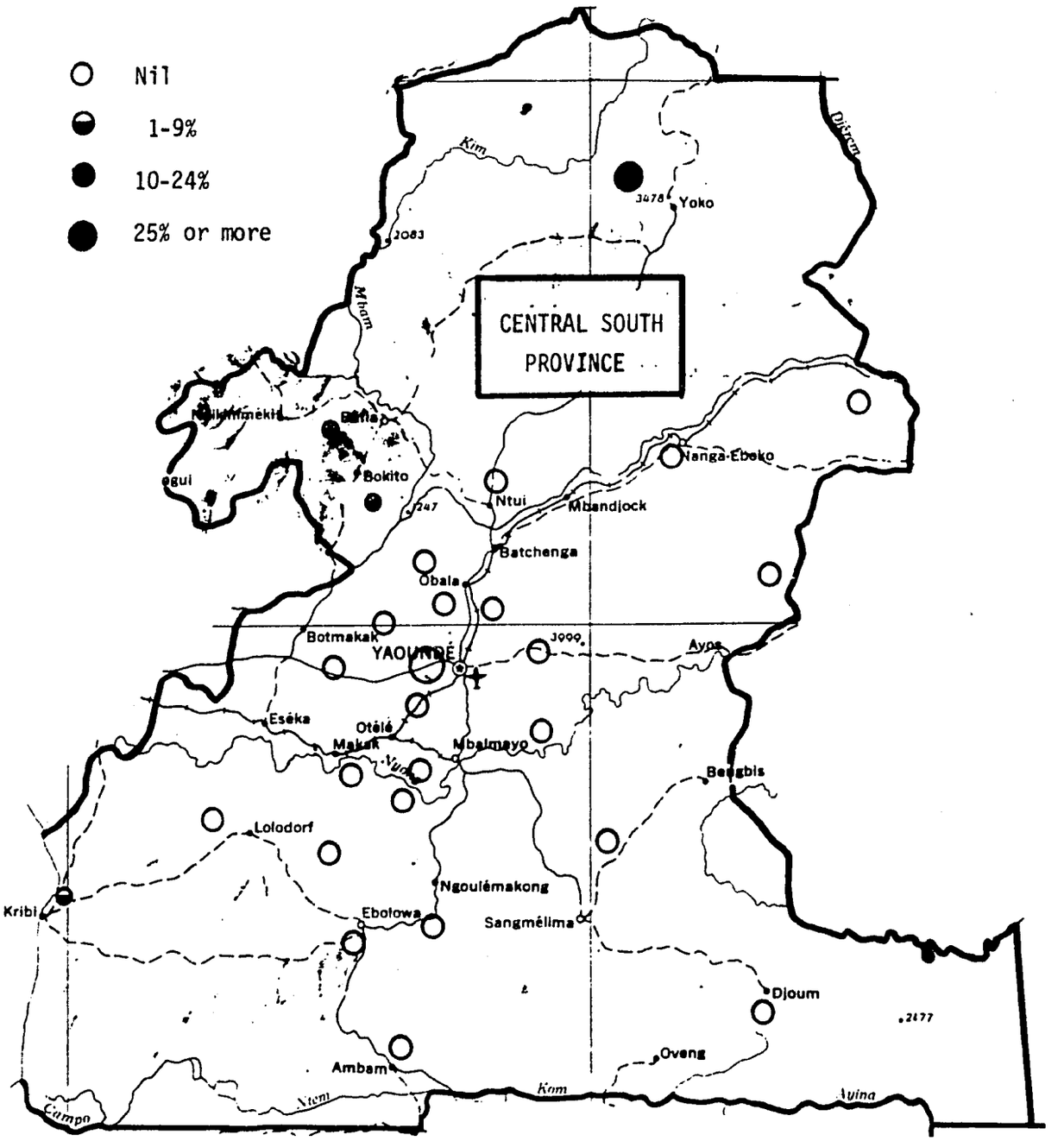


FIGURE 25 PREVALENCE OF OBVIOUS GOITER BY SITE
CENTRAL SOUTH PROVINCE

12 SALIVA TEST

12.1 PREVALENCE RATES FOR SALIVA TEST FINDINGS

This test was conducted on mothers to determine the presence of hydrocyanic acid in saliva, as an indication of recent consumption of unrefined cassava. (See Appendix 14, Form Clarification).
A positive result was a blue color change of the starch paper in ten seconds, after exposure to saliva. False positive results may be obtained in cigarette smokers. When the test was positive, interviewers were instructed to question the mother about smoking. When this occurred, the results were not included. This in fact occurred rarely.

The test was not done in the North Province, due to problems with the filter paper, nor was it done in Yaounde.

Results (Table 91)

The test was frequently positive in the East Province, followed by the Central South Province, and least commonly positive in Douala.

12.2 RELATIONSHIP BETWEEN GOITER, SALIVA TEST AND CASSAVA CONSUMPTION IN MOTHERS

According to total province prevalence rates, there was no consistent relationship found in mothers between obvious goiter present, saliva test positives and recent cassava consumption.(Table 92).

Although findings showed that the rates for all three factors were highest in the East Province, there were inconsistencies in province ranking with regards to the Western Provinces and Yaounde/Douala.

TABLE 91

PERCENTAGE OF SALIVA TEST RESULTS IN MOTHERS

PROVINCE	Positive (Blue)	Negative (White)	Sample Size
Central South *	57.9	42.1	535
East	74.3	25.7	509
North **	----	----	---
North-West	39.4	60.6	218
West	31.6	68.4	225
South-West	39.9	60.1	278
Littoral *	48.4	51.6	219
Yaounde ***	----	----	---
Douala	22.1	77.9	262

* Excluding Yaounde and Douala
** Test unsuitable
*** Test not done

TABLE 92

COMPARISONS OF PERCENTAGE OF ADULTS (MOTHERS) WITH OBVIOUS GOITER, POSITIVE SALIVA TEST AND RECENT CONSUMPTION OF CASSAVA BY PROVINCE

PROVINCE	Percent Obvious Goiter Present	Percent Saliva Test Positive	Percent Recent Cassava
Central South	3.1	57.9	60
East	16.8	74.3	73
North	5.6	----	10
N-West/West	1.9	35.5	18
S-West/Littoral	0.4	43.6	35
Yaounde	0.0	----	- 44
Douala	0.0	22.1	-

12.3 RELATIONSHIP BETWEEN GOITER AND SALIVA TEST IN INDIVIDUAL MOTHERS

Results for obvious goiter and saliva test for individual mothers, were tabulated according to province (Table 93). Only in the Central South Province was a significant difference found between those mothers with obvious goiter and a positive saliva test (5.2%) and those mothers with an obvious goiter and a negative test on the saliva (0.0%).

Discussion

It must be noted that the study of the relationships between the saliva test for hydrocyanic acid (as an index for recent unrefined cassava ingestion) and goiter prevalence, has limited value in this type of cross-sectional survey. No firm inferences as to causality can be made. Other limiting factors must also be taken into account. Firstly, maternal goiter is usually a chronic condition, whereas the findings for cassava ingestion and the saliva test deal with recent events. Only obvious goiter was elicited, excluding all cases with lesser enlargements of the gland.

It is perhaps significant that recent cassava ingestion and a positive saliva test were common in the South-West/Littoral Provinces and in Yaounde/Douala, whereas obvious goiter was rarely found.

Goiter is usually due to iodine deficiency although possible goitrogens (goiter inducing substances) may at times be important. However it is noteworthy that Public Health Projects to prevent goiter have been successful by increasing the iodine supply to the affected population, not by excluding possible goitrogens, such as the hydrocyanic acid in unrefined cassava (See p. 213 - Examples of methods used in other countries to reduce goiter).

TABLE 93

RELATIONSHIP BETWEEN OBVIOUS GOITER AND SALIVA TEST IN MOTHERS BY PROVINCE

PROVINCE	Number Obvious Goiter Present	Number Obvious Goiter Absent	Total	Percent Obvious Goiter Present
Central South				
Saliva positive	16	294	310	5.2% *
Saliva negative	0	225	225	0.0% *
East				
Saliva positive	59	318	377	15.6%
Saliva negative	23	108	131	17.6%
N-West/West				
Saliva positive	7	147	154	4.5%
Saliva negative	4	282	286	1.4%
S-West/Littoral				
Saliva positive	1	214	215	0.5%
Saliva negative	1	278	279	0.4%
Douala				
Saliva positive	0	58	58	0.0%
Saliva negative	0	204	204	0.0%

* Significant difference at $P<0.05$ level of confidence

13 OTHER ANTHROPOMETRIC RESULTS

13.1 MATERNAL ANTHROPOMETRY

a. Introduction

The basis for the measurements in mothers was presented on p.57 , Indices of Malnutrition. It should be noted that such measurements are far less specific indicators for nutritional status of the mothers than those for the young child. Several factors, such as activity and genetics, as well as nutrition are important.

b. Maternal Height (Stature) (Table 94)

"Short" stature (under 152 cm) was present in 13.3% of mothers and tall stature (over 165 cm) in 15.6% The average height for all mothers was 158.7 cm. (5'1").

The East and North-West Provinces showed the highest prevalence of short mothers (24.8% and 22.5%) and the lowest proportion of tall mothers (5.8% and 8.1%) compared with other provinces. The mean height was lowest in the East (158 cm. = 5' 1/4"). The mothers in Yaounde/Douala were the tallest throughout Cameroon. There were no differences in stature between Urban and Rural Cameroon mothers.

c. Maternal Arm Circumference (Table 95)

A "low" arm circumference (under 23 cm.) was found in 7.3% of Cameroon mothers. This measure is an index for undernutrition in adults, bearing in mind the limitations already stated. Those "above average" (29 cm. +) were present in 17.0%. The average refers to that found in industrialized countries (19).

There were quite large differences in maternal arm circumference throughout Cameroon. The North Province had the highest proportion of mothers with thin arms(11.6%) and the least above average (8.7%). In all other provinces the percentage of mothers with thin arms was below the national average, the Western provinces having the lowest percentages. In addition, there were clear differences between Yaounde/Douala and Urban mothers, who had less thins and more above average arm size compared with Rural Cameroonian mothers.

d. Maternal Triceps Fatfold (Table 96)

Low maternal fatfold (under 7.5 mm) was found in 13.6% of Cameroon mothers in the sample and high fatfold in 7.8% (over 20 mm). Obesity (defined as over 25 mm) was quite rare throughout Cameroon.

Differences in prevalence rates for low maternal fatfold between provinces reflected those for thin arms. Mothers in the North had by far the highest rates.

Discussion

Tribal differences in adult stature may explain in part the survey results for maternal height. It should be noted that probably less than 10% of the sampled mothers in the East Province were of pygmy origin, so this alone may not explain the high proportion of short mothers in the East (24.8%). Nor is the high rate for the mothers in the North-West readily explained on ethnic grounds alone. It is likely that many short mothers had chronic undernutrition as a young child, resulting in eventual short stature.

The significance of maternal stature as it affects the nutritional interpretation of the height-for-age index in young children has been discussed on pages 83-85. A more detailed description is presented in the following section, which considers the relationship between maternal and child stature from the survey findings.

There was evidence that a greater proportion of mothers in the North Province had recent undernutrition (low arm circumference and fatfold findings) as compared with mothers in other provinces. An important implication for this may be an inadequate diet. It is noteworthy that Northern mothers had the least number of variety and energy containing food groups than all other provinces (see lowermost part of Tables 77 and 78, pages 195-6).

TABLE 94

PERCENT DISTRIBUTION (w) AND AVERAGE HEIGHT
MOTHER OF INDEX CHILD

	Height Groupings			
PROVINCE	Under 152 cm (SHORT)	152-165 cm (MEDIUM)	165cm+ (TALL)	Average Height
Central South*	11.2	73.7	15.1	158.7
East	24.8	69.4	5.8	155.8
North	12.2	70.1	17.7	159.4
N-West	22.5	69.4	8.1	157.6
West	14.9	74.4	10.7	158.1
S-West	19.2	68.0	12.8	156.6
Littoral*	12.7	75.5	11.8	157.4
Total Provinces*	13.8	71.0	15.2	158.1
URBAN/RURAL				
Yaounde/Douala	7.2	74.3	18.5	159.8
Urban Cameroon*	12.3	72.2	15.5	158.1
Rural Cameroon	14.4	71.6	14.0	158.4
TOTAL CAMEROON	13.1	71.3	15.6	158.7

*Excluding Yaounde/Douala

(w) Weighted Percentage

TABLE 95

PERCENT DISTRIBUTION (w) AND MEAN ARM CIRCUMFERENCE

Mother of Index Child

	Arm Circumference Grouping			
PROVINCE	Under 23 cm (THIN)	23-28.9 cm (AVERAGE)	29cm + (ABOVE AVERAGE)	Average (MEAN) Arm Circ.
Central South*	4.4	75.0	20.6	27.1
East	6.5	77.3	16.2	26.4
North	11.6	79.7	8.7	25.8
N-West	3.2	76.1	20.7	27.3
West	0.9	69.5	29.6	28.1
S-West	2.4	78.0	19.6	26.9
Littoral*	2.2	63.8	34.0	27.9
Total Provinces*	7.8	77.1	15.1	26.5
URBAN/RURAL				
Yaounde/Douala	3.5	62.3	34.2	28.2
Urban Cameroon*	4.3	67.5	28.2	27.7
Rural Cameroon	7.3	77.8	14.9	26.5
TOTAL CAMEROON	7.4	75.6	17.0	26.6

*Excluding Yaounde and Douala

(w) Weighted Percentage

TABLE 96

PERCENT DISTRIBUTION AND AVERAGE FATFOLD

Mother of Index Child

PROVINCE	Fatfold Grouping: Under 7.5 mm (LOW)	7.5-19.9 mm (MEDIUM)	20mm+ (HIGH)	Average Fatfold
Central South*	5.3	84.3	10.4	13.5
East	11.9	80.6	7.5	12.2
North	23.7	72.2	4.1	10.7
N-West	4.5	85.7	9.8	13.2
West	0.9	79.0	20.1	15.5
S-West	7.4	83.7	8.9	13.4
Littoral*	1.1	78.9	20.0	15.3
Total Provinces*	14.8	77.4	7.8	12.2
URBAN/RURAL				
Yaounde/Douala	2.8	68.7	28.5	16.7
Urban Cameroon*	3.1	74.3	22.6	15.7
Rural Cameroon	14.8	78.6	6.4	11.9
TOTAL CAMEROON	13.6	76.6	9.8	12.4

*Excluding Yaounde and Douala

(w) Weighted Percentage

13.2 CORRELATIONS OF ANTHROPOMETRIC MEASURES

a. Maternal Heights and Child Height (Table 97)

The height of the mother and the height for age of the child were compared to determine their inter-relationship, with special reference to the possible role of genetic factors.

Of all children with "short" mothers (<150cm), 33.5% had chronic undernutrition. This percent was greater when compared with mothers of "average" height and tall mothers (24.0% and 11.7%). This confirms the "influence" of maternal stature on child height. However, only 129 out of 949 i.e. 13.6% of all children with chronic undernutrition had a mother who was "short". This supports the evidence that environmental factors are more important in relation to the nutritional status of the young child.

TABLE 113

Relationship Between Height of Mothers and Height-for-Age of Children. (3-59 months)

	FREQUENCY MATERNAL HEIGHT				PERCENTAGE MATERNAL HEIGHT			
CHILD HEIGHT FOR AGE	<150cm	150-165cm	165+cm	TOTAL	<150cm	150-165cm	165+cm	TOTAL
<90%	129	757	63	949	33.5	24.0	11.7	20.4
>90%	256	2395	475	3126	66.5	76.0	88.3	79.6
TOTAL	385		538	4659	100%	100%	100%	100%

b. Arm Circumference and Undernutrition Anthropometric Indices

This section is included to indicate how closely the arm circumference groupings (as an index of arm wasting) and the weight-for-age (index for underweight) and weight-for-height (index for acute undernutrition) interrelate. Earlier in the report, the possibility of using arm circumference as an index of undernutrition for future studies and surveillance was considered, in view of its simplicity and utility.

Tables 98 and 99 show that arm circumference findings, based on the recommended cut-off values (<12.5, 12.5-13.4 and 13.5+ cm) may have limited use in identifying children who are underweight or acutely undernourished, as defined by the weight indices. For example it will identify only 50.0% (as definite arm wasting) of all the children with acute undernutrition (<80% weight-for-height). That is to say, its sensitivity is relatively low.

On the other hand, the tables show that the arm circumference specificity is quite high. It"diagnoses" correctly well over 90% of all children who are not underweight and have no acute undernutrition.

For practical purposes and taking into consideration the results for the insertion tape and X-ray strip for measuring arm circumference, cut-off points for this measure may have to be modified in order to fully utilize its value. Rather than using specific cut-off points as is done for the X-ray strip, it may be more appropriate to present the results within centimeter ranges as was described by Zerfas (52).

TABLE 98

RELATIONSHIP BETWEEN ARM CIRCUMFERENCE
AND WEIGHT-FOR-AGE (Children Aged 6-59)

	Weight-for-Age					
	Frequency			Percentage		
	<80%	80%+	Total	<80%	80%+	Total
<12.5 cm	172	33	205	16.3%	0.8%	3.9%
12.5-13.4 cm	324	210	534	30.7%	5.0%	10.1%
13.5+ cm	558	3999	4557	52.9%	94.2%	86.0%
Total	1054	4242	5296	100.0%	100.0%	100.0%

TABLE 99

RELATIONSHIP BETWEEN ARM CIRCUMFERENCE
AND WEIGHT-FOR-HEIGHT (Children Aged 6-59)

	Weight-for-Height					
	Frequency			Percentage		
	<80%	80%+	Total	<80%	80%+	Total
<12.5 cm	29	176	205	50.0%	3.4%	3.9%
12.5-13.4 cm	10	524	534	17.2%	10.0%	10.1%
13.5+ cm	19	4538	4557	32.8%	86.6%	86.0%
Total	58	5238	5296	100.0%	100.0%	100.0%

14 ASSOCIATIONS OF UNDERNUTRITION PREVALENCE WITH RELEVANT HOUSEHOLD,FAMILY AND CHILD CHARACTERISTICS

In this section, relevant household,family and child characteristics (e.g. household size or sex of child) are investigated for associations with the percentage of sampled children who were found to have undernutrition, as defined by anthropometry. These characteristics or factors are indicators for socio-economic status, demographic patterns, health services and other conditions which may influence nutritional status. Their relationship with regards to the different prevalence rates of undernutrition in certain areas of the country has been discussed (pages 162-3).

Findings for the following characteristics are presented for the whole country. In addition, different age groups or provinces are also included, where sample size permits.

A. CHILD CHARACTERISTICS

1. Number of Children under Five Years per Family
2. Number of Children under Five Years per Household — Province

3. Birth Order
4. Birthplace of Child
5. Child Care
6. Sex of Child
7. Age Determination
   a. Birth Record
   b. Clinic Record
   c. Calendar of Events
   d. Declaration

— Age Groups 6-23 and 24-59 months

8. Source of Milk
   a. Breast
   b. Artificial
   c. Other Milk
   d. No Milk at All
   e. Bottle Fed
9. Source of Food
   a. Common(Family) Food
   b. Special Food
   c. Any Food

— Age Groups 3-5,6-11 and 12-23 months

B. RECENT ILL HEALTH OF CHILD — Age Groups 3-5,6-11 and 12-23 months

C. ANEMIA AND EDEMA OF CHILD

1. Hemoglobin Percentage — Age Groups 6-23 and 24-59 months
2. Edema

D. HOUSEHOLD CHARACTERISTICS

1. Household Size
2. Occupation Household Head
— Provinces

3. Type of House
4. Method of Cooking
5. Animals Owned
— Rural Areas

E. MATERNAL CHARACTERISTICS

1. Mother Present
2. Mother Reads English
3. Mother Reads French
4. Mother Reads Neither
5. Mother Reads Other Language
6. Age Group of Mother
7. Saliva Test Result
— Provinces

8. Obvious Goiter — Age Groups 6-23 and 24-59 months

For each variable, the following descriptions for undernutrition were included:

Chronic Undernutrition	- Under 90% of reference median Height-for-Age (H/A<90%)
Underweight	- Under 80% of reference median Weight-for-Age (W/A<80%)
Arm Wasting	- Under 82.5% of reference median Arm Circumference-for-Age (AC/A<82.5%).

Acute Undernutrition was not included, because no significant differences were found, due to the very low prevalence rates in the subsets of the characteristics,with consequent low sample sizes. At times, Acute Mild Undernutrition (Under 85% of reference median Weight-for-Height) was included when a significant difference was present.

The sample size (N) is included for each variable.

Only associations which show a statistically significant difference (P value equal or less than 0.05) in the percentages of undernutrition for each variable are included in the tables. The probability value (P) more precisely determines the significance of differences from the chi square test by considering the proportions of children who have and do not have undernutrition for the particular variable. Only the percentages who have undernutrition are included in the tables, for the purpose of brevity.

The P value result indicates whether a difference is statistically significant, while the percentage results shows the magnitude of the difference for each variable.

Table 105, page 255, shows the percentage of undernutrition for household size within the whole country. There was a significantly greater proportion of children with chronic undernutrition (24.6%) in children under five years who belonged to a household with 11 or more members compared with that in smaller households. In other words, there were about 5% more children who had chronic undernutrition who lived in large households - compared with smaller ones (24.6% - 19.8/20.0%). There was no difference found in the other undernutrition measures (Acute, Underweight and Arm Wasting) nor any for the individual provinces (not shown in Table 105) for comparing household sizes 2-5, 6-10 and 11+ members.

The complete explanatory table for this description is as follows:

CHRONIC UNDERNUTRITION - TABLE 100

Household Size	Number			Percent		
	Chronic	Not-Chronic	Total	Chronic	Not-Chronic	Total
2-5	258	1046	1304	19.8	80.2	100.0
6-10	553	2216	2769	20.0	80.0	100.0
11+	391	1199	1590	24.6	75.4	100.0
TOTAL	1202	4461	5663	21.2	78.8	100.0

IT MUST BE NOTED THAT AN IMPORTANT OR SIGNIFICANT ASSOCIATION OF ANY VARIABLE WITH NUTRITIONAL STATUS DOES NOT NECESSARILY INDICATE A CAUSAL RELATIONSHIP. ON THE OTHER HAND, AN ASSOCIATION COULD EXIST, BUT MAY NOT BE FOUND WITH THIS PARTICULAR SAMPLE. IN ADDITION THESE ASSOCIATIONS DESCRIBE THE SAMPLE AND DO NOT NECESSARILY APPLY TO THE POPULATIONS FROM WHICH THE SAMPLE WAS TAKEN. THIS IS A LIMITATION OF THE METHOD OF CLUSTER SAMPLING, WHERE THE DISTRIBUTION OF VARIABLE PRESENCE OR ABSENCE AND THAT OF UNDERNUTRITION IN CHILDREN MAY VARY CONSIDERABLY FROM SITE TO SITE. FOR EXAMPLE, RESULTS FOR A FEW SITES MAY INFLUENCE THE RESULTS FOR THE WHOLE AREA BEING DESCRIBED, BUT THESE SITES REPRESENT ONLY A SMALL SECTION OF THAT AREA. THIS IS PARTICULARLY IMPORTANT WHEN SMALL SAMPLE SIZES (N) ARE NOTED.

IN ORDER TO INVESTIGATE THE MULTIPLE CAUSES FOR UNDERNUTRITION, IT IS NECESSARY TO PERFORM PROPERLY CONTROLLED LONGITUDINAL STUDIES. THE NATURE OF THIS CROSS-SECTIONAL SURVEY DID NOT PERMIT SUCH STUDIES TO BE DONE.

The choice for cut-off points for particular variables (e.g. household size 2-5, 6-10, 11+) was based on the results describing these variables previously,as well as a reasonable sample size for each subset. The same consideration was given to describing some variables only by total country and others by provinces. Age groupings were included where relevant to the child's nutritional status. For example, both the child's source of milk or food and nutritional status might vary considerably according to the age of the child.

A. CHILD CHARACTERISTICS

1. Number of Children Under Five Years per Family

Results are scanty and conflicting. Further analysis, controlling for age, may be useful.

2. Number of Children Under Five Years per Household

Both in the total country and in Yaounde/Douala, the greater the number of children under five years sampled per household, the more likely they had chronic undernutrition. This may suggest that a high number of dependents (children under five years) in a household is related to this type of undernutrition.

3. Birth Order

Only in the North-West/West provincial grouping was a positive association found. Children aged under five years with high birth order were more likely to have chronic undernutrition. There were insufficient numbers to permit analysis for the West Province alone. However, further study of this and related factors may be indicated for the West, in view of the relatively high chronic undernutrition prevalence rate found in that province.

4. Birthplace of Child

This analysis was limited to the whole country for the two major age groups. For all types of undernutrition listed,an impressive trend was found. A child born in a hospital or clinic was least likely to be undernourished, born at home without a TBA (Traditional Birth Attendant) of intermediate and at home with a TBA of greatest likelihood of being undernourished. The finding for the hospital/clinic birthplace reflects available health services; that for the attending TBA is difficult to explain. This is discussed on page 264.

5. Child Care

There was a higher prevalence of chronic undernutrition when someone other than the mother took care of the child, both in the total country and in the North Province. This may have important implications with regards to the diet of the young child, particularly in the North.

TABLE 101

PERCENTAGE UNDERNUTRITION ACCORDING TO CHILD CHARACTERISTICS

CHILD CHARACTERISTICS		Sample Size	Chronic H/A<90%	Under-Weight W/A<80%	Arm Wasting AC/A<82.5%
1. No. of Children Under 5 Years Per Family					
North	1	654	23.8	20.7	
	2+	544	17.6	23.1	
Yaounde/Douala	1	593		9.1	
	2+	302		13.9	
2. No. of Children Under 5 Years Per Household					
Total Country	1	1864	19.2		
	2-3	3111	21.6		
	4+	699	25.2		
Yaounde/Douala	1	316	7.3		
	2-3	509	12.9		
	4+	69	21.7		
3. Birth Order					
NW/West	1-4	605			7.2
	5-8	243			9.5
	9+	37			21.0
4. Birth Place - Total Country					
6-23 Months	Hospital	1202	12.3	17.2	13.5
	Home (No TBA)	349	14.3	25.6	24.5
	Home (TBA)	371	22.9	33.1	31.6
24-59 Months	Hospital	2037	25.0	15.3	5.2
	Home (No TBA)	638	26.0	21.2	10.2
	Home (TBA)	629	33.1	25.8	13.3
5. Child Care					
Total Country	Mother	4826	20.6		
	Other	848	24.8		
North	Mother	1076	20.1		
	Other	122	29.5		

6. Sex of Child

There was no consistent relationship between sex of the child and prevalence of undernutrition, with regards to the whole country.

7. Age Determination Methods

These were investigated for the whole country for the two major age groups. It is perhaps most useful to review the findings for calendar of events and declaration, which were generally performed when neither a birth nor clinic record was available at the time of the interview. Children of both age groups were more likely to be underweight and have arm wasting when these records were unavailable. This is possibly related to degree of urbanization and perhaps health services. The lesser prevalence of underweight in those children with a clinic record may also be related to health service availability. It must be noted that a clinic record was obtained only when a birth record was unavailable.

TABLE 102

PERCENTAGE UNDERNUTRITION ACCORDING TO CHILD CHARACTERISTICS

CHILD CHARACTERISTICS		Sample Size	Chronic H/A<90%	Under-Weight W/A<80%	Arm Wasting AC/A<82.5%
6. Sex of Child - Total Country					
6-23 Months	Male	988			15.5
	Female	1027			21.9
24-59 Months	Male	1669		20.1	
	Female	1656		17.0	
7. Age Determination - Total Country					
a. Birth Record 6-23 Months	Yes	1110		18.7	15.7
	No	906		25.1	22.6
24-59 Months	Yes	1823	28.5		6.3
	No	1500	24.7		9.5
b. Clinic Record 24-59 Months	Yes	179		10.6	
	No	3140		19.0	
c. Calendar of Events 6-23 Months	Yes	633		27.5	23.9
	No	1383		18.9	16.4
24-59 Months	Yes	1135		21.8	10.8
	No	2188		16.9	6.1
d. Declaration 6-23 Months	Yes	721		26.8	23.9
	No	1295		18.7	15.9
24-59 Months	Yes	1227		21.1	9.9
	No	2096		17.1	6.4

8. Source of Milk

Children aged 12-23 months who were breast fed or having any milk were more likely to have chronic undernutrition and underweight than those without milk of the same age. The most likely explanation for this result is that many other factors are inter-related, for example inadequate foods other than milk. This problem of interpretation is a good illustration of the limitations which may occur in deriving associations for meaningful analysis.

9. Source of Food

Children aged 6-11 months and 12-23 months who shared food with the family were far less likely to be underweight than those who did not share food. In addition, the prevalence of underweight was far less in children aged 6-11 months who received some food(other than milk) as compared with those who did not. This may be an extremely important finding, as it tends to support the problems of weaning already discussed for the North and East children aged 6-11 months.

The results for the 3-5 months old child with regards to special and any food are perhaps of lesser significance because of the overall better nutritional status in this age group.

TABLE 103

PERCENTAGE UNDERNUTRITION ACCORDING TO CHILD CHARACTERISTICS

CHILD CHARACTERISTICS		Sample Size	Chronic H/A<90%	Under-Weight W/A<80%	Arm Wasting AC/A<82.5%
8. Source of Milk					
Total Country (By Age in Months)					
a. Breast					
12-23 Months	Yes	839	21.6	28.3	
	No	451	14.0	18.1	
b. Any Milk at All					
12-23 Months	No	386	14.5	18.3	
	Yes	896	20.8	27.6	
9. Source of Food					
Total Country (By Age in Months)					
a. Common Plate					
6-11	Yes	427		12.4	
	No	285		20.7	
12-23	Yes	1190	18.2	23.6	
	No	88	29.5	40.9	
b. Special Food					
3-5	Yes	132		3.0	
	No	201		9.4	
c. Any Food					
3-5	Yes	159		3.8	
	No	173		9.8	
6-11	Yes	594		13.8	
	No	116		25.9	

B. RECENT ILL HEALTH OF CHILD

Throughout the whole country, children aged 6-11 months were much more likely to have acute mild undernutrition if they were ill, had diarrhea or fever during the past week, as compared with those who were not. The same result occurred with recent arm wasting (Under 82.5% of reference median arm circumference-for-height). This is not tabulated. Both the ill health and undernutrition indicators pertain to recent events, so that the findings are not unexpected. Ill health of the young child is a potent factor with regards to undernutrition. As well as a direct detriment, it also leads to loss of appetite and poor diet. The resulting undernutrition further leads to increased susceptibility to diarrhea and disease.

The same positive relationship between ill health and undernutrition occurred for children aged 12-23 months, with the addition of underweight and arm wasting , and for diarrhea, chronic undernutrition. The finding may suggest the illnesses have been recurrent in the past and we are simply identifying one recent cycle (the past week).

It is of interest that the prevalence of recent illness, as determined on this survey (p. 143), showed similar trends throughout each province and Yaounde/Douala. This may be explained by the subjective answers required from the mother and that the severity of illness was not determined.

C. PRESENCE OF ANEMIA

Contradictory findings occurred with regards to anemia prevalence and undernutrion rates (chronic/arm wasting). This makes interpretation difficult for the child group aged 6-23 months. In children aged 24-59 months there was a clear positive relationship between anemia and undernutrition.

EDEMA

In those few children with edema, the prevalence of undernutrition was far greater as compared to those without edema.

TABLE 104

PERCENTAGE UNDERNUTRITION ACCORDING TO RECENT ILL HEALTH OF CHILD PRESENCE OF ANEMIA AND EDEMA

Recent Ill Health		Sample Size	Mild Acute W/H<85%	Chronic H/A<90%	Under-Weight W/A<80%	Arm Wasting AC/A<82.5%
Child Aged 6-11m						
SICK						
	Yes	148	10.8			
	No	569	3.9			
DIARRHEA						
	Yes	116	10.3			
	No	539	4.4			
FEVER						
	Yes	149	9.4			
	No	499	4.4			
Child Aged 12-23m						
SICK						
	Yes	255	10.2		31.0	28.7
	No	888	4.9		22.6	17.9
DIARRHEA						
	Yes	213	11.3	27.7	34.4	30.7
	No	929	4.9	17.7	22.2	17.9
FEVER						
	Yes	284	8.8		30.7	27.5
	No	856	5.3		22.5	17.9
Anemia						
HEMOGLOBIN Gm%						
Child Aged 6-23m						
Anemia(Hb < 10Gm%)						
	Yes	127		11.0		26.2
	No	198		17.7		17.5
Child Aged 24-59m						
Anemia(Hb < 11Gm%)						
	Yes	270		32.2		10.0
	No	432		23.8		6.5
Edema						
Child Aged 3-59m						
Edema	Present	43		51.2	51.2	30.2
Edema	Absent	5581		20.9	18.6	11.2

D. HOUSEHOLD CHARACTERISTICS

1. Household Size

The prevalence of chronic undernutrition was greater in children in the whole country belonging to households with larger household size (11+), as compared with smaller sizes (10 or less). Although a significant difference was found, the percentage difference was not marked.

2. Occupation of Household Head

For the whole country, children who belonged to a household whose head was a farmer or unemployed, had a higher percentage of chronic undernutrition, underweight and arm wasting than those whose head was a professional or other occupation. This result perhaps confirms urban/rural differences in prevalence rates for undernutrition, for the whole country as well as for certain provinces. It is noteworthy that the urban/rural stratification described throughout this report, considers only as urban those localities which are capitals of either a Province, Division, Sub-Division or District. Findings presented here relate to a rather different approach to the urban/rural groupings.

For Yaounde/Douala, children of non-professionals had a higher prevalence of chronic undernutrition than those whose household head was a professional.

TABLE 105

PERCENTAGE UNDERNUTRITION ACCORDING TO HOUSEHOLD CHARACTERISTICS

HOUSEHOLD CHARACTERISTICS		Sample Size	Chronic H/A<90%	Under-Weight W/A<80%	Arm Wasting AC/A<82.5%
1. Household Size					
Total Country	2-5	1304	19.8		
	6-10	2769	20.0		
	11+	1590	24.6		
2. Household Head Occupation					
Total Country	Agriculture	3528	24.7	22.2	14.1
	Unemployed	72	25.0	19.4	13.9
	Professional	714	14.0	12.5	6.0
	Rest	1357	16.0	13.7	7.0
Central South	Agriculture	652	20.1		
	Unemployed	21			
	Professional	101	10.9		
	Rest	121	14.0		
East	Agriculture	691	28.7	23.9	14.8
	Unemployed	2			
	Professional	74	25.7	12.2	4.0
	Rest	129	17.0	11.6	10.1
SW/Littoral	Agriculture	516	25.7		12.0
	Unemployed	12			
	Professional	92	10.9		5.4
	Rest	271	18.0		6.9
Yaounde/Douala	Agriculture	12			
	Unemployed	25			
	Professional	283	8.1		
	Rest	574	12.9		

3. Type of House

Children who live in a traditional house were more likely to have undernutrition than those who did not. In most instances there was a gradation of reduced undernutrition prevalence rates, the highest for traditional houses and the lowest rates for concrete houses. This was apparent for the country as a whole, but also occurred for arm wasting in the rural area grouping. These findings emphasise the importance of socio-economic status as it relates to undernutrition.

4. Method of Cooking

In those houses where the method of cooking was other than wood (gas, kerosene), children were less likely to have undernutrition. This is another socio-economic indicator and reflects urbanization.

5. Presence of Animals

It is noteworthy, that in almost all instances, with regards to cattle, sheep or goats owned by the household, the presence of undernutrition in the child was positively associated with the numbers owned; i.e. the more animals owned, the more likely the child had undernutrition. This is discussed at the end of the section.

TABLE 106

PERCENTAGE UNDERNUTRITION ACCORDING TO HOUSE, COOKING AND ANIMALS

Whole Country	Sample Size	Mild Acute W/H<85%	Chronic H/A<90%	Under-Weight W/A<80%	Arm Wasting AC/A<82.5%
House					
Traditional	995	7.6	16.9	25.1	21.7
Improved	762	3.5	15.1	19.5	15.3
Semi-Concrete	365	4.4	8.5	11.7	10.4
Concrete	259	1.5	6.6	11.9	8.5
Cooking					
Wood	2193	5.5	14.7	20.8	17.3
Other	190	1.0	4.2	7.9	6.9
Cattle					
Nil	2122			18.8	
1-4 Head	112			24.8	
5+ Head	118			28.8	
Sheep					
Nil	1987			18.8	15.8
1-4 Head	4256			23.4	19.1
5+ Head	135			26.3	22.6
Goats					
Nil	1804		12.0	19.0	15.4
1-4 Head	401		17.5	18.0	19.1
5+ Head	167		16.2	31.5	22.0
Rural Areas					
House					
Traditional	942			25.6	22.0
Improved	422			19.9	17.1
Semi-Concrete	123			16.9	16.3
Concrete	56			17.9	3.6
Sheep					
Nil	1200	6.0			
1-4	219	10.5			
5+	117	5.1			
Goats					
Nil	1054			22.9	
1-4	330			19.3	
5+	148			33.1	

E. MATERNAL CHARACTERISTICS

1. Mother Present at Time of Interview

Children of mothers who were present at the time of the interview had a lower prevalence of chronic undernutrition than children of mothers who were not present (for total country, East and North-West Provinces). In the North, children of mothers who were present at the interview had a higher prevalence of arm wasting than children of mothers who were not present.

2,3 Mother Reads English - Mother Reads French

In Cameroon children of mothers who could read French or English were much less likely to be undernourished (chronic, underweight and arm wasting). The South-West/Littoral Province (for English) and Yaounde/Douala (for French) showed a lower prevalence of child undernutrition when the mother could read French or English.

4. Mother Reads Neither French nor English

Children of mothers in the whole country who could not read either of these languages had a greater prevalence of chronic undernutrition, underweight and arm wasting compared with those who could. The same association results for at least one of the undernutrition descriptions was found for the East and South-West/Littoral Provinces and in Yaounde/Douala. The opposite association (i.e. greater prevalence of chronic undernutrition in those with mothers who could not read French nor English) occurred in North-West/West Provinces. No association was found in Central South and none in the North, the latter because there were too few mothers who could read these languages to be able to examine the relationship with child undernutrition.

TABLE 107

PERCENTAGE UNDERNUTRITION ACCORDING TO MATERNAL CHARACTERISTICS

MATERNAL CHARACTERISTICS		Sample Size	Chronic H/A<90%	Under-Weight W/A<80%	Arm Wasting AC/A<82.5%
1. Mother Presence					
Total Country	Present	4724	20.4		
	Absent	939	25.4		
East	Present	755	24.8	20.0	
	Absent	144	36.8	27.8	
North	Present	1042			18.0
	Absent	153			9.8
NW/West	Present	712	26.1		
	Absent	179	33.9		
2. Mother Reads English					
Total Country	Yes	285	12.6	10.1	7.0
	No	5381	21.7	19.4	11.6
SW/Littoral	Yes	123	12.2	9.6	
	No	768	23.2	19.4	
3. Mother Reads French					
Total Country	Yes	1617	17.4	13.8	8.6
	No	4041	22.8	20.9	12.5
Yaounde/Douala	Yes	591		9.1	4.7
	No	304		13.8	8.8
4. Mother Reads Neither					
Total Country	Yes	2768	22.8	22.3	13.7
	No	2878	19.8	15.8	9.1
East	Yes	493			15.4
	No	406			10.8
SW/Littoral	Yes		25.3	21.5	11.8
	No		18.2	14.6	7.4
NW/West	Yes	521	25.5		
	No	366	30.8		
Yaounde/Douala	Yes	142		16.2	9.9
	No	752		9.7	5.4

5. Mother Reads Language Other than English and French

For the country as a whole, children of mothers who could read a language other than English or French had a lower percent of chronic undernutrition as compared with children of mothers unable to read these languages.

The ability to read a language (any language, but particularly English and French) is probably a good reflection of socio-economic status. This is additional evidence for the role of such a status with adequate nutrition.

It should be noted that nutrition education programs must rely primarily on the spoken word, as children of mothers who cannot read are more likely to be undernourished. Such mothers would not be reached in any other way, for practical purposes.

6. Age of Mother

There was no difference in undernutrition prevalence according to the age of the mother. Low sample sizes in mothers aged over 40 years limited this investigation to the under 21 and 21-40 year age groups.

7. Saliva Test

Only in the South-West/Littoral Provincial Grouping was a positive association found. Children of mothers there, who had a positive filter paper test (blue), indicating recent ingestion of unrefined cassava, were more likely to have chronic undernutrition. The significance of the finding is unknown.

8. Obvious Goiter

For the country as a whole, children aged 6-23 months of mothers who had obvious goiter were more likely to have chronic undernutrition and arm wasting as compared with children of mothers without such a goiter. It is known that goiter in the mother may result in cretinism or poor growth in her young child.

TABLE 107 (Continued)

PERCENTAGE UNDERNUTRITION ACCORDING TO MATERNAL CHARACTERISTICS

MATERNAL CHARACTERISTICS		Sample Size	Chronic H/A<90%	Under-Weight W/A<80%	Arm Wasting AC/A<82.5%
5. Mother Reads Languages Other Than English/French					
Total Country	Yes	200	15.5		
	No	4996	22.1		
7. Saliva					
SW/Littoral	Blue	310	16.6		
	White	385	23.8		
8. Goiter					
Total Country 6-23 Months	Ev/Seen	281	18.8		24.6
	No	1734	13.9		17.8

ASSOCIATIONS

Discussion

Characteristics that tend to be associated with undernutrition may be regarded as "at risk" factors for undernutrition. Target groups for priority care have already been considered by age (p. 74) and by area in which they live (p.79). This section deals with the demographic, socio-economic health and diet characteristics or variables which further identify target groups on a more functional approach.

Certain limitations should be noted. These include:

1. Variables must not be considered to have a direct causal relationship. A different type of study is required for this purpose.
2. Each variable has been considered separately. Hence factors other than the individual variable may better "explain" the association with undernutrition. For example, breast fed children aged 12-23 months, were more likely to be underweight than those not breast fed at the same age. On the other hand, children aged 12-23 months who did not share a common plate were more likely to be underweight than those of the same age who shared the plate. Thus the common important factor was not the continuance of breast feeding, but rather the lack of family food, which was associated with underweight.
3. The associations were based on the sample and were not strictly representative of the population from which the sample was taken (see p. 245).
4. Certain variables could not be investigated because of insufficient sample size.

With these limitations in mind, the following variables for the total country may be considered as "at risk" factors for chronic undernutrition or underweight.

A. Demographic

1. Household size more than 10 members
2. High number (i.e. 4+) of dependents (children under 5 years) in household.

B. Socio-Economic

1. Household head a farmer
2. Household structure traditional or improved
3. Family owned more cattle, sheep or goats
4. Someone other than mother cared for the child
5. Mother illiterate (cannot read French, English or other language.

C. Health and Health Service Utilization

1. Child not born in a hospital
2. Child with no birth nor clinic record (i.e. calendar of events or declaration required for age determination)
3. Recent onset of fever, diarrhea or illness

D. Diet

1. Child aged 3-5 and 6-11 months receiving no food other than milk
2. Child aged 6-11 and 12-23 months who received no family food
3. Child aged 12-23 months still being breast-fed (assuming inadequate additional foods other than milk)
4. Children of all ages who received less number of variety, energy-containing and protein-rich food groups (see section on Qualitative Dietary Recall, pages 198-9)

No association was found between sex of the child, age of the mother, or birth order of the child, with undernutrition.

Certain results require special discussion.

a. A higher prevalence of chronic undernutrition and underweight occurred on those children who were born at home with a Traditional

Birth Attendant (TBA) as compared with those born without a TBA. There are a number of possible reasons for this finding. They include:

i. The definition of a TBA was not clear to the respondents.
ii. The TBA deliveries occurred in a selective group of babies such as premature, ill or complicated births. If so, it is noteworthy that many such children even aged 2 to 5 years were still undernourished.
iii. The TBA deliveries may have occurred in areas where there was a higher prevalence of undernutrition for reasons unknown.

b. Undernutrition prevalence was higher in these children whose families owned more animals (cattle, sheep or goats). It is not possible on the results of this survey to delineate the reasons for this. It may be that such families have less food available for their young children or have poorer access to services.

c. It would appear from the results, that arm wasting may be a better parameter than chronic undernutrition or underweight to identify children with anemia, as defined by WHO.

d. The higher prevalence of chronic undernutrition or arm wasting in children aged 6-23 months whose mother had an obvious goiter is noteworthy. This supports, at least indirectly, the prior reported evidence of the association of maternal goiter with retarded growth of the child.

e. Undernutrition occurred much more frequently in children with edema than those without. On the other hand the anthropometric measures alone missed approximately half the children with edema. This indicates that the clinical sign of edema must always be used with the measurements to identify those children with kwashiorkor. It should also be realised that edema may occur in conditions unrelated to kwashiorkor (for example,certain types of heart and kidney disease).

Summary

Many of the variables listed which assciated with a higher prevalence of undernutrition in young children were consistent with the results for rural compared with urban areas (outside Yaounde/Douala) reported in the section on undernutrition by area. These variables indicate a low socio-economic status, poorer access to services, poorer diet and perhaps over-crowding.

Due to lack of sufficient sample size, it was not possible to fully investigate the association between variables and undernutrition for each province. For example, in the North, almost all mothers were illiterate, hence this factor may not be useful in discriminating the undernourished from normal children.

Further studies, on a longitudinal basis, are required to investigate actual causal factors.

15 COMPARISONS BETWEEN REFERENCE, SPECIAL GROUP AND SURVEY ANTHROPOMETRIC VALUES

The median values for weight and height according to age, sexes combined, for the reference population are listed and plotted on the following pages. Mean values for the same measures, derived from the special group and survey sample findings are also included.

The special group curves, particularly that of weight by age, corresponds closely to that of the reference median. Inspection of Tables 108 and 109 reveals that the differences between the values for the special group and reference median are minor, taking into account the relatively large Standard Deviation for individual special group values by age.

The very low prevalence rates for undernutrition found in the special group, reported on page 72, also indicates a close correspondence with reference median values.

With regards to the findings for the Cameroon sampled children, growth appears adequate up to six months of age. After this age there is a rapid flattening which continues up tp five years. This illustrates the onset and progression of growth retardation in the young child population.

TABLE 108

COMPARISONS OF HEIGHT ACCORDING TO AGE
MEDIAN REFERENCE VALUES AND FINDINGS FOR
MEAN OF CAMEROON SPECIAL GROUP AND TOTAL SURVEY SAMPLE(w)

AGE (months)	NAS Reference Median	Special Group Mean	S.D.*	Number	Cameroon Sample Mean
4	62.8	63.7	2.7	14	62.3
7	68.6	69.0	2.1	14	67.6
10	72.7	71.5	2.8	24	71.0
13	76.3	75.8	7.1	21	74.0
16	79.6	77.5	4.9	21	76.3
19	82.6	82.3	4.9	16	77.5
22	85.3	82.0	4.9	28	79.6
25	86.4	83.7	4.6	25	82.7
28	88.7	87.3	5.0	17	84.2
31	90.9	90.1	4.9	19	86.1
34	93.1	89.5	4.6	21	88.1
37	95.1	94.7	4.9	21	90.5
40	97.2	97.8	5.6	23	92.0
43	99.1	97.8	4.2	21	94.0
46	101.0	102.8	3.6	23	94.4
49	102.9	104.0	4.2	18	96.3
52	104.6	103.7	3.4	21	98.3
55	106.3	105.3	4.1	25	100.4
58	108.0	106.5	5.0	33	101.6

* SD = Standard Deviation
Height values in cm
(w) Weighted Percent

TABLE 109

COMPARISONS OF WEIGHT ACCORDING TO AGE
MEDIAN REFERENCE VALUES AND FINDINGS FOR
MEAN OF CAMEROON SPECIAL GROUP AND TOTAL SURVEY SAMPLE(w)
(Sexes Combined)

AGE (months)	NAS Reference Median	Special Group Mean	S.D.*	Number	Cameroon Sample Mean
4	6.3	7.3	0.6	14	6.9
7	8.0	9.1	1.1	14	7.8
10	9.2	9.1	1.2	24	8.5
13	10.1	10.0	1.7	21	9.1
16	10.7	10.3	1.3	21	9.7
19	11.3	11.7	1.5	16	9.9
22	11.8	11.4	1.4	28	10.6
25	12.2	12.0	1.9	25	11.3
28	12.8	12.9	1.4	17	11.8
31	13.4	14.2	1.4	19	12.4
34	14.0	13.7	1.9	21	12.9
37	14.5	14.7	2.1	21	13.4
40	15.0	15.6	2.1	23	13.8
43	15.5	15.5	1.6	21	14.4
46	16.0	17.1	1.8	23	14.5
49	16.5	17.1	1.9	18	14.8
52	16.9	16.6	1.6	21	15.3
55	17.4	17.6	1.9	25	15.8
58	17.8	18.3	2.3	33	16.2

* S.D. Standard Deviation
Weight values in kg
(w) Weighted Percent

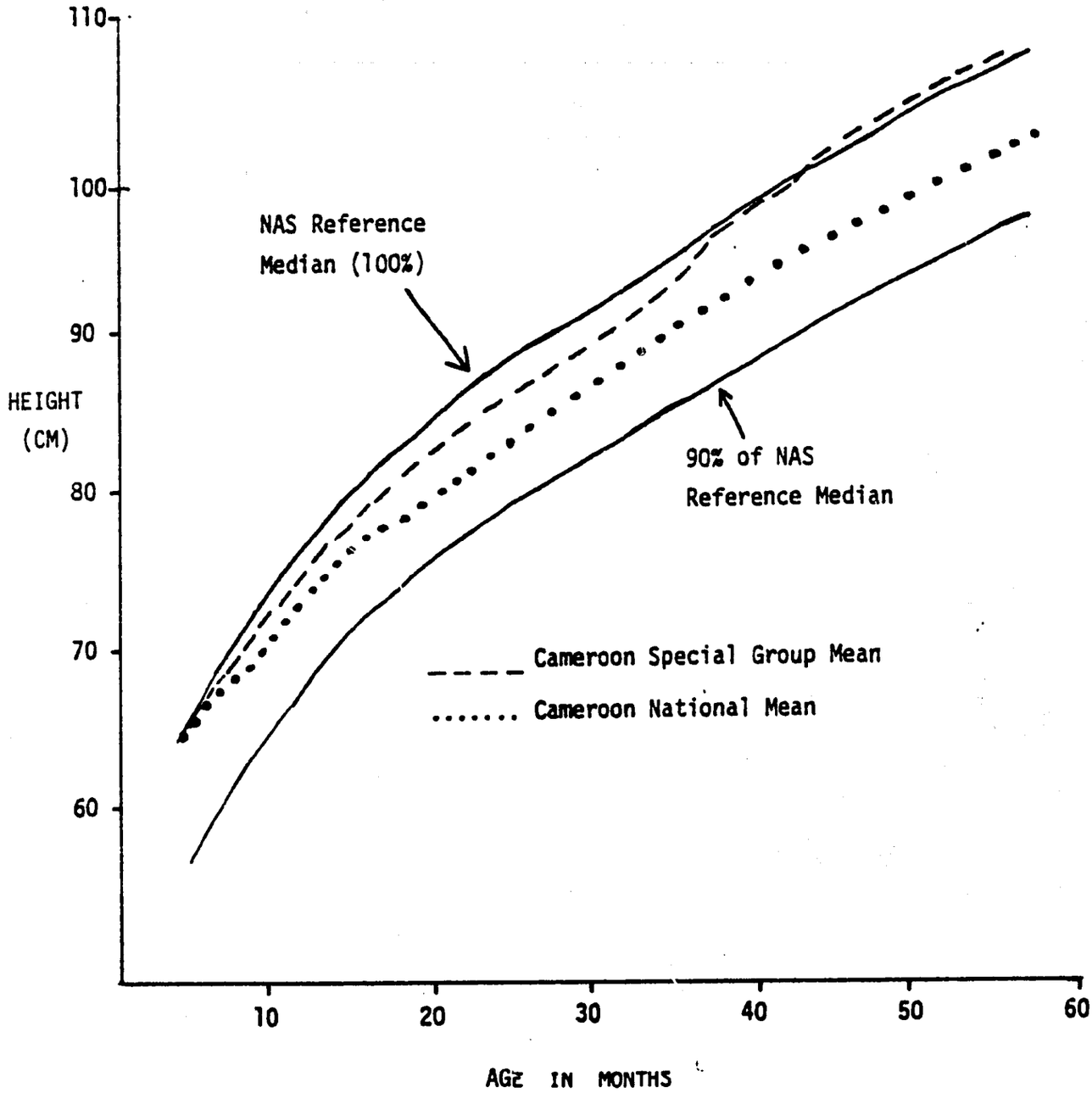


Figure 26 HEIGHT BY AGE OF CHILD - COMPARISONS OF REFERENCE MEDIANS AND CAMEROON MEAN VALUES (SEXES COMBINED)

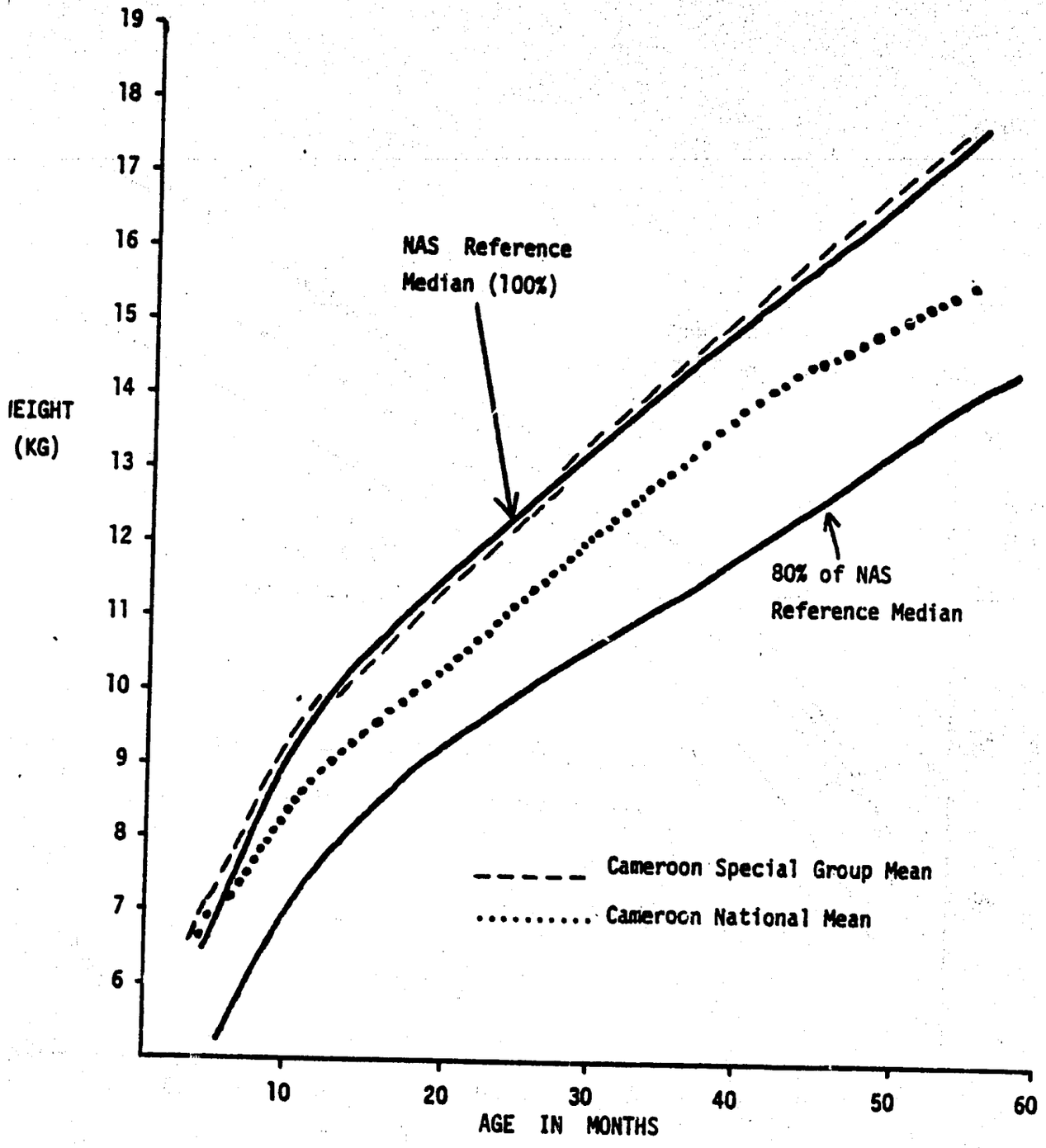


Figure 27 WEIGHT BY AGE OF CHILD - COMPARISONS OF REFERENCE MEDIANS AND CAMEROON MEAN VALUES (SEXES COMBINED)

APPENDICES 1 - 31

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1. Survey Sample Size - Theoretical Aspects
2. Survey Sample Size - Methods
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15. Item Investigated But Not Included in the Survey - Vitamin A
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26. Survey Preparation
27. Survey Training
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    - Field Phase
    - Field Phase Schedule
30. Participating Organizations
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REFERENCES

APPENDICES 1 TO 4 SURVEY DESIGN

APPENDIX 1 SURVEY SAMPLE SIZE - Theoretical Aspects

The method of determining sample size presented here very closely follows the method used by the Center for Disease Control, Atlanta, Georgia (23).

Some of the key factors which determine sample size include:

1. Available financial, personnel and physical resources.
2. Constraints such as time and logistical problems affecting the survey in the field, particularly transport.
3. Nature of the sample distribution assumed applicable.
4. The extent and depth of information desired.
5. Precision desired for statistical estimates and the confidence level to be associated with them.

Considering the effect of these factors on the survey, 30 sampling units would allow an estimation of the portion of the population in an area having a characteristic provided the characteristic is not rare (less than 5%) or very sporadic in its distribution.

To determine the appropriate survey sample size for a geographic area, the following equation can be used if the sampling distribution of "p" (prevalence) is approximately Gaussian (43).

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

Z = normal deviate for confidence level desired (1.96 for 95% confidence and 1.65 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."

Past experience with the Liberia National Nutrition Survey data regard-

ing the proportion of children up to five years of age under the 90% reference median height for age has shown that K = 2 should provide at least the desired precision. The "Z" score is generally chosen for 95% confidence (Z = 1.96).

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

The value of p yielding the largest n is .5, so if a number of different attributes are to be measured for the universe, it is usually safest to assume p = .5. After fixing K, Z and p; n and D are the only values not determined.

By determining maximum deviation tolerable (D) equal to 4.6%, n can be solved for as follows:

$$k = 2 \text{ (cluster effect)}$$
$$Z = 1.96 \text{ (95\% confidence)}$$
$$p = .5 \text{ (50\%)}$$
$$D = .046 \text{ (4.6\%)}$$
$$n = \frac{2\ (1.96)^2}{(.046)^2}\ (.5)\ (.5)$$
$$n = 900$$

Thirty children were drawn using a random start technique within each selected unit. A total sample of 900 children (30 sample units x 30 children) with proportions having a characteristic varying as follows would have the following approximate precisions:

% Having Characteristics		95% Confidence Limits
50.0%	(50%)	± 4.6%
20.0%	(80%)	± 3.7%
10.0%	(90%)	± 2.8%

Predetermination of sample size does not predetermine precision of survey estimation. Some variables will have greater precision than predicted and others will have less. Findings were presented on page 92 Table 26, Undernutrition Prevalence Estimates and Precisions.

APPENDIX 2
SURVEY SAMPLE SIZE - Methods

I. First Stage

(a) The universe sampled was the whole population of the Cameroon as defined by the 1976 Population Census. Samples were drawn from each province, groups of provinces (e.g. North-West/West) and the two major cities, Yaounde and Douala.

(b) A random start and a fixed interval method for population proportional sampling was done for each defined area, using the Enumeration Area lists from the Census.

(1) The populations of all EA's for the area were progressively cumulated.

(2) The final total area population was divided by the predetermined number of sample sites to obtain a sampling interval.

e.g. Total population of East Province = 366,235
Number of sites to be selected = 30
Sampling interval = $\frac{366,235}{30}$ = 12,208

(3) A random number was selected, within the range of the sampling interval (e.g. for East Province a number from 1 to 12,208). This number identified the first enumeration area sampled.

(4) The sampling interval was added consecutively to the starting number to identify further EA's as sites until all sites were selected, up to the end of the cumulative total population.

(5) Subsequent areas of the country (North Province, etc.) were sampled in the same way to select sites.

II. Sampling Within Sites

The methods varied according to the area, based on available popula-

tion and mapping information.

(a) Yaounde and Douala

(1) Aerial maps of the EA's selected, delineated individual structures and were photocopied from those of the Bureau of the Census.

(2) A sampling interval was predetermined, based on the estimated number of children, aged 3-59 months from the 1976 Population Census results and the number of children required. In the Census approximately 1:6 (16%) of the total population were children aged 3-59 months.

e.g. Total population in EA = 700

Estimated population children 3-59 months = 700 x 1/6 = 117

Required number of children = 30

Sampling interval = $\frac{117}{30}$ = 3.9 = 5 (approx.)

(3) In the EA, a team member stood with his/her back to the front door of the chief's house and traced a direction to the right to continue to the border of the EA. The structure at this border point was the first structure to be visited.

(4) The senior occupant of this structure was questioned as to the number of separate households living there; using the same definition of a household, employed by the 1976 Census. The door of the structure was numbered according to the order of household. In the first household, all the young children and babies were presented to the team to determine if there were any children aged 3-59 months. If such was the case, this child or these children were selected first in the sample and measured.

In the example (p.276), the first household was to be selected, with a sampling interval of 4 for subsequent households (1, 5, 9, 13, 17, etc.). The first structure had one

Example (where sampling interval 1:4)

Structure	Household Enumerated	Child 3-59 Months	Child Selected in Sample
1	1	No	
2	2-3	Yes in 2 (1 child) Yes in 3 (1 child)	1 (2)*
3	4 NP	---	
4	5	No	
5	6	Yes (2 children)	2, 3 (6)
6	7-8	Yes in 7 (2 children)	
7	9 NP	---	
8	10	Yes (1 child)	4, (10)
9	11	No	
10	12 NP	---	
11	13	Yes (2 children)	5-6 (13)
12	14-15	Yes in 14 (1 child)	
13	16	No	
14	17 NP	---	
15	18	Yes (2 children)	7-8 (18)

*Household Number

NP - noone present

◯ - predetermined household no. to be sampled

household (No. 11 for the area) with occupants present, but no child 3-59 months of age. In order to select the first household with a child of that age, it was necessary to continue to the next household.

The next structure to be visited was that adjacent to the first structure, in a clockwise direction around the perimeter of the enumeration area. This second structure contained two households, each with one child of the required age. The first household of these two was the one nearest geographically to the previous structure visited. This household (No. 2 for the area) was selected.

Households were enumerated until No. 5 for the area was reached. The procedure was repeated as for household No. 1, and continued until 30 children were measured.

When the perimeter of the area was completed, a circular path was continued for the subsequent perimeters inwards.

It should be noted that only households as residences were included in the enumerations, even if there was no one present at the time of the visit.

(b) Rural Areas

The same procedure as that outlined for Yaounde and Douala with the following exceptions:

1. Maps had to be drawn by the surveyors, noting the approximate position of all structures in the village to be sampled, prior to the selection of the first.
2. In many instances, the whole EA was not sampled, as was the case for Yaounde and Douala. The procedure included the first and proceeding quartiers (localities) or villages until the required number of children were selected. A predetermined sampling interval was used, based on their total population as reported by the 1976 Census.

CARTE

MAP SHOWING A SAMPLED VILLAGE

SITE 6 5

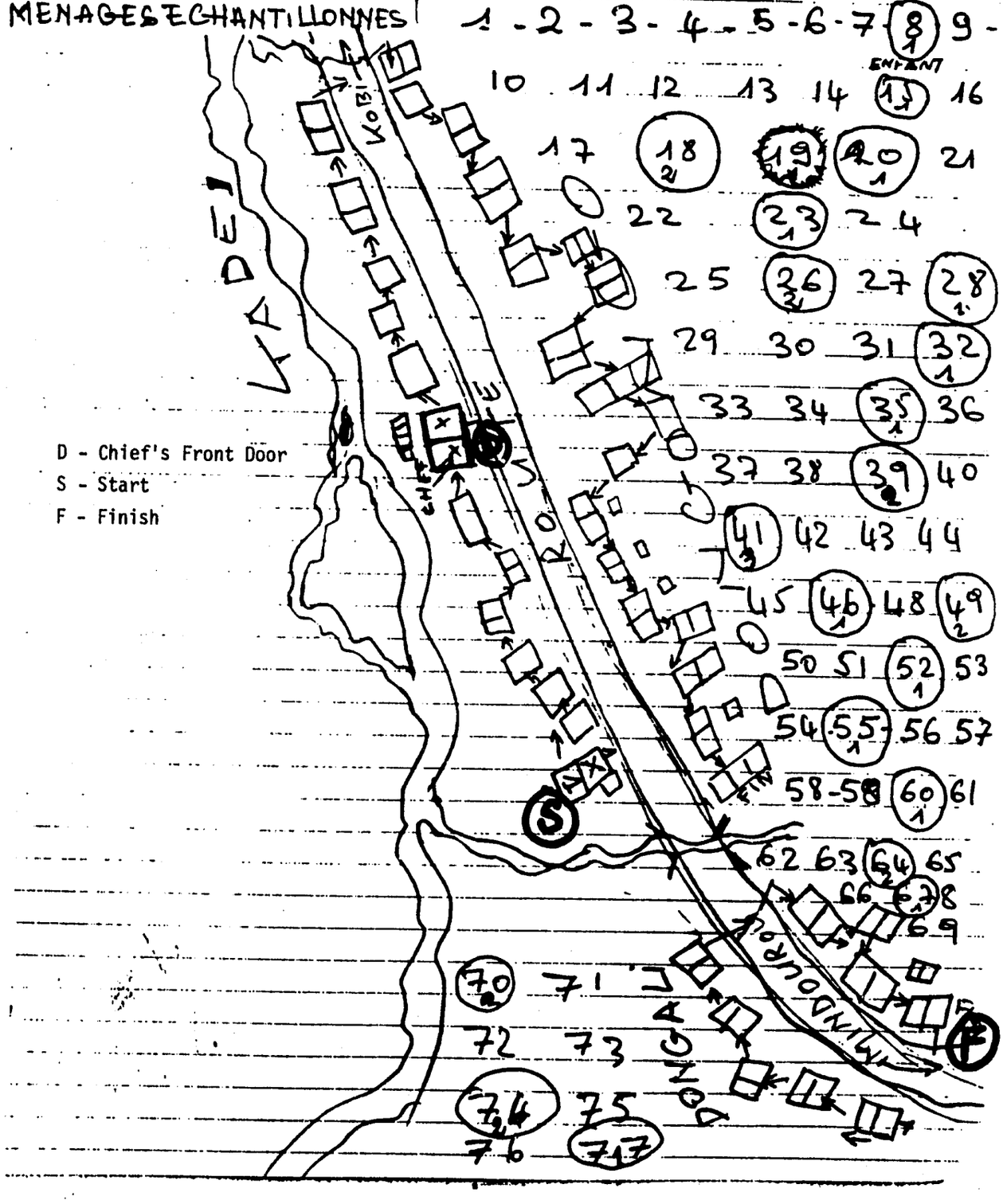
VILLAGE DONGOLO DONGOLI

EQUIPE 0 5

DATE 2 6 0 1 7 8

PROGRESSION: 1:2

MENAGES ECHANTILLONNES



Supervisors and senior personnel of the survey assisted teams in the preparation and when available, the execution for sampling within the site. As convenience allowed during the field phase, a thorough review of the sampling procedures for each site was undertaken with the respective teams and supervisors by senior personnel. In almost all cases, such procedures were found to be satisfactory in that the correct sampling interval was used and their was no bias due to the teams not following the instructions explicitly. It should be noted that although the chief's house was visited first, according to protocol, the first child measured for the sample in that site was not in the chief's house, unless that structure was first selected by the designated procedure. This rarely occurred.

A total of three sites were incorrectly selected by the teams. Two of these were in Douala and one in the North Province. This was due to an error in identifying the assigned enumeration area to be sampled. The corresponding three correct sites were surveyed and their data replaced the that for the incorrect sites.

Example of a Map Showing a Sampled Village (p. 278)

This site comprised two villages Dongongo and Dongali. The sampling interval (progression) was 1:2. There was a total of 77 households in the site. The first child measured in the site was in household No. 8, this being the first household according to the sampling scheme in which a child aged 3-59 months was available. The next child measured was in household No. 15. Household No. 18 contained two children under five years, who were measured. The procedure continued to household No. 77, where the 30th child was completed. In the intervening households, (i.e. 9-14, 16-17, 19 etc), there was one household having at least one child under five years. These households were not included in the survey, as only every second household with a child under five years was allowed in the sample.

APPENDIX 3 MAPS OF SURVEY SITES

APPENDIX 4 LIST OF SURVEY SITES

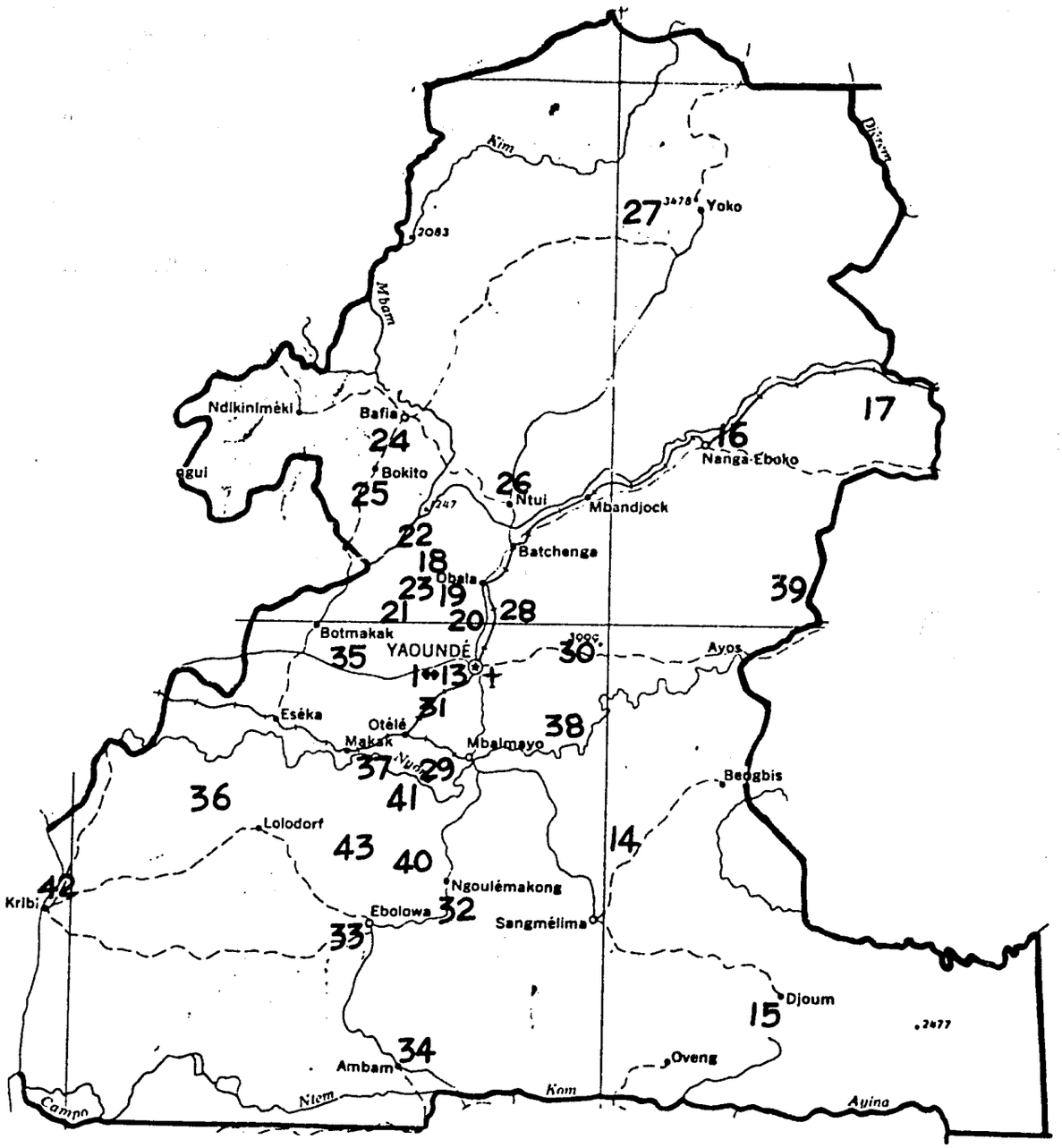
The maps of survey sites are presented according to province (Central South-p. 281, East-p. 282 and North-p. 283) and provincial groupings (North-West, West, South-West and Littoral -p.284).

Site numbers which correspond to the data file and the list of survey sites (pp. 285-298) are written on the maps so that a visual location is available in this report.

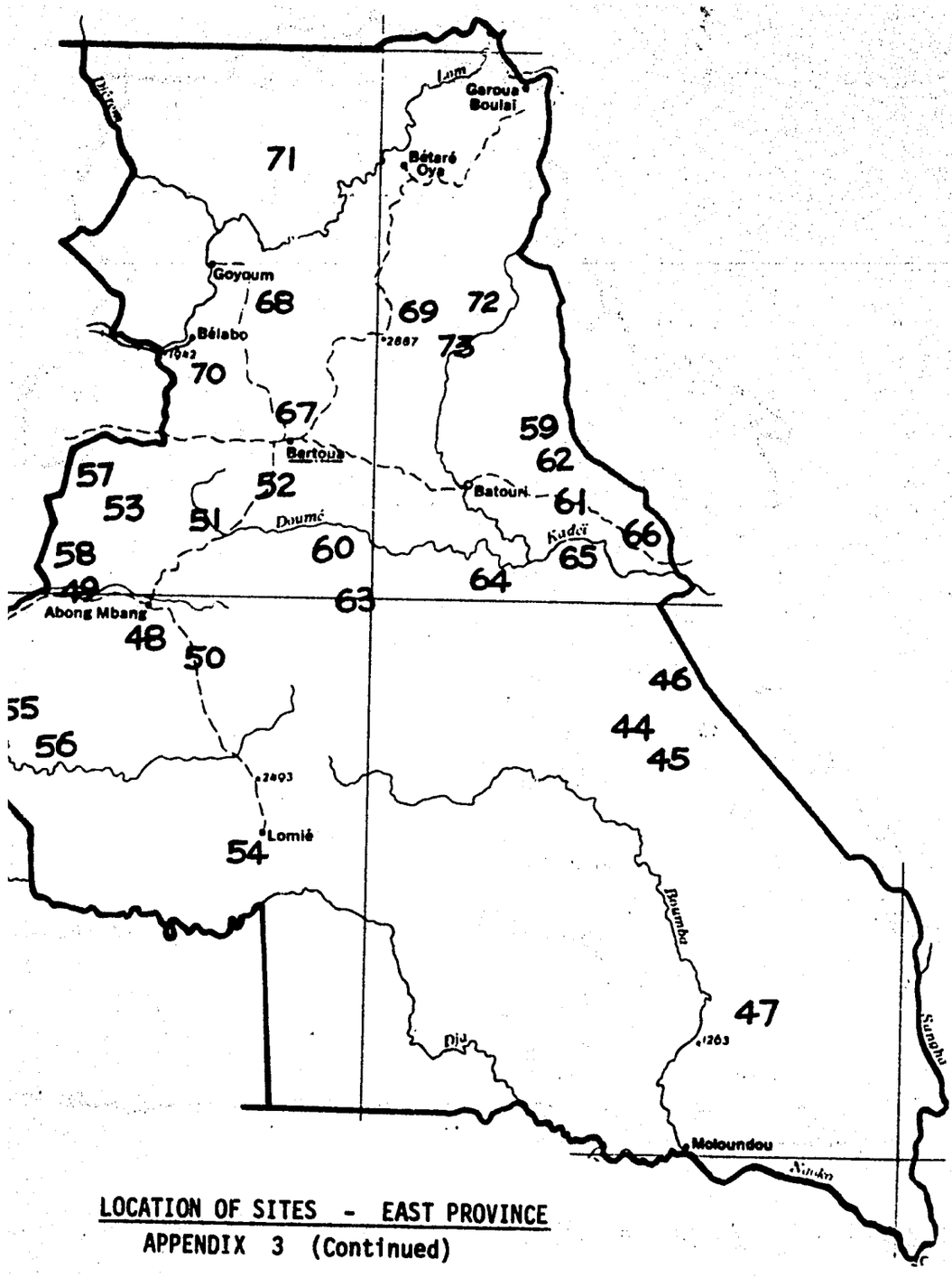
The list of sites includes the following:

Survey Number
Department
Arrondissment
Canton
Village
Quartier, i.e. locality within the village
Census Number for the site Enumeration Area

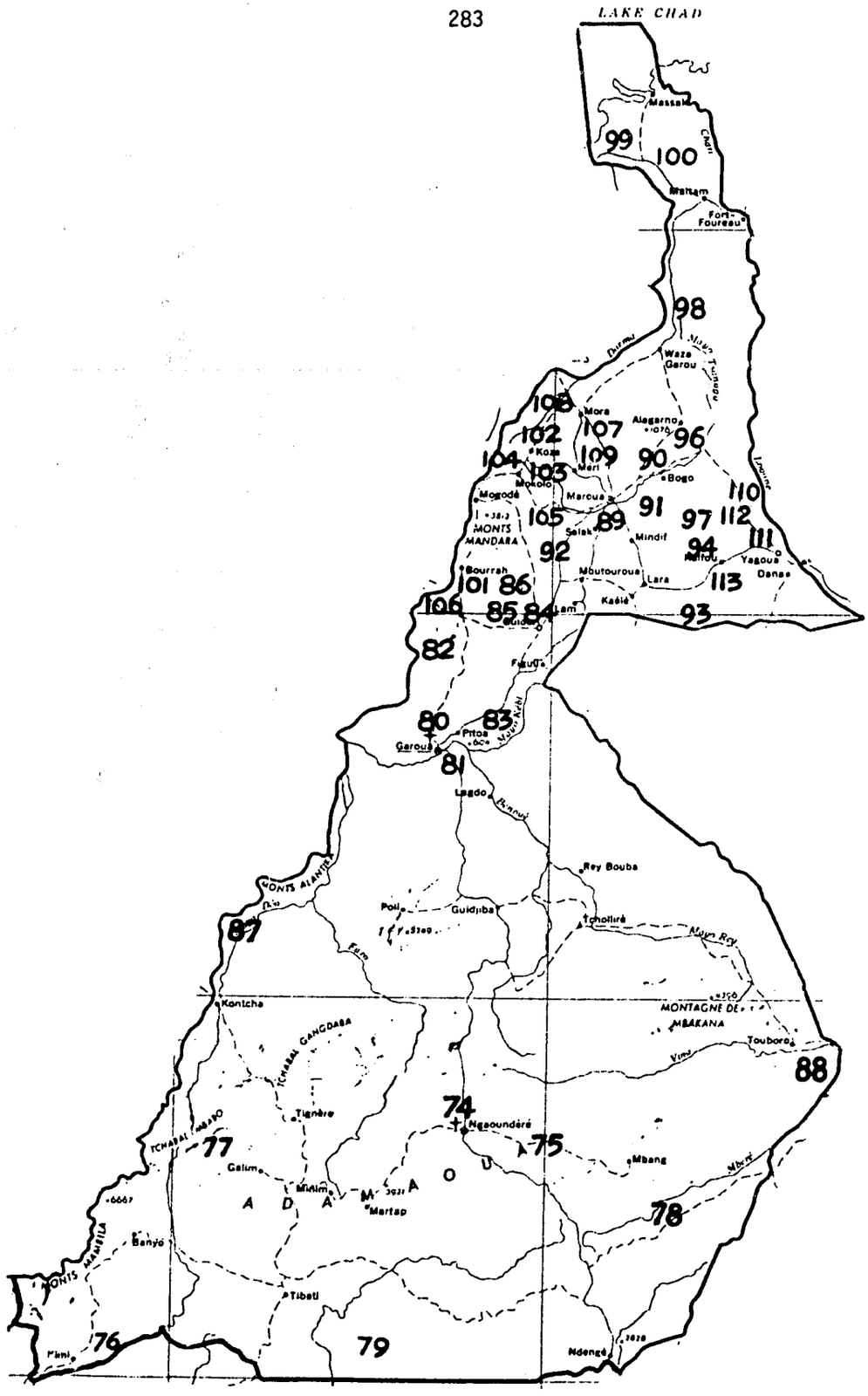
The maps and lists are included also in case they may be useful in case any follow up studies are done in any of the survey sites.



APPENDIX 3 LOCATION OF SITES - CENTRAL SOUTH PROVINCE

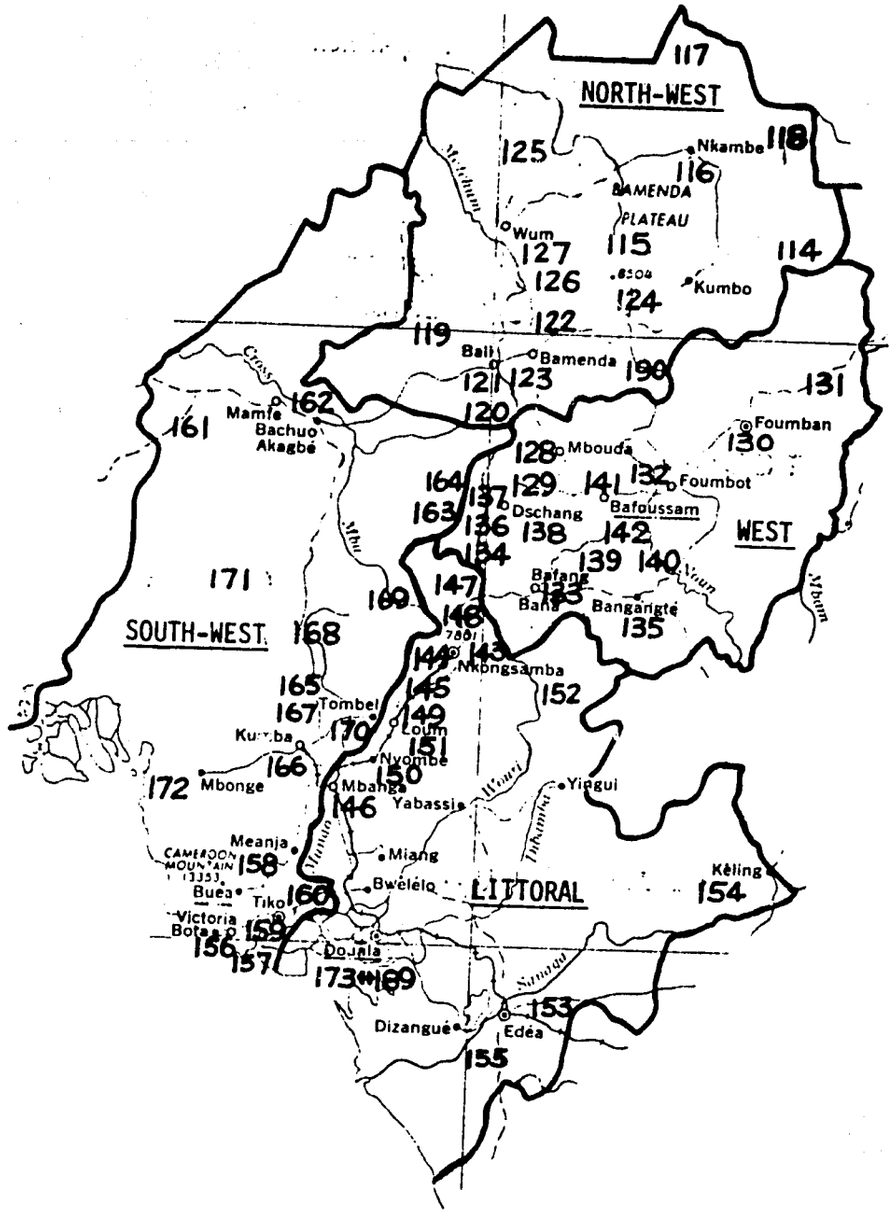


LOCATION OF SITES - EAST PROVINCE
APPENDIX 3 (Continued)



LOCATION OF SITES - NORTH PROVINCE

APPENDIX 3 (Continued)



LOCATION OF SITES - WESTERN PROVINCES

APPENDIX 3 (Continued)

LIST OF SITES: YAOUNDE AND DOUALA

YAOUNDE

Survey Number	Department	Arrondissement (Zone)	Quartier	Census Number
1	Mfoundi	I	Olezon	003
2	Mfoundi	I	Elig Essono	020
3	Mfoundi	I	Centre-Ville	055
4	Mfoundi	I	Essos	096
5	Mfoundi	II	Ntougou II	010
6	Mfoundi	II	Messa-Plateau	028
7	Mfoundi	II	Ekoudou	051
8	Mfoundi	II	Tsinga (Haoussa)	077
9	Mfoundi	III	Camp-Dakar	015
10	Mfoundi	III	Biyemassi	043
11	Mfoundi	III	Nkol Bikok	078
12	Mfoundi	IV	Nkol Ndongo	026
13	Mfoundi	IV	Kondengui	057

DOUALA

173	Wouri	I	New-Deido	011
174	Wouri	I	Bonandjo	024
175	Wouri	I	Congo	043
176	Wouri	I	Ngodi-Cimetiere	070
177	Wouri	I	Bonapriso	094
178	Wouri	II	New-Bell Bassa	010
179	Wouri	II	Sabendjogo	037
180	Wouri	II	KassalaFâm	057
181	Wouri	II	Nkololoum	081
182	Wouri	II	Yabassi-Scierie	106
183	Wouri	III	Madagascar	013
184	Wouri	III	Oyack	027
185	Wouri	III	Ndog-Bong	051
186	Wouri	III	Bepanda Omnisport	072
187	Wouri	III	Bepanda New-Style	100
188	Wouri	III	Oyack	132
189	Wouri	IV	Nkomba I	002

SOUTH-CENTRAL PROVINCE

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
14	DJA-ET-LOBO	Sangmelina	Yenvan-Yassam	Nkomo		228
15	DJA-ET-LOBO	Djoum	Fang-Center	Minko		213
16	HAUTE-SANAGA	Nanga-Eboko	Nango-Eboko-Ville	Nanga-Eboko	Center Urbain	004
17	HAUTE-SANAGA	Minta	Bibey	Bibey		213
18	LEKIE	Monatele		Polo I	Nkolovang,Elig Manga Ngong Ndanga	218
				Nkol-Ossanga		
19	LEKIE	Obala	Endingding	Zoatoubsi		234
20	LEKIE	Obala	Mendoum	Nkol-Mendouga Yemsoum I	Nkol-Mendouga Nkoi Olem	274
21	LEKIE	Okala	Mvog Nana II	Mkoulovang		233
22	LEKIE	Saa	Benyabeba	Ebebeda I	Ndzong-Eseka	231
23	LEKIE	Evodoula	Ntsa & Endo-Mvog Onamenye	Pong Solo III		205
24	MBAM	Bafia	Bekke	Bitang	Zoko Dodjam Ribekiti	208
25	MBAM	Bokito	Mmahala	Yorro	Bougnogolo	219
26	MBAM	Ntui	Ntui-ville	Ntui	Ntui Bloc 001	001
27	MBAM	Yoko	Tikar	Kong		215

SOUTH-CENTRAL PROVINCE, cont.

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
28	MFOU	Mfou	Ntouessong & Ngoul Mekonk	Ndong-Eton	Gali I	210
29	MFOU	Akono	Mvog Tsoungui Mballa	Mfida II & IV		203
30	MFOU	Awae	Edouma	Alanguena Nkol-Top		212
31	MFOU	Mbankomo	Nomayos	Mbeyengue I		210
32	NTEM	Ebolowa	Anonyme	Mekomevom Efot Ebap		228
33	NTEM	Ebolowa	Akono Beme	Zouameyong	Enongal Bulu	276
34	NTEM	Ambam	Abessolo Mgbawa	Minsele		214
				Mfouloukok	Endayos Mfouloukok Mboleman	
35	NYONG-ET-KELLE	Eseka	Ndog-Seng	Matomb	Matomb Center	006
36	NYONG-ET-KELLE	Messondo	Yabi	Song-Lipem Makot		212
37	NYONG-ET-KELLE	Makak	Ndok-Bera-Sud	Libamba	Libamba	213
38	NYONG-ET-MFOUMOU	Akonolinga	Mbida-Mbani	Man I & II		241
39	NYONG-ET-MFOUMOU	Ayos	Ye Bekola-Nord Est	Mbang	Mbang I Okak	212
40	NYONG-ET-SO	Mbalmayo	Enoah & Ngoue	Mebomezoa		208

SOUTH-CENTRAL PROVINCE, cont.

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
41	NYONG-ET-SO	Ngomedzap	Etoudi & Essomba	Ekoudendi		205
42	OCEAN	Kribi	Ipre Bouri	Bembabwe I Mpolongue		205
43	OCEAN	Mvengue	Yanda	Ebom	Ebom Center	216

EAST PROVINCE

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
44	BOUMBA-ET-NGOKO	Yakadouma	Bombong	Landjoue		202
45	BOUMBA-ET-NGOKO	Yakadouma	Bombong(S-West)	Parny		219
46	BOUMBA-ET-NGOKO	Yakadouma	Mbimou	Gribi		244
47	BOUMBA-ET-NGOKO	Mouloundou	Bangando	Koumela		221
48	HAUT-NYONG	Abong-Mbang	Abong-Mbang Ville	Abong-Mbang	Boulet	003
49	HAUT-NYONG	Abong-Mbang	Maka Mboans	Mayos		213
50	HAUT-NYONG	Abong-Mbang	Maka Bebeng	Nkouak		226
51	HAUT-NYONG	Doume	Doume-Ville	Doume	Briqueterie	001
52	HAUT-NYONG	Doume	Bakoum-Doume	Ngolambele		204
53	HAUT-NYONG	Doume	Djato	Bamako I & II		215
54	HAUT-NYONG	Lomie	Djem Center	Pohempoun		205
55	HAUT-NYONG	Messamena	Badjoue-Nord et Bikele	Tiang Mang Mbouni		202
56	HAUT-NYONG	Messamena	Lehe Mpouo	Ekomo Essiengbot		216
57	HAUT-NYONG	Nguelemendouka	Ohvang Sekonda	Zembe I & II		210
58	HAUT-NYONG	Nguelemendouka	Ohvang Sekonda	Efoulan Namedjab		226
59	KADEY	Batouri	Baya-Est	Boubara	Begongo Befio Musulman	007

EAST PROVINCE, cont.

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
60	KADEY	Batouri	Mbondto	Ngodanga Mboutou		204
61	KADEY	Batouri	Kata-Ngbwaka	Ngangam Ngette		218
62	KADEY	Batouri	Baya-Est (Kette)	Oudjiki		229
63	KADEY	Batouri	Mezime	Bitouala Mombel I	Bitouala Mombel	240
64	KADEY	Batouri	Bangantou	Mombel Ndjang		253
65	KADEY	Ndelele	Kata Mbessombo	Dongongo Dongali		209
66	KADEY	Ndelele	Kata Bera	Lolo	Lolo	225
67	LOM-ET-DJEREM	Bertoua	Meteo	Bertoua	Yademe	005
68	LOM-ET-DJEREM	Bertoua	Pol	Mambaya		203
69	LOM-ET-DJEREM	Bertoua	Baya	Yangamo	Mougadolo	218
70	LOM-ET-DJEREM	Bertoua	Bobilis	Ndemba I		235
71	LOM-ET-DJEREM	Betare-Oya	Yagoue	Ndoykayo		207
72	LOM-ET-DJEREM	Betare-Oya	Baguinda	Ndouba-Bello		224
73	LOM-ET-DJEREM	Betare-Oya	Baguinda	Oudou Kambo		245

NORTH PROVINCE

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
74	ADAMAOUA	Ngaoundere	Ngaoundere-Centre	Ngaoundere	Boumdjere III	009
75	ADAMAOUA	Ngaoundere	Bele	Bera		237
76	ADAMAOUA	Banyo	Bankim Bandam Songkolong	Nyakong		204
77	ADAMAOUA	Banyo	Banyo	Koui Louga Mayo Fouro		248
78	ADAMAOUA	Meiganga	Ojohang	Yarmbang	Gazi	230
79	ADAMAOUA	Tibati	Tibati-Yoko	Mbakaou	Mbissari Naskoul	203
80	BENOUE	Garoua	Garoua-ville	Garoua	Toupouri	002
81	BENOUE	Garoua	Garoua-ville	Garoua	Bibemire I Lycee	036
82	BENOUE	Garoua	Bascheo	Bascheo		245
83	BENOUE	Garoua	Be	Badjouwa		289
84	BENOUE	Guider	Guider	Mozongo	Mozongo Bama	231
85	BENOUE	Guider	Libe	Libe		299
86	BENOUE	Guider	Douroum	Tirlao	Bret	367
87	BENOUE	Poli	Wangay	Bogdou		232
88	BENOUE	Tchollire	Touboro	Njankone		245
89	DIAMARA	Maroua	Djarengol	Maroua	Djarengol	028
90	DIAMARA	Maroua	Malam-Pete	Malam Petel		224
91	DIAMARA	Maroua	Dargala et Yoldeo	Yoldeo	Gaigai Moundire	275

NORTH PROVINCE, cont.

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
92	DIAMARA	Maroua	Ouzallou et Gawel	Ouzal Loulou Loulou	Zikaka Goudoum Kourkalaf	322
93	DIAMARA	Kaele	Doubane	Golonghini	Yamada	240
94	DIAMARA	Kaele	Bizili	Bizili	Bardouki	285
95	DIAMARA	Meri	Kallio	Kallio Dourga		225
96	DIAMARA	Bobo	Baldea	Madide	Tchollire	217
97	DIAMARA	Mindif	Korne et Kadei	Moutfire Kassay		236
98	LOGONE-ET-CHARI	Kousseri	Logone-Birni	Leyauma		215
99	LOGONE-ET-CHARI	Serbewel (Makari)	Makany	Dis-Salam Glo		219
100	LOGONE-ET-CHARI	Serbewel (Makari)	Goulfan Sultanat	Krenac Mahadjiri Hambaka		262
101	MARGUI-WANDALA	Mokolo	Tchevi	Yaoura	Yaya	245
102	MARGUI-WANDALA	Mokolo	Koza	Mokolo	Koza Djah Varkla Oubonzoum	315
103	MARGUI-WANDALA	Mokolo	Matakam Sud	Sir	Oudouva Mboumede	389
104	MARGUI-WANDALA	Mokolo	Matakam Sud	Baou	Gouro Dehavane	463

NORTH PROVINCE, cont.

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
105	MARGUI-WANDALA	Mokolo	Mokolo Rural	Dimeo	Zang	520
106	MARGUI-WANDALA	Mokolo	Tchevi	Bôukoula	Lamorde	602
107	MARGUI-WANDALA	Mora	Warba-Palbara-Mounyengue	Dzourou Grea Boukar Rama		277
108	MARGUI-WANDALA	Mora	Kerawa	Bakarisse Namba Gakara Ildoko		364
109	MARGUI-WANDALA	Mora	Makalingai	Ndagal		448
110	MAYO-DANAY	Yagoua	Pouss	Begue	Paria	238
111	MAYO-DANAY	Yagoua	Guiruidig	Dama	Dama	288
112	MAYO-DANAY	Yagoua	Yagaoua Rural	Guia	Rakay Dibamna I & II	355
113	MAYO-DANAY	Kar-Hay	Doukoula	Filiou		224

NORTH-WEST PROVINCE

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
114	BUI	Kumbo	Nkum	Ngendzen	Yungdzen Kiteboh	211
115	BUI	Jakiri	Oku	Jikijem	Tolon Nkwin III Nkas Dtiyketam Ketule IV	223
116	DONGA MATUNG	Nkambe	Nohautimdan Bane-don, Dourbon clan	Chunghe (Tsungue)	Fuang Yabo	202
117	DONGA MATUNG	Nkambe	Loower, Mbende clan	Abvenshie	Abvenshie Up Abvenshie Down	244
118	DONGA MATUNG	Nwa	Yamba	Gom	Ngoh Nchack Nkwi Lip	209
119	MOMO	Mbengwi Centre	Ngie	Tinechung	Teifuh	219
120	MOMO	Batibo	Moghamo	Ashong	Kwongwok Ngako	222
121	MEZAM	Bamenda	Bali-Nyonga	Bali Nyonga	Mbufang	235
122	MEZAM	Bamenda	Bafut-Tubah	Bafut	Atualah-Mambu	251
123	MEZAM	Bamenda	Bali-Town	Bali-Nyonga	Nteda	001
124	MEZAM	Ndop	Bamunka	Babungo	Nkafinteng	282
190	MEZAM	Ndop		Bangola	Mbutaw	
125	MENCHUM	Wum Central	Fungom	Nashi		229
126	MENCHUM	Fundong	Kom	Fundong	Belo	003
127	MENCHUM	Fundong	Kom	Njimikom	Wom Bong Down	242

WEST PROVINCE

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
128	BAMBOUTOS	Mbouda	Babete	Babete	Latet III Mission Catholique	231
129	BAMBOUTOS	Batcham	Batcham	Batcham	Konti	238
130	BAMOUN	Foumban	Koukwet-Maloun	Foumban	Koukwet-Maloun	016
131	BAMOUN	Foumban	Mayap	Makouetvu		224
132	BAMOUN	Foumbot	Foumbot-Centre et Rural	Fochieya	Fochieya	204
133	HAUT-NKAM	Bafang	Nguenack	Bafang	Nguenack Bloc C	008
134	HAUT-NKAM	Company	Fondanti et Fond-jamekwet	Fondjomekwet		212
135	NDE	Bangangte	Bangangte-Chefferie et Bangoula	Bagoulap	Femtchouet Mbokeu	221
136	MENOUA	Dschang	Fosson-Wentcheng	Fossong Wentcheng	Zingla	209
137	MENOUA	Dschang	Batou	Bafou	Lepo	258
138	MENOUA	Penka-Michel	Bamendou	Bamendou	Panni	205
139	MIFI	Bangou	Baham et Bata	Baham	Poumze	203
140	MIFI	Bandjoun	Bandjoun	Bandjoun	Mbemtum	236
141	MIFI	Bafoussam	Bafoussam-ville	Bafoussam	Famla II	011
142	MIFI	Bafoussam	Bafaoussam-ville	Bafoussam	Toungang	031

LITTORAL PROVINCE

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
143	MOUNGO	Nkongsamba	Nkongsamba-ville	Nkongsamba	Quartier I	001
144	MOUNGO	Nkongsamba	Nkongsamba-ville	Nkongsamba	Quartier X	017
145	MOUNGO	Nkongsamba	Bakaka	Manengole II	Bloc VI	034
146	MOUNGO	Mbanga	Mbanga-ville	Mbanga	Quartier VII	017
147	MOUNGO	Melong	Melong-ville	New Melong	Bloc 2	002
148	MOUNGO	Melong	Mbo	Nkongsoung	Nkongsoung	219
149	MOUNGO	Manjo	Nlohe	Nlohe II		201
150	MOUNGO	Loum	Loum-ville	Penja	Mbalmbong II	020
151	MOUNGO	Loum	Loum-ville	Loum	Madagascar	042
152	NKAM	Nkondjock	Mbang, Bandem	Ndock Samba		212
153	SANAGA-MARITIME	Edea	Abie-Bassa	Makondo		206
154	SANAGA-MARITIME	Ngambe	Ndog-Nbok, Babimbi II	Nkom		220
155	SANAGA-MARITIME	Dizangue	Yakalak	Olombe		201

SOUTH-WEST PROVINCE

Survey Number	Department	Arrondissement	Canton	Village	Quartier	Census Number
156	FAKO	Victoria	Victoria-ville	Victoria	Mbende Street	010
157	FAKO	Victoria	Victoria-rural	Cape Nightingale Light House Bimba		200
158	FAKO	Victoria	Buea	Bonakanda	Bova I	223
159	FAKO	Tiko	Tiko-ville	Mutengene	Victoria Road	004
160	FAKO	Tiko	Mudeka	Missellele	Keme CDC Camp	210
161	MANYU	Mamte	Keaka-Kembong	Aja		219
162	MANYU	Mamfe	Bachuo-Akagbe	Manta		263
163	MANYU	Fontem	Fontem-ville	Lebang		004
164	MANYU	Fontem	Mweh	Lebong	Leweh Lettia Belluia	220
165	MEME	Kumba	Kumba-ville	Bekondo	Matoh	011
166	MEME	Kumba	Kumba-ville	Kumba	Kumba Town	031
167	MEME	Kumba	Bakuman-Kombone	Kake II		222
168	MEME	Kumba	Kumba-Central	Kombone Bafan		259
169	MEME	Bangem	Elung	Ekanjoh		221
170	MEME	Tombel	Muetan	Buba	Buba III	201
171	NDIAN	Mundemba	Batanga	Dibonda Mosina Dibonda Clocki		216
172	NDIAN	Bamusso	Bakolle I	Bekumu	Mbenekang	201D

URBAN AREAS SAMPLED

PROVINCE	DEPARTMENT	ARRONDISSEMENT	POPULATION	NO. SITES
South Central	Haute Sanaga	Nanga-Eboko	6,201	1
	Mbam	Ntui	2,902	1
	Nyong-Et-Kelle	Eseka	10,359	1
East	Haut-Nyong	Abong-Mbang	6,689	1
	Haut-Nyong	Doume	5,299	1
	La Kadey	Batouri	18,332	1
	Lom-De-Djerem	Bertoua	18,460	1
North	L'Adamaoua	Ngoundere	42,038	1
	La Benoue	Garoua	69,285	2
	Diamare	Maroua	67,187	1
South-West	Fako	Victoria	51,600	1
	Fako	Tiko	23,411	1
	Manyu	Fontem	6,343	1
	Meme	Kumba	58,469	2
Littoral	Moungo	Nkungsamba	79,343	3
	Moungo	Mbanga	23,153	1
	Moungo	Melong	18,076	1
	Moungo	Loum	57,228	2
North-West	Menchum	Fundong	21,914	1
	Mezam	Bamenda	67,184	1
West	Bamoun	Foumban	39,425	1
	Haut-Nkam	Bafang	26,660	1
	La Mifi	Bafoussam	62,239	2

APPENDICES 5-7 SURVEY ANALYSIS

APPENDIX 5 ESTIMATES OF MEAN PREVALENCE RATES FOR UNDERNUTRITION

Prevalence results from this sample survey are estimates of the true prevalence rates. The mean prevalence rate plus or minus a given value show the interval for which there is 95% confidence that the true prevalence rate will fall within the total range. This interval is derived from the standard error of mean values for each group of thirty children who are measured in a selected enumeration area or site.

The statistical formula for computing the 95% confidence interval for the true prevalence rate of a stratum or ecological area is based on a calculation of the standard error:

$$\text{Standard Error (S.E.)} = \frac{s_h}{\sqrt{n_h}}$$

(NOTE: The confidence interval includes $\pm$ 2 S.E.)

$$\text{where } s_h = \sqrt{\frac{\Sigma (x - \bar{x}_h)^2}{n_h - 1}}$$

s_h = Standard deviation of mean values of prevalence rates for groups of thirty children from selected enumeration areas.

and n_h = Number of enumeration areas (sites) in the stratum.

Σ = Summation is meant to be over the sites within s strata .

x = Prevalence rate determined from thirty children within a site.

$\bar{x}_h$ = The mean prevalence rate for the sum of all EAs in a stratum.

h = Stratum number.

This estimate is based on a probability proportion sample chosen with replacement. Our sample was selected without replacement, so this is a conservative estimate of the Standard Error (61).

The standard error of prevalence rates for combinations of strata such as for the whole of Cameroon is estimated by:

$$SE^2 (\bar{x}_{st}) = \sum_{h=1}^{L} \frac{N_h^2}{N^2} \frac{s^2_h}{n_h}$$

where L is the number of strata

N_h is the population of the hth stratum

N is the total population of the L strata $N = \sum_1^L N_h$

s^2_h is the variance of the prevalence rates of the n_h sites.

$\bar{x}_{st} = \sum_1^L \frac{N_h}{N} \bar{x}_h$

The 95% confidence interval for the true prevalence for the population of Cameroonian children is

$\bar{x}_{st}$ +/- 2.0 S.E. ($\bar{x}_{st}$).

In table 26, page 92 for example, 18.8% of the children in the Central South Province were estimated to have chronic undernutrition. Based on the sample, the true prevalence rate was 18.8% +/- 3.2%, i.e. 15.6% to 22.0%. This range (15.6 to 22.0%) is the 95% confidence interval of the true prevalence rates for this measure.

APPENDIX 6 COMPARISONS OF PREVALENCE ESTIMATES FOR UNDERNUTRITION-BY AREAS

Statistically significant differences of prevalence estimates of nutritional status comparing certain parts of Cameroon are examined in this section. The formula for determining a 95% confidence interval for the difference is:

$$\ell_1 = (\bar{x}_a - \bar{x}_b) - 2\sqrt{SE_a^2 + SE_b^2} \text{ and}$$

$$\ell_2 = (\bar{x}_a - \bar{x}_b) + 2\sqrt{SE_a^2 + SE_b^2}$$

where:

$\bar{x}_a$ = the mean prevalence rate for area "a"
$\bar{x}_b$ = the mean prevalence rate for area "b"
SE_a^2 = the standard error of mean prevalence estimate for "a"
SE_b^2 = the standard error of mean prevalence estimate for "b"

If the range from the lower to the upper limit does not include zero, then the difference between the mean prevalence rates ($\bar{x}_a$ and $\bar{x}_b$) is statistically different from zero at the 0.05 level.

Table 25, page 90 compares the prevalence estimates between provinces. For example, there was no statistical difference between the North and West Provinces with regards to the prevalence of underweight, using the data from table 25, page 90. In this example,

$$\ell_1 = (27.2 - 22.0) - 2\sqrt{(2.25)^2 + (2.9)^2}$$

$$= 5.2 - 7.3 = -2.1$$

and $\ell_2 = 5.2 + 7.3 = 12.5$

The range -2.1 to 12.5 includes zero, therefore the difference between the mean prevalence rates (27.2 and 22.0%) is <u>not</u> statistically different from zero at the 0.05 level. In this example, the mean difference in rates was 5.2%, but the range was -2.1 to +12.5.

An example showing a statistically significant difference from zero was the difference between the underweight prevalence for the North (27.2%) and Yaounde (8.3%) of 18.9%. The range of this difference at the 95% confidence interval using the ℓ_1 and ℓ_2 formula above, was 18.9 +/- 5.3%; i.e. 13.6 to 24.2%, a relatively large difference.

In summary, allowance must be made for the sample variability of the estimate of the true difference in prevalence rates. Accordingly, the data are given as intervals rather than single point estimates. In effect, we are 95% confident that the intervals presented (estimate +/- 2 S.E.) will contain the true prevalence difference.

APPENDIX 7 AGE CATEGORIZATION

The following age categorizations were made for the National Center for Health Statistics (NCHS) when the reference data were prepared:

Range	Category
0 to 0.01 yr	First week
0.04 to 0.12 yr	1 month
0.13 to 0.37 yr	3 months
0.31 to 0.62 yr	6 months
0.63 to 0.87 yr	9 months
0.88 to 1.12 yrs	12 months
1.25 to 1.75 yrs	18 months
1.75 to 2.25 yrs	24 months
2.25 to 2.75 yrs	30 months
2.75 to 3.25 yrs	36 months
3.25 to 3.75 yrs	42 months
3.75 to 4.25 yrs	48 months
4.25 to 4.75 yrs	54 months
4.75 to 5.25 yrs	60 months

It should be noted that age categorisation was based on a central month (e.g. for 3 months it was 0.25 ± 0.12 yr) rather than month completed.

From this basic data, spline curves by computer were completed, so that the reference anthropometric measure by exact month was obtained.

Based on the central month categorization, it was decided in concert with the Cameroon representatives to present the reference anthropometric data according to the central month categorisation. At the same time, the anthropometric indices were determined by the completed month method so that any differences could be examined. Such differences were in fact minor, and even these were primarily in children aged less than 6 months.

Other than the determination of anthropometric measures, all parameters with age, were based on the completed month category (i.e. 6 months = 6.0-6.9 months) rather than the central month (i.e. 6 months = 5.5-6.4 months).

APPENDICES 8,9

APPENDICES 8-9. ANTHROPOMETRIC REFERENCE DATA

APPENDIX 8 ANTHROPOMETRIC STANDARDS FOR REFERENCE POPULATIONS

Data from reference populations are used throughout the world to indicate whether a subject, usually a child, has normal anthropometric measurements such as weight or height. The reference median value is a basis of comparison between the child studied and that of the reference population.

The result is usually presented in the form of percentages (19). For example, a child's weight has a value that is a percentage of the median weight for children of the same age from the reference population This result is expressed as a "percentage weight-for-age." In the same way, percentages of other measures can be expressed such as "percentage height-for-age." The percentage weight-for-height is the ratio of the weight of the child with that of the median weight of reference children who are the same height.

Requirements for reference data include (35):

1. A large and valid sample, representative of a well defined group.
2. Relatively recent reference data.
3. Adequate measuring techniques.

If the reference population is from an industrialized country and is characterized by reasonably adequate health and nutrition care, then it might indicate a median level of a measure near which the risk of morbidity and mortality related to undernutrition is relatively low. This is one basis for the "Road to Health" weight charts used throughout the world, where a continuing upper level of the "safe" weight range is based on a reference median (31).

Such a level is neither ideal nor is it necessarily a "standard" that a population would be expected to achieve with improved health and nutrition status. Within the country itself, there is usually an upper socio-economic group which can indicate to some extent the potential

growth and tissue bulk of the rest of the country. This assumes similar racial groups are compared. A perspective may thus be achieved by comparing the reference median such as from the USA, a Cameroon optimum and the rest of the Cameroon population (see p. 266).

No reference data are available from Cameroon. However, studies in West Africa, such as in Ibadan (28) show that young children of families attending the University have similar measurements of weight and height to American children. Habicht presents evidence from studies in less developed countries that the difference in growth of preschool children associated with social class and environment are many times related to ethnic factors alone (27). Recent results of the International Biological Program indicate that genotype differences in growth perhaps do not exist between Africans and Europeans (62), strengthening the evidence that environmental factors such as health and nutrition, are all important in growth.

Reference data for height and weight for this survey were derived from large, representative studies recently completed in the USA. This was recommended by the National Academy of Sciences (NAS) Committee on Nutrition Advisory to the Center for Disease Control, USA in 1974. The reference populations included children up to 24 months from middle to upper socio-economic status families and those aged 2-6 years from a nation-wide study in the USA and were more recently compiled by the National Center for Health Statistics, USA (1).

These data are similar but not identical to that recommended by WHO using the "Boston" reference population compiled 30 years ago (19). Comparisons of results for this survey with others using the Boston references should take into account the differences.

Reference data for arm circumference and fatfold measures was derived from the Ten State Survey performed in the USA in the late 1960's and the results prepared by the Center of Disease Control, Atlanta, Georgia, USA.

Using the reference data, on what basis can an index for undernutrition be derived? For practical purposes, it should indicate a level below which an individual or population is at serious risk of ill health. Delayed mental development and reduced potential for learning also have been implicated as factors related to this low nutritional status (63).

The reference data values for all the anthropometric indices used on the survey are tabulated in Appendix 9. The "cut-off points" used to determine the type of undernutrition are also presented for each index. For purposes of simplification, the weight-for-height and arm circumference-for-height indices have sexes combined as there is little difference in reference values between sexes.

APPENDIX 9

EFERENCE ANTHROPOMETRY DATA ACCORDING TO AGE AND SEX FOR HEIGHT AND WEIGHT

Age in Months	Height (cm) Boys 100%	Height (cm) Boys 90%	Height (cm) Girls 100%	Height (cm) Girls 90%	Weight (kg) Boys 100%	Weight (kg) Boys 80%	Weight (kg) Girls 100%	Weight (kg) Girls 80%
0	50.5	45.5	49.9	44.9	3.3	2.6	3.2	2.6
1	54.6	49.1	53.5	48.1	4.3	3.4	4.0	3.2
2	58.1	52.3	56.8	51.1	5.2	4.2	4.7	3.8
3	61.1	55.0	59.5	53.6	6.0	4.8	5.4	4.3
4	63.7	57.3	62.0	55.8	6.7	5.4	6.0	4.8
5	65.9	59.3	64.1	57.7	7.3	5.8	6.7	5.4
6	67.8	61.0	65.9	59.3	7.8	6.2	7.2	5.8
7	69.5	62.6	67.6	60.8	8.3	6.6	7.7	6.2
8	71.0	63.9	69.1	62.2	8.8	7.0	8.2	6.6
9	72.3	65.1	70.4	63.4	9.2	7.4	8.6	6.9
10	73.6	66.2	71.8	64.6	9.5	7.6	8.9	7.1
11	74.9	67.4	73.1	65.8	9.9	7.9	9.2	7.4
12	76.1	68.5	74.3	66.9	10.2	8.2	9.5	7.6
13	77.2	69.5	75.5	68.0	10.4	8.4	9.8	7.8
14	78.3	70.5	76.7	69.0	10.7	8.6	10.0	8.0
15	79.4	71.5	77.8	70.0	10.9	8.7	10.2	8.2
16	80.4	72.4	78.9	71.0	11.1	8.9	10.4	8.3
17	81.4	73.3	79.9	71.9	11.3	9.0	10.6	8.5
18	82.4	74.2	80.9	72.8	11.5	9.2	10.8	8.6
19	83.3	75.0	81.9	73.7	11.7	9.4	11.0	8.8
20	84.2	75.8	82.9	74.6	11.8	9.5	11.2	9.0
21	85.1	76.6	83.8	75.4	12.0	9.6	11.4	9.1
22	86.0	77.4	84.7	76.2	12.2	9.8	11.5	9.2
23	86.8	78.1	85.6	77.0	12.4	9.9	11.7	9.4
24*	85.6	77.0	85.7	77.1	12.3	9.8	11.8	9.4
25	86.4	77.8	86.4	77.8	12.5	10.0	12.0	9.6
26	87.2	78.5	87.2	78.5	12.7	10.2	12.2	9.8
27	88.1	79.3	87.9	79.1	12.9	10.3	12.4	9.9
28	88.9	80.0	88.6	79.7	13.1	10.5	12.6	10.1
29	89.6	80.6	89.3	80.4	13.3	10.6	12.8	10.2
30	90.4	81.4	90.0	81.0	13.5	10.8	13.0	10.4
31	91.2	82.1	90.7	81.6	13.7	11.0	13.2	10.6
32	92.0	82.8	91.4	82.3	13.9	11.1	13.4	10.7
33	92.7	83.4	92.1	82.9	14.1	11.3	13.6	10.9
34	93.5	84.2	92.7	83.4	14.3	11.4	13.8	11.0
35	94.2	84.8	93.4	84.1	14.4	11.5	13.9	11.1

APPENDIX 9 (Continued)

Age in Months	Height (cm) Boys 100%	Height (cm) Boys 90%	Height (cm) Girls 100%	Height (cm) Girls 90%	Weight (kg) Boys 100%	Weight (kg) Boys 80%	Weight (kg) Girls 100%	Weight (kg) Girls 80%
36	94.9	85.4	94.1	84.7	14.6	11.7	14.1	11.3
37	95.6	86.0	94.7	85.2	14.8	11.8	14.3	11.4
38	96.3	86.7	95.4	85.9	15.0	12.0	14.4	11.5
39	97.0	87.3	96.0	86.4	15.2	12.2	14.6	11.7
40	97.7	88.0	96.7	87.0	15.3	12.2	14.8	11.8
41	98.4	88.6	97.3	87.6	15.5	12.4	14.9	11.9
42	99.1	89.2	97.9	88.1	15.7	12.6	15.1	12.1
43	99.7	89.7	98.5	88.7	15.8	12.6	15.2	12.2
44	100.4	90.4	99.2	89.3	16.0	12.8	15.4	12.3
45	101.0	90.9	99.8	89.8	16.2	13.0	15.5	12.4
46	101.7	91.5	100.4	90.4	16.4	13.1	15.7	12.5
47	102.3	92.1	101.0	90.9	16.5	13.2	15.8	12.6
48	102.9	92.6	101.6	91.4	16.7	13.4	16.0	12.8
49	103.6	93.2	102.2	92.0	16.9	13.5	16.1	12.9
50	104.2	93.8	102.7	92.4	17.0	13.6	16.2	13.0
51	104.8	94.3	103.3	93.0	17.2	13.8	16.4	13.1
52	105.4	94.9	103.9	93.5	17.4	13.9	16.5	13.2
53	106.0	95.4	104.5	94.1	17.5	14.0	16.7	13.4
54	106.6	95.9	105.0	94.5	17.7	14.2	16.8	13.4
55	107.1	96.4	105.6	95.0	17.9	14.3	17.0	13.6
56	107.7	97.0	106.2	95.6	18.0	14.4	17.1	13.7
57	108.3	97.5	106.7	96.0	18.2	14.6	17.2	13.8
58	108.8	98.0	107.3	96.6	18.3	14.6	17.4	13.9
59	109.4	98.5	107.8	97.0	18.5	14.8	17.5	14.0

Note: Reference data up to 23 months taken for length; data 24 months and above taken for height

APPENDIX 9 (Continued)

REFERENCE ANTHROPOMETRIC DATA ACCORDING TO SEX FOR WEIGHT FOR HEIGHT AND ARM CIRCUMFERENCE FOR HEIGHT

(Combined Sexes)

	Weight (kgs)		Arm Circ. (cms)	
Height/Length (cms)	100% Ref.	80% Ref.	100% Ref.	82.5% Ref.
48			10.6	8.7
49	3.3	2.6	10.8	8.9
50	3.4	2.7	11.0	9.1
51	3.5	2.8	11.2	9.2
52	3.7	3.0	11.4	9.4
53	3.9	3.1	11.6	9.6
54	4.1	3.3	11.8	9.7
55	4.3	3.4	12.0	9.9
56	4.6	3.7	12.2	10.1
57	4.8	3.8	12.4	10.2
58	5.1	4.1	12.6	10.4
59	5.4	4.3	12.8	10.6
60	5.6	4.5	13.0	10.7
61	5.9	4.7	13.2	10.9
62	6.2	5.0	13.4	11.1
63	6.5	5.2	13.6	11.2
64	6.8	5.4	13.8	11.4
65	7.1	5.7	14.0	11.6
66	7.4	5.9	14.1	11.6
67	7.6	6.1	14.2	11.7
68	7.9	6.3	14.3	11.8
69	8.2	6.6	14.4	11.9
70	8.5	6.8	14.5	12.0
71	8.7	7.0	14.6	12.0
72	9.0	7.2	14.7	12.1
73	9.2	7.4	14.8	12.2
74	9.5	7.6	14.9	12.3

APPENDIX 9 (Continued)

(Combined Sexes)

Height/Length (cms)	Weight (kgs) 100% Ref.	Weight (kgs) 80% Ref.	Arm Circ. (cms) 100% Ref.	Arm Circ. (cms) 82.5% Ref.
75	9.7	7.8	15.0	12.4
76	9.9	7.9	15.1	12.5
77	10.2	8.1	15.2	12.5
78	10.4	8.3	15.2	12.5
79	10.6	8.5	15.3	12.6
80	10.8	8.6	15.4	12.7
81	11.0	8.8	15.4	12.7
82	11.2	8.9	15.5	12.8
83	11.4	9.1	15.5	12.8
84	11.6	9.3	15.6	12.9
85	11.8	9.4	15.6	12.9
86	12.0	9.6	15.7	13.0
87	12.1	9.7	15.7	13.0
88	12.4	9.9	15.7	13.0
89	12.6	10.1	15.8	13.0
90	12.8	10.3	15.8	13.0
91	13.0	10.4	15.8	13.0
92	13.2	10.6	15.9	13.1
93	13.5	10.8	15.9	13.1
94	13.7	11.0	16.0	13.2
95	14.0	11.2	16.0	13.2
96	14.2	11.4	16.0	13.2
97	14.5	11.6	16.1	13.3
98	14.8	11.8	16.1	13.3
99	15.1	12.1	16.2	13.4
100	15.4	12.3	16.2	13.4
101	15.7	12.5	16.2	13.4
102	16.0	12.8	16.3	13.4
103	16.3	13.0	16.3	13.4
104	16.6	13.3	16.4	13.5

APPENDIX 9 (Continued)

(Combined Sexes)

Height/Length (cms)	Weight (kgs) 100% Ref.	Weight (kgs) 80% Ref.	Arm Circ. (cms) 100% Ref.	Arm Circ. (cms) 82.5% Ref.
105	16.9	13.5	16.4	13.5
106	17.2	13.8	16.5	13.6
107	17.5	14.0	16.5	13.6
108	17.8	14.2	16.6	13.7
109	18.1	14.5	16.7	13.8
110	18.4	14.7	16.7	13.8

APPENDIX 9 (Continued)

REFERENCE ANTHROPOMETRIC DATA ACCORDING TO AGE AND SEX
FOR ARM CIRCUMFERENCE AND TRICEPS FAT FOLD

	Arm Circumference (cms)				Triceps Fat Fold (mms)			
	100% Ref.			82.5% Ref.	100% Ref.	60% Ref.	100% Ref.	60% Ref.
Age in Months	Males	Females	Both Sexes	Both Sexes	Males		Females	
0	10.2	10.0	10.1	8.3	7.2	4.3	7.6	4.6
1	11.3	11.1	11.2	9.2	8.4	5.0	8.3	5.0
2	12.2	12.1	12.1	10.0	9.5	5.7	9.0	5.4
3	13.0	12.9	12.9	10.6	10.3	6.2	9.6	5.8
4	13.7	13.6	13.6	11.2	11.0	6.6	10.1	6.1
5	14.2	14.2	14.2	11.7	11.5	6.9	10.5	6.3
6	14.7	14.7	14.7	12.1	11.8	7.1	10.9	6.5
7	15.1	15.1	15.1	12.5	12.0	7.2	11.1	6.7
8	15.4	15.4	15.4	12.7	12.1	7.3	11.3	6.8
9	15.6	15.6	15.6	12.9	12.2	7.3	11.4	6.8
10	15.8	15.8	15.8	13.0	12.2	7.3	11.5	6.9
11	15.9	15.9	15.9	13.1	12.1	7.3	11.6	7.0
12	16.0	16.0	16.0	13.2	12.0	7.2	11.6	7.0
13	16.0	16.0	16.0	13.2	11.9	7.1	11.6	7.0
14	16.1	16.0	16.0	13.2	11.8	7.1	11.6	7.0
15	16.1	16.0	16.0	13.2	11.7	7.0	11.6	7.0
16	16.1	16.0	16.0	13.2	11.6	7.0	11.6	7.0
17	16.2	16.0	16.1	13.3	11.5	6.9	11.6	7.0
18	16.2	16.0	16.1	13.3	11.4	6.8	11.6	7.0
19	16.2	16.1	16.1	13.3	11.3	6.8	11.6	7.0
20	16.2	16.1	16.1	13.3	11.2	6.7	11.6	7.0
21	16.2	16.1	16.1	13.3	11.1	6.7	11.5	6.9
22	16.3	16.1	16.2	13.4	11.0	6.6	11.5	6.9
23	16.3	16.1	16.2	13.4	10.9	6.5	11.5	6.9
24	16.3	16.1	16.2	13.4	10.8	6.5	11.5	6.9
25	16.3	16.1	16.2	13.4	10.7	6.4	11.5	6.9
26	16.3	16.1	16.2	13.4	10.6	6.4	11.4	6.8
27	16.4	16.2	16.3	13.4	10.6	6.4	11.4	6.8
28	16.4	16.2	16.3	13.4	10.5	6.3	11.4	6.8
29	16.4	16.2	16.3	13.4	10.4	6.2	11.3	6.8
30	16.4	16.2	16.3	13.4	10.3	6.2	11.3	6.8
31	16.4	16.2	16.3	13.4	10.2	6.1	11.3	6.8
32	16.4	16.2	16.3	13.4	10.1	6.1	11.2	6.7

APPENDIX 9 (Continued)

	Arm Circumference (cms)				Triceps Fat Fold (mms)			
	100% Ref.			82.5% Ref.	100% Ref.	60% Ref.	100% Ref.	60% Ref.
Age in Months	Males	Females	Both Sexes	Both Sexes	Males		Females	
33	16.4	16.2	16.3	13.4	10.1	6.1	11.2	6.7
34	16.4	16.3	16.4	13.5	10.0	6.0	11.2	6.7
35	16.5	16.3	16.4	13.5	10.0	6.0	11.1	6.7
36	16.5	16.3	16.4	13.5	9.9	5.9	11.1	6.7
37	16.5	16.3	16.4	13.5	9.8	5.9	11.1	6.7
38	16.5	16.3	16.4	13.5	9.7	5.8	11.0	6.6
39	16.5	16.4	16.4	13.5	9.7	5.8	11.0	6.6
40	16.5	16.4	16.4	13.5	9.6	5.8	11.0	6.6
41	16.5	16.4	16.5	13.6	9.6	5.8	10.9	6.5
42	16.5	16.4	16.5	13.6	9.5	5.7	10.9	6.5
43	16.5	16.5	16.5	13.6	9.4	5.6	10.8	6.5
44	16.6	16.5	16.5	13.6	9.4	5.6	10.8	6.5
45	16.6	16.5	16.5	13.6	9.3	5.6	10.7	6.4
46	16.6	16.5	16.6	13.7	9.3	5.6	10.7	6.4
47	16.6	16.6	16.6	13.7	9.2	5.5	10.7	6.4
48	16.6	16.6	16.6	13.7	9.2	5.5	10.6	6.4
49	16.6	16.6	16.6	13.7	9.1	5.5	10.6	6.4
50	16.6	16.7	16.6	13.7	9.1	5.5	10.6	6.4
51	16.7	16.7	16.7	13.8	9.0	5.4	10.5	6.3
52	16.7	16.7	16.7	13.8	9.0	5.4	10.5	6.3
53	16.7	16.7	16.7	13.8	8.9	5.3	10.5	6.3
54	16.7	16.8	16.7	13.8	8.9	5.3	10.4	6.2
55	16.7	16.8	16.7	13.8	8.8	5.3	10.4	6.2
56	16.7	16.8	16.8	13.9	8.8	5.3	10.3	6.2
57	16.8	16.9	16.8	13.9	8.7	5.2	10.3	6.2
58	16.8	16.9	16.8	13.9	8.7	5.2	10.2	6.1
59	16.8	16.9	16.8	13.9	8.6	5.2	10.2	6.1

APPENDIX 10 FORM I

UNITED REPUBLIC OF CAMEROON — Peace-Work-Fatherland

NATIONAL NUTRITION SURVEY OF CAMEROON — FORM I — CHILDREN AGED 3 to 59 MONTHS

ZONE (1)(2) | ECOLOGY (3) | SITE No. (4)(5)(6) | 1 U 2 R (7) | VILLAGE (8)(9) | TEAM (10)(11) | CHILD No. (12)(13) | H'HOLD No. (14)(15) | FIRST CHILD MEASURED 1 Yes 2 No (16)

1 (17) NAME H'HOLD HEAD _____
OCCUPN _____ (18) (19)
NAME OF CHILD _____ 1 M 2 F (20) SEX

PERSON INTERVIEWED (21)
1 Mother
2 Father
3 Grandmt
4 Other _____

WHO TAKES CARE OF THE CHILD? (22) _____
1 Mother
2 Father
3 Grandmother
4 Brother/Sister
5 Other spouse
6 Relative
7 Other

BIRTH ORDER (23)(24) | HOUSEHOLD SIZE (25)(26)

DATE — DAY (27)(28) MONTH (29)(30) YEAR (31)(32)
INTERVIEW
BIRTH (33)(34) (35)(36) (37)(38)
AGE IN MONTHS (39) (40)

SOURCE OF BIRTHDATE
(41) Birth Record
(42) Clinic Record
(43) Bapts. Record
(44) Calend. Events
(45) Declaration
(46) Other _____

BIRTHPLACE (47)
1 Hospital/Clinic
2 Home (with TBA)
3 Home (w'out TBA)
4 Unknown
5 Other _____

(48) MOTHER
1 Present
2 Absent

(49) AGE
1 20 or -
2 21 - 40
3 41 or more

ABLE TO READ
(50) English
(51) French
(52) Nil
(53) Unknown
(54) Other _____

DEATHS IN CHILDREN DURING PAST 12 MONTHS
Nº Born (55)
Nº Under 5yr died (56)
Age of Death (57)(58) (59)(60) (61)(62)

MARITAL STATUS
1 Monogamous
2 Polygamous
3 Not Married (63)

OCCUPATION (64-65)
EARNS AT MARKET (67) 1 Yes 2 No 3 Unk
Nº OF TIMES (66)
TOTAL MONEY (68)(69)(70)(71)

2 (17) (3-24 MTHS) 1 Yes 2 No (18)

SOURCE OF MILK
(19) Breast
(20) Artificial
(21) Fresh Milk
(22) No Milk

BOTTLE FED
1 Yes
2 No
3 Unk. (23)
CONDITION (24)
1 Sterilized
2 Clean
3 Dirty
4 Unknown

COMMON FOOD (25)
1 Yes
2 No
3 Unk.

FOOD SPECIALLY PREPARED (26)
1 Yes
2 No
3 Unk.

CLINICAL — CHILD

EDEMA (27)
1 Yes — 1 Skin
2 No — 2 Hair
3 Unk. — 3 Unk.
(28-30) (31)(32)

MOTHER

GOITER (33)
1 Seen Far
2 Seen Close
3 Not Seen
4 Unknown

SALIVA PAPER TEST (34)
1 Blue
2 White
3 Unknown
4 Test Not Done

CHILDREN UNDER 5 YRS WITH MEASLES DURING PAST YEAR
Nº Having Measles (35)
Nº Dying with Measles (36)

MEASUREMENT — CHILD

WEIGHT (37)(38).(39) Kg.
ARM CIRC. (44)(45).(46) Cm.
LENGTH/HEIGHT (40)(41)(42).(43) Cm.
FATFOLD (47)(48).(49) Mm.
X-RAY STRIP TEST (50) 1 Green 2 Yellow 3 Red

MOTHER

ARM CIRC. (51)(52).(53) Cm. FATFOLD (54)(55).(56) Mm. HEIGHT (57)(58)(59).(60) Cm.

5th (61) 1 Yes 2 No — BLOOD TAKEN (62) 1 Yes 2 No 3 Unknown

HB % (63)(64).(65) Gm%. HB GENOTYPE (66)

FORM VERIFIED BY — SURVEYOR — SUPERVISOR — OTHER

IMMEDIATELY
AT THE END OF THE DAY
AT THE END OF THE SITE

COMMENTARY (67) 1 Yes 2 No

APPENDICES 10-20

METHODS AND PROCEDURES

APPENDIX 11 QUESTIONS FORM I

Introductory Statement

"We are the representatives of the Ministry of Health. Because the Ministry requires important information about the health and nutrition of the people of Cameroon, we are measuring all available young children and their mothers. Would you allow us to do this?"

Questions

- "Who is the household head?"
- "What is the usual occupation of the household head?"
- "What is the name of this child?"
- "What is the sex of this child?"
- "What is your relationship to this child?"
- "Who usually feeds and cares for this child?"
- "How many children did you give birth to before _____ (child's name), including those children who died?"
- "How many people usually eat meals prepared in this household, including all children?"
- "When was this child born? Do you have a birth record?" If "yes", "Can you show it to us?" If there is no verifiable record (check the date of issue and birth date), use the calendar of local events, and ask at least the following:
    - "How many yearly crops took place since _____ was born?"
    - "What kind of work were you doing out in the fields when _____ was born?"
    - "Was the child born the same year as _____?"
    - "Was the child born before _____?"
    - "Was the child born after _____?"
- "Where was _____ born?" If the child was born at home, "Did anyone help with the child's birth?"

Questions to the mother, when present

- "How old are you?"
- Read this card and answer what is written:-

  Etes-vous mariees?
  How old are you?
- "What language can you read?"
- "Are you married?" If yes, "Does your husband have other wives?"

- "Since last year, have any children been born to you ? Since last year did any of your children die ?"
  If "no": "Not even a Baby ?"
  If "yes": "How old was the child when he died ?"
- "What is your usual occupation ?"
  - "Did you sell something at the market last week ?"
  - "If "yes" "How often did you go to the market last week ?"
  - "How much money did you get each time ?"
- "Is this a child from 3 to 24 months of age ?" Check with age estimation.
- "Was _____(name of child) breast fed yesterday? Get any milk?"
  If "yes": What kind of milk ?
- "Did _____(name of child) drink another kind of milk yesterday ?"
- If "yes":"What sort of milk ?" Probe for all types.
- "Does _____(name of child) take food from a feeding bottle ?"
  If "yes":"Show me the bottle. How do you prepare the bottle for your baby?"
- "Did _____(name of child) eat any of the food prepared for the family yesterday?"
- "Did you prepare any food especially for this child yesterday ?"
- "Since last year, did you have any children sick from measles?"
  If "yes":"How many children caught them ? Did you have any children who died from measles since last year ?"

APPENDIX 12 FORM 2

UNITED REPUBLIC OF CAMEROON
Peace - Work - Fatherland

NATIONAL NUTRITION SURVEY OF CAMEROON FORM 2 CHILDREN 3-24 MONTHS

3 (17)	SITE No. (18)(19)(20)	CHILD No. (21) (22)	CHILD AGE (23) (24)	CHILD NAME _____

TYPE OF HOUSE
1 ☐ Traditional
2 ☐ Improved
3 ☐ Semi-strong
4 ☐ Strong
(25)

METHOD OF COOKING
1 ☐ Wood (Open Fire)
2 ☐ Coal
3 ☐ Kerosine
4 ☐ Gas
5 ☐ Electricity
(26)

	No.	1 0	2 1	3 2	4 3-4	5 5-10	6 10+	7 Unk.
(27)	CATTLE							
(28)	SHEEP							
(29)	GOATS							
(30)	PIGS							
(31)	POULTRY							

FAMILY SELLS CASH CROPS
1 ☐ Yes
2 ☐ No

WATER SOURCE
1 ☐ River, stream, unprotected source
2 ☐ Unprotected well or cistern
3 ☐ Protected source
4 ☐ Protected well, government-provided faucet, communal well or pump
5 ☐ Private faucet
6 ☐ Other _____

DISTANCE
1 ☐ <5 min.
2 ☐ 5-29 min.
3 ☐ 30-60 min.
4 ☐ 1-3 hours
5 ☐ More than ½ day
6 ☐ Unk.
(34)

DURING THE PAST WEEK, THE CHILD:

WAS SICK (Not capable of playing, eating)
1 ☐ Yes 2 ☐ No 3 ☐ Unk. (35)

HAD DIARRHEA (4+ stools during 2 days)
1 ☐ Yes 2 ☐ No 3 ☐ Unk. (36)

HAD A FEVER (More than 2 days)
1 ☐ Yes 2 ☐ No 3 ☐ Unk. (37)

No. TIMES BREAST-FED YESTERDAY
1 ☐ 0
2 ☐ 1
3 ☐ 2-4
4 ☐ On demand day
5 ☐ On demand night
6 ☐ Unk. (38)

PERSON WHO FED CHILD YESTERDAY
1 ☐ Mother
2 ☐ G'mother
3 ☐ Brothers/Sisters
4 ☐ Himself
5 ☐ Unk.
6 ☐ Other _____
(39)

ASK THE PERSON WHO FED THE CHILD YESTERDAY TO INDICATE ALL THAT THE CHILD ATE AND DRANK YESTERDAY FROM THE TIME HE WOKE UP UNTIL THE TIME HE WENT TO SLEEP (MARK WITH AN X) (40-91)

	CHILD	COMMENTS	MOTHER	COMMENTS
Cassava	(40)	... ...	(41)	... ...
Cassava Gruel	(42)		(43)	
Other Tubers	(44)	... ...	(45)	... ...
Plantain/Banana	(46)		(47)	
Corn/Corn Flour/Fritters ...	(48)	... ...	(49)	... ...
Corn Gruel	(50)		(51)	
Rice/Rice Flour	(52)	... ...	(53)	... ...
Rice Gruel	(54)		(55)	
Millet/Sorghum/Fritters ...	(56)	... ...	(57)	... ...
Millet Gruel	(58)		(59)	
Wheat/Bread/Fritters ...	(60)	... ...	(61)	... ...
Groundnuts/ Bambara/ Peas/Fritters	(62)		(63)	
Squash Seeds/Sesame	(64)	... ...	(65)	... ...
Dried Beans/Fritters	(66)		(67)	
Green Leaves	(68)	... ...	(69)	... ...
Dried or Fresh Fish	(70)		(71)	
All kinds of Meat	(72)	... ...	(73)	... ...
Eggs	(74)		(75)	
Mother's (breast) milk ...	(76)	... ...	(77)	... ...
Milk or Milk derivatives	(78)		(79)	
Baby Food (Guigoz, Cerelac) ...	(80)	... ...	(81)	... ...
Fruits/Vegetables	(82)		(83)	
Red pepper	(84)	... ...	(85)	... ...
Palm Oil/Palm Nuts	(86)		(87)	
Other oils/Butter	(88)	... ...	(89)	... ...
Sugar/Beverages	(90)		(91)	
Other	(92)	... ...	(93)	... ...

DIETS: CHILD (94) ☐ MOTHER (95) ☐ PERSON WHO FED THE CHILD (96) ☐
FIRST ADULT (97) ☐ HOUSEHOLD (98) ☐

APPENDIX 13 QUESTIONS FORM 2

First check that the age of the child (3-24 months) is appropriate for the form. After verifying the type of house,ask:

- "What method do you use to prepare the meals?"
- We are asking the following only to have information on your food reserve and not for any other purpose:

  "Does your family keep animals?" If "yes": "How many?"
  "Does your family have any cattle?" If "yes": "How many?"
  "Does your family have any sheep?" If "yes": "How many?"
  "Does your family have any goats?" If "yes": "How many?"
  "Does your family have any pigs?" If "yes": "How many?"
  "Does your family have any poultry?" If "yes": "How many?"
- "Did the family sell any cash crop last year?" If "yes": "Which ones?"
- "Where do you usually draw drinking water?"
- "How long does it take to bring water to your house?"
- "During the past week, was this child sick (Not able to play,eat)?"
  "During the past week, did this child have diarrhea (Watery stools, at least four times a day for at least two days)?"
  "During the past week, did this child have fever(for more than two days)?"
- "How many times did you breastfeed this child yesterday?"
- "Who fed this child yesterday?"

APPENDIX 14 FORM CLARIFICATION

The following are explanations of some items on the survey form.

FORM I

First Child Measure

The first child measured on the survey of each mother in a household was noted by marking "Yes". Any other children measured on the survey of the same mother in the same household had "No" crossed for this question. The same procedure was repeated for any other mothers in the household.

Milk Source

The term "fresh milk" refers to fresh cows' or goats' milk which has not been processed (e.g., homogenization or pasteurization) whereas "artificial" refers to any other milk, excluding breast milk.

Common Plate and Food Specially Prepared

These questions determine if on the day before the interview the child ate from food prepared for the family or had food prepared specially for him.

Edema

The extended question on hair and skin observations was eliminated from the survey because of standardization difficulties in training and problems of identifying these conditions in the field.

Goiter and Saliva Tests

The following explanations for Goiter and Saliva Tests are taken directly from the training manual.

Goiter (mother only)

Goiter is a swelling of part or all of the thyroid gland in the front and sides of the neck. The swelling moves upwards when the person swallows.

To identify goiter:

1. Stand one and a half meters in front of the mother. If an obvious swelling is seen mark "EVIDENT".
2. If not seen, look closely at the front of the neck. If a swelling is now seen, mark "SEEN CLOSE".
3. If no swelling is seen mark "NO".
4. If you are uncertain of a swelling mark "UNK".

Saliva Test (mother only)

Take one piece of the paper in the packet marked "SALIVA TEST" and have the mother put this paper in her mouth or place it in her mouth so that the paper is made wet with her saliva.

Remove the paper, hold it and count slowly up to 10.

At the end of this time look at the color of the paper. It will be a definite blue or not colored at all (white). Mark accordingly in the box. If you are not sure of the color mark "UNK" (unknown).

False positives can occur with cigarette smokers. These results were excluded from the description. The test was not done in the North where there were problems with the filter papers, nor was it done in Yaounde.

Verification Strip (Arm Circumference)

The Shakir Strip was made using clear sheets of X-ray film, cut into half centimeter widths. Lengthwise, from 0 cm to 12.5 cm was marked off and colored red, from 12.5 to 13.5 cm colored yellow and from 13.5 cm the strip was colored green. After measuring the arm circumference of the child with the strip, the result for color was marked in the Form I item, X-ray Strip Test. For interpretation of the measures, see pages 102-104 and pages 240 and 241.

FORM 2

Type of House: Observe the walls, the roof and the floors of the house where the family lives and classify the types of houses by the following categories:

TYPE OF HOUSE

1. Traditional

   walls: bark, matting, "poto-poto" (mixture of clay and straw)
   roof: matting, straw, earth
   floor: earth

2. Improved

   walls: bark, matting, wood frame filled in with poto-poto
   roof: aluminum sheet
   floor: earth

3. Semi-Concrete

   walls: wooden poles filled with mud and covered with cement
   roof: aluminum sheet
   floor: cement or mixture of mud and cement

4. Concrete

   walls: bricks, cement bricks
   roof: aluminum sheet, cement, tiles
   floor: cement or pavement

APPENDIX 15 ITEMS INVESTIGATED BUT NOT INCLUDED IN SURVEY

Vitamin A

At the request of GURC, a vitamin A specialist spend two weeks in Cameroon investigating whether a vitamin A problem existed in the country. After an investigation of the North, he concluded in his first report "...it is possible that pockets of vitamin A malnutrition exist, but in view of the lack of any clear indications in the preliminary assessments, it is not likely that vitamin A malnutrition is a significant problem in the United Republic of Cameroon. Therefore, I recommend that a vitamin A section NOT be included in the Cameroon National Nutrition Survey." (64) Based on the recommendation, there was no vitamin A segment in the survey.

APPENDIX 16 EMPLOYMENT CODES

1. Agricultural workers; forestry, fishermen, hunters, and like workers. Rice workers, cultivators, farm hands, lumberjacks, plantation workers from CDC, Sodecoton, Semry, and other large agricultural and livestock organizations.

2. Planters and Animal Raisers

   This is anyone who has cash crops (see Form II): cocoa, coffee, cotton, tobacco. . .or large food crop holdings (like corn, manioc, peanuts, bananas, palm oil).

   This equally concerns people owning/managing cows, goats, sheep, (again see Form II for holdings).

3. Workers; Non-Agricultural Laborers, Drivers of Transport Vehicles

   This includes: carpenters, masons, painters, miscellaneous laborers, transporters, cab drivers, mechanics (+apprentices), factory workers (such as the brewery, Sonel, print shops, Sosucam, CCC, Cicam, etc.); bakers, plumbers, dock workers, train conductors, ticket takers. . . also drivers of trains, buses, trucks, and cars.

4. Without Work/Looking For Work:

   Also code for Undetermined. This includes housewives, students, people declaring no activity, vagabonds and family help that are unsalaried.

5. Personnel of scientific professions, technical workers and related categories, people in the legislature, high level cadres in the public administration, directors and foremen of agricultural projects, administrative personnel and the like. Also: doctors (both diploma and traditional), engineers, teachers, shop foremen, sculptors, artists, accountants, economists, clergymen, jurists, lawyers, judges, bailors.

   Also: fonctionaires, prefets, sous prefets, mayors, secretaries, post heads.

   Also: Administrators and responsables of large agricultural projects and forestry operations (Sodecoton, Sosucam, CDC) or all like operations having laborers.

6. Sellers and Vendors

   Anyone in commercial operations both retail and wholesale. People working in shops; buyers of cash crops, insurance agents, real estate agents, "Buy Am Sell Am" people, independent tailors, gas station attendants, butchers.

7. Hotel workers; restaurant workers, cafe workers, house servants, <u>service</u>: managers, waiters in hotels or restaurants: bartenders, busboys, maids, cooks.

   <u>Also</u>: House maids, "boys", laundrymen, hair dressers/barbers, night guards, guides.

8. <u>Military and Police</u>

   Soldiers, gendarmes, police agents, messengers, prison guards, customs agents and firemen.

APPENDIX 17 : AGE ASSESSMENT

Date of birth is the most important piece of background information on the form. Be certain to take great care in assessing the child's age. Survey data which will be compared to anthropometric standards require highly accurate age information.

Question the mother, father or substitute several times about different birth records which may be available. Cross check answers given by re-questioning using other methods (e.g. calendar).

Methods of Age Assessment

The most valid birthdate information is obtained from records such as:

1. Birth Record - This is an official document recorded at the time of birth (e.g. birth certificate, baptismal certificate) and is the most reliable type of record.
2. This is a verifiable record from a clinic which contains the age of the child and was very often recorded some time after the date of birth.

If no such records are available, estimates of birth must be made by using the following:

1. Calendar - This is a calendar of events. Age can be determined if a child is born at the time of a particular event. Local events such as floods, elections, harvest, etc. are recorded in the appropriate boxes as follows:
   a. In the first column marked ANNUAL, mark in the box events next to the appropriate month which occur every year (e.g. planting season, harvest, rains, winter).

Example:	ANNUAL
May	rains
June	
July	
Aug.	

Sept. _____

Oct. ___harvest___

b. In the remaining columns record in the appropriate box when a special event took place.

Example:	1967	1968	1969
Aug.			Village Chief Died

2. Milk Teeth Count - The number of milk teeth plus six equals the child's age in months. Count the number of milk teeth if the child is approximately 36 months of age or less. This may be done by glancing in the child's mouth when the opportunity arises during the interview session. DO NOT FORCE THE CHILD'S MOUTH OPEN.

3. Other Records - This includes a broader, more general category such as written record kept by the parents.

4. Stated - the parent or caretaker states the birthdate (or age) of the child.

5. Sibling Age - This is a comparison of ages between the child and a brother or a sister.

Local Calendar of Events Example (p. 327)

Events which occur at each month of the year are indicated (Column 2 in the calendar). From column 3-8 are singular events which happened during the month of the year above. The facts must be known by everybody in the area.

The experience of the field shows that the calendar of events must be filled not only by the chief and/or his family, but also in cooperation with assistants, senior people and even possible teachers or students who know exactly the dates. In fact, the calendar is difficult to use alone in certain analphabetic localities, where the month and even the year divisions are not very sure, particularly for events which occurred several years ago. At least basic facts are often obtained and correct dates verified from other sources (e.g. reliable administrative or religious authorities).

PROVINCE: East

DEPARTMENT: Boumba-Ngoko

ARRONDISSMENT: Yokadouma

VILLAGE: PARNY

DATE: 01.28.1978

CALENDAR OF LOCAL EVENTS

ZONE	SITE	VILLAGE	TEAM
0 2	0 4 5	0 1	1 0

1	2	3	4	5	6	7	8
	ANNUAL	1973	1974	1975	1976	1977	1978
JAN	new year day						
FEB	YOUTH Day		many young men have been recruited to the armed Forces.				
March	EASTER			great famine after a tornado on the crops.		governor visit for a school litigation	
Ap			Parny school inauguration				
May	National Day	The village chief received a decoration at the national day		a harmful gorilla has been killed	chief daughter's marriage		
JUNE	School Exams						
JULY	School holidays			the former chief is deported with his family to Tchéliné		Prefet's visit	
AUG.				a pygmee woman gave birth to a monster			
Sept					Death of NKOI Antoine, student, one of the best of the village		
Oct.	School Reopening					Municipal Elections	
NOV.	All SAINTS' day						
Dec.	CHRISTMAS	a little goat with 2 horns has been born.					

APPENDIX 19 ANTHROPOMETRIC EQUIPMENT

Height or length of children was measured in centimeters, using a custom-made portable wooden board produced in Yaounde from a prototype made in UCLA.

Height of mothers was measured with the same board, using an extension piece fitted to the top of the board.

Weight of children was measured with a Salter Hanging Scale, calibrated in 0.1 kg graduations up to 25 kg.

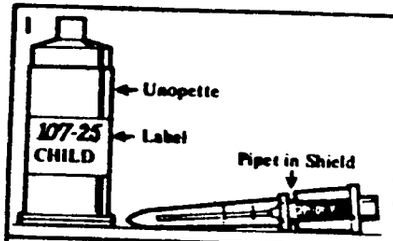
Left Mid-upper Arm Circumference was obtained with a Zerfas Insertion Tape and read to the nearest 0.1 cm. Arm Circumference was also categorised (Red,Yellow and Green), using a Shakir X-ray strip.

Triceps Fatfold was measured with a Holtain/Tanner-Whitehouse caliper at the mid-posterior point of the left upper arm.

APPENDIX 20

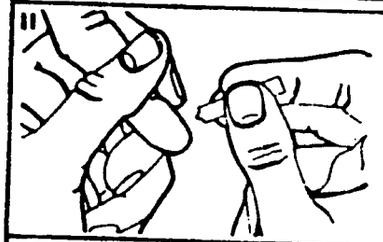
PROCEDURE FOR OBTAINING BLOOD SAMPLES (USING THE UNOPETTE SYSTEM)

I



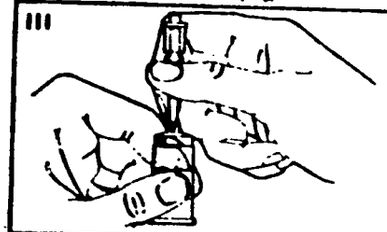
Take one unopette and pipet with shield from the plastic bag. On the unopette label write the sample site and individual ID code number of the child. Write "child" on the label *before* drawing blood on a child. Write "mother" on the label *before* drawing blood on a mother.

II



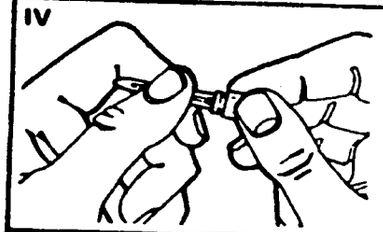
Clean the thumb of the child or the middle finger of the mother with an alcohol swab. Dry with a guaze sponge. Take the finger of the subject. Make a quick, but firm, jab to the fleshy part of the finger tip. Wipe away the first drop of blood with a dry sponge.

III



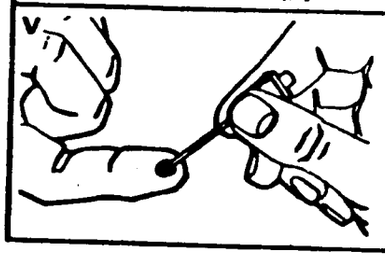
Use the shield containing the pipet to pierce the unopette seal.

IV



Remove the pipet from its shield.

V

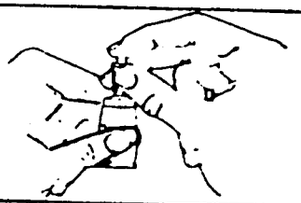


Holding the pipette slightly up from the horizontal plane, touch the pipet to, but not into, the blood droplets and allow the pipet to fill by capillary action. Wipe away any blood on the exterior of the pipet with a dry gauze sponge, being careful not to touch the pipet tip.

VI

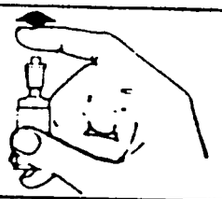
Firmly squeeze and hold the sides of the unopette with one hand.

VII



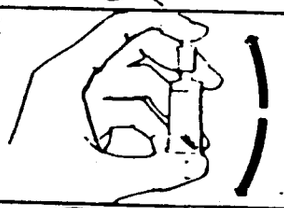
Carefully cover the pipet opening with a finger of the other hand. Then, carefully introduce the pipet into the unopette and seat it firmly.

VIII



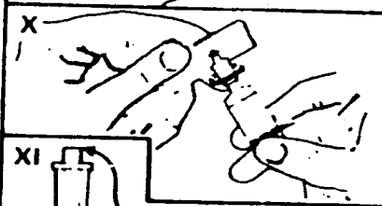
Release finger pressure from the unopette sides. Then remove your finger from the pipette opening. The blood will be drawn into the unopette. Squeeze the unopette, gently, several times to rinse out the pipet. Observe rinsing at eye level to avoid pipet overflow.

IX



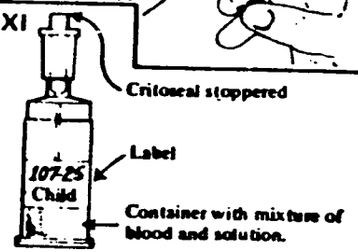
Placing your finger over the pipet opening invert the unopette several times to mix the blood and diluting solution.

X



After mixing, place Critoseal in the pipet opening to prevent leakage.

XI



Compress the finger puncture with a dry guaze pad and apply a bandaid. Make certain that the label has been filled out completely. Check the appropriate block on the survey form. Place the used labelled unopette into the plastic bag provided.

APPENDICES 21-24 ADDITIONAL SURVEY RESULTS

APPENDIX 21 DIETARY TABLES

a. Percentage Intake of Food Groups by Child and Adult - p. 331-336
(Child Ages 6-11 and 12-23 months)

Central South Province
East Province
North Province
South-West/Littoral Provinces
North-West/West Provinces
Yaounde/Douala

b. Percentage Intake of Food Groups by Child and Adult -p. 337-339
(Child Ages 3-5 months)

Central South and East Provinces
North and South-West/Littoral Provinces
North-West/West Provinces and Yaounde/Douala

c. Percentage Intake of Individual Foods by Child and Adult-p.340-351
(Child Ages 6-11 and 12-23 months)

Central South Province
East Province
North Province
South-West/Littoral Provinces
North-West/West Provinces
Yaounde/Douala

The first two series of dietary tables (a & b) indicate the percentage of children and adults consuming each food group. Those pertaining to the age groups 6-11 and 12-23 months have been presented in the bar diagrams in the report (Figures 13-19, pp 172-180). Because of low sample sizes (see page 165), the results for children aged 3-5 months were not detailed in the report.

The third series of tables (c) indicate the percentage of children and adults consuming individual foods.

In all tables:

Column 1 (CHILD) pertains to the percentage of children eating the food group (or individual food)

Column 2 (ADULT) pertains to the percentage of adults (those feeding the child) eating the food or group

Column 3 (FAMILY) pertains to that for the child and/or adult (representing the availability in the family)

Column 4 (CHILD/FAMILY RATIO) represents the ratio (expressed as a percentage) of the child to family percentage result (see pages 170 and 186)

The caption N refers to the Sample Size

PERCENTAGE INTAKE OF FOOD GROUPS BY CHILD AND ADULT

CENTRAL SOUTH PROVINCE

	Eaten By			Child-Family Ratio
	Child (1)	Adult (2)	Family** (3)	(4)
Child Aged 6-11 Months*				
Tubers	69	92	95	73
Cereals	47	50	63	75
Beans, Seeds, Nuts	47	72	77	61
DG Leafy Veg.	26	42	43	60
Meat, Fish, Eggs	33	77	80	41
Milk	94	0	94	100
Baby Food	10	0	10	100
Fruits & Veg.	32	46	50	64
Palm Oil/Other Oils	49	72	77	64

*N = 109

Child Aged 12-23 Months*				
Tubers	89	97	98	91
Cereals	59	56	64	92
Beans, Seeds, Nuts	74	80	84	88
DG Leafy Veg.	43	48	51	84
Meat, Fish, Eggs	69	74	78	88
Milk	46	1	46	100
Baby Food	2	0	2	(100)
Fruits & Veg.	56	54	59	95
Palm Oil/Other Oils	70	70	75	93

*N = 212

** Family refers to child and/or adult.

*IN THIS AND FOLLOWING TABLES "N" IS THE SAMPLE SIZE

PERCENTAGE INTAKE OF FOOD GROUPS BY CHILD AND ADULT

EAST PROVINCE

	Eaten By			Child-Family Ratio
	Child (1)	Adult (2)	Family (3)	(4)
Child Aged 6-11 Months*				
Tubers	58	96	97	60
Cereals	36	45	50	72
Beans, Seeds, Nuts	38	86	87	44
DG Leafy Veg.	23	53	53	43
Meat, Fish, Eggs	25	63	63	40
Milk	96	1	96	100
Baby Food	7	0	7	
Fruits & Veg.	19	45	49	39
Palm Oil/Other Oils	26	47	49	53
*N = 98				
Child Aged 12-23 Months*				
Tubers	89	92	95	94
Cereals	46	43	50	92
Beans, Seeds, Nuts	70	80	82	85
DG Leafy Veg.	42	48	50	84
Meat, Fish, Eggs	59	68	73	81
Milk	75	1	75	100
Baby Food	0	0	0	-
Fruits & Veg.	39	46	49	81
Palm Oil/Other Oils	42	46	49	86
*N = 215				

PERCENTAGE INTAKE OF FOOD GROUPS BY CHILD AND ADULT

NORTH PROVINCE

	Eaten By			Child-Family Ratio
	Child (1)	Adult (2)	Family (3)	(4)
Child Aged 6-11 Months*				
Tubers	9	17	17	53
Cereals	51	97	98	52
Beans, Seeds, Nuts	20	60	61	33
DG Leafy Veg.	9	39	40	22
Meat, Fish, Eggs	15	75	75	20
Milk	99	12	99	100
Baby Food	2	0	2	
Fruits & Veg.	11	46	46	24
Palm Oil/Other Oils	17	29	31	55
*N = 162				
Child Aged 12-23 Months*				
Tubers	11	15	15	73
Cereals	92	98	99	93
Beans, Seeds, Nuts	47	57	60	78
DG Leafy Veg.	34	44	44	77
Meat, Fish, Eggs	56	72	73	77
Milk	91	10	91	100
Baby Food	0	0	0	-
Fruits & Veg.	40	52	54	74
Palm Oil/Other Oils	40	46	49	82
*N = 232				

PERCENTAGE INTAKE OF FOOD GROUPS BY CHILD AND ADULT

SOUTHWEST/LITTORAL PROVINCES

	Eaten By			Child-Family Ratio
	Child (1)	Adult (2)	Family (3)	(4)
Child Aged 6-11 Months*				
Tubers	69	83	97	71
Cereals	53	47	61	87
Beans, Seeds, Nuts	34	64	66	52
DG Leafy Veg.	28	46	47	60
Meat, Fish, Eggs	49	85	88	56
Milk	9	5	13	69
Baby Food	16	0	16	
Fruits & Veg.	23	40	46	50
Palm Oil/Other Oils	61	91	93	66

*N = 87

Child Aged 12-23 Months*				
Tubers	89	96	98	91
Cereals	66	60	69	96
Beans, Seeds, Nuts	65	70	73	89
DG Leafy Veg.	35	40	43	81
Meat, Fish, Eggs	79	84	89	89
Milk	11	6	12	92
Baby Food	3	0	3	
Fruits & Veg.	49	49	56	88
Palm Oil/Other Oils	90	92	96	94

*N = 203

PERCENTAGE INTAKE OF FOOD GROUPS BY CHILD AND ADULT

NORTHWEST/WEST PROVINCES

	Eaten By			Child-Family Ratio
	Child (1)	Adult (2)	Family (3)	(4)
Child Aged 6-11 Months*				
Tubers	55	81	84	65
Cereals	72	79	83	87
Beans, Seeds, Nuts	34	69	72	47
DG Leafy Veg.	17	34	35	49
Meat, Fish, Eggs	30	60	63	48
Milk	7	0	7	100
Baby Food	3	0	3	
Fruits & Veg.	24	45	46	52
Palm Oil/Other Oils	47	89	89	53

*N = 96

Child Aged 12-23 Months*				
Tubers	77	82	87	89
Cereals	74	81	83	89
Beans, Seeds, Nuts	63	71	75	84
DG Leafy Veg.	27	37	38	71
Meat, Fish, Eggs	58	65	69	84
Milk	9	4	10	90
Baby Food	1	0	1	
Fruits & Veg.	47	51	54	87
Palm Oil/Other Oils	84	88	93	90

*N = 196

PERCENTAGE INTAKE OF FOOD GROUPS BY CHILD AND ADULT

YAOUNDE AND DOUALA

	Eaten By			Child-Family Ratio
	Child (1)	Adult (2)	Family (3)	(4)
Child Aged 6-11 Months*				
Tubers	53	85	87	61
Cereals	80	81	93	86
Beans, Seeds, Nuts	46	71	75	61
DG Leafy Veg.	16	28	30	53
Meat, Fish, Eggs	52	85	89	58
Milk	97	12	98	99
Baby Food	28	0	28	100
Fruits & Veg.	56	73	80	70
Palm Oil/Other Oils	60	90	95	63
*N = 113				
Child Aged 12-23 Months*				
Tubers	76	82	87	87
Cereals	93	90	97	96
Beans, Seeds, Nuts	63	71	75	84
DG Leafy Veg.	22	23	26	85
Meat, Fish, Eggs	89	92	94	95
Milk	51	12	51	100
Baby Food	10	0	10	100
Fruits & Veg.	76	76	81	94
Palm Oil/Other Oils	89	88	95	94
*N = 193				

PERCENTAGE INTAKE OF FOOD GROUPS

Child group aged 3-5 months and Adult (Person Feeding Child)

CENTRAL SOUTH PROVINCE

	Eaten By			Child-Family Ratio
	Child (1)	Adult (2)	Family (3)	(4)
Child Aged 3-5 Months				
Tubers	27	94	94	29
Cereals	12	44	48	25
Beans, Seeds, Nuts	8	85	87	9
DG Leafy Veg.	6	60	62	10
Meat, Fish, Eggs	8	67	69	12
Milk (any)	100	0	100	100
Baby Food	17	0	17	
Fruits & Veg.	10	58	60	17
Palm Oil/Other Oils	6	65	67	9
Peppers	6	77	79	8

Sample size = 48

EAST PROVINCE

Child Aged 3-5 Months				
Tubers	11	96	98	11
Cereals	13	43	46	28
Beans, Seeds, Nuts	10	80	82	12
DG Leafy Veg.	7	46	46	15
Meat, Fish, Eggs	8	75	75	11
Milk (any)	100	0		100
Baby Food	13	0		
Fruits & Veg.	6	49	51	12
Palm Oil/Other Oils	3	44	44	7
Peppers	10	90	92	11

Sample size = 61

PERCENTAGE INTAKE OF FOOD GROUPS

Child group aged 3-5 months and Adult (Person Feeding Child)

NORTH PROVINCE

Child Aged 3-5 Months	Eaten By: Child (1)	Eaten By: Adult (2)	Eaten By: Family (3)	Child-Family Ratio (4)
Tubers	1	17	17	-
Cereals	16	93	96	17
Beans, Seeds, Nuts	0	71	71	0
DG Leafy Veg.	0	42	42	0
Meat, Fish, Eggs	0	79	79	0
Milk (any)	100	12	100	100
Baby Food	0	0	0	-
Fruits & Veg.	0	43	43	0
Palm Oil/Other Oils	9	38	42	21
Peppers	0	61	61	0

Sample size = 77

SOUTH-WEST/LITTORAL PROVINCES

Child Aged 3-5 Months	Eaten By: Child (1)	Eaten By: Adult (2)	Eaten By: Family (3)	Child-Family Ratio (4)
Tubers	8	90	90	9
Cereals	36	46	58	62
Beans, Seeds, Nuts	6	62	62	10
DG Leafy Veg.	0	36	36	0
Meat, Fish, Eggs	8	82	84	10
Milk (any)	100	0	0	100
Baby Food	15	0	15	-
Fruits & Veg.	6	46	48	12
Palm Oil/Other Oils	14	40	40	35
Peppers	8	90	90	9

Sample size = 50

PERCENTAGE INTAKE OF FOOD GROUPS

Child group aged 3-5 months and Adult (Person Feeding Child)

NORTH-WEST/WEST PROVINCES

Child Aged 3-5 Months	Eaten By: Child (1)	Adult (2)	Family (3)	Child-Family Ratio (4)
Tubers	26	87	89	29
Cereals	46	76	87	53
Beans, Seeds, Nuts	4	78	78	5
DG Leafy Veg.	2	39	39	5
Meat, Fish, Eggs	9	78	78	12
Milk (any)	100	2	100	100
Baby Food	8	0	8	-
Fruits & Veg.	4	59	61	7
Palm Oil/Other Oils	6	98	98	6
Peppers	2	94	94	2

Sample size = 46

YAOUNDE/DOUALA

Child Aged 3-5 Months				
Tubers	19	89	92	21
Cereals	40	87	95	42
Beans, Seeds, Nuts	11	75	78	14
DG Leafy Veg.	5	24	24	21
Meat, Fish, Eggs	19	86	89	21
Milk	95	8	95	100
Baby Food	34	0	-	-
Fruits & Veg.	16	73	73	22
Palm Oil/Other Oils	16	89	92	17
Peppers	19	79	84	23

Sample size = 37

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 6-11 months and Adult (Person Feeding Child)

CENTRAL SOUTH PROVINCE

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	Child-Family Ratio (4)
Cassava	31	60	62	50
Cassava Gruel	3	3	6	
Other Tubers	29	37	42	69
Plantain/Banana	31	49	54	57
Corn	10	18	20	50
Corn Gruel	8	8	11	73
Rice	11	12	16	69
Rice Gruel	0	1	1	
Millet/Sorghum	1	2	2	
Millet Gruel	0	1	1	
Wheat/Bread	30	26	37	81
Nuts	41	63	69	59
Seeds	6	13	16	37
Beans	2	5	6	
Green Leafy Veg.	26	42	43	60
Fish	19	56	58	33
Meat (any)	10	27	30	33
Eggs	8	7	12	67
Breast Milk	94	0	94	100
Milk and Derivatives	4	0	4	
Baby Food	10	0	10	100
Fruits/Vegetables	32	46	50	64
Peppers	42	71	75	56
Palm Oil/Palm Nuts	49	71	75	65
Other Oils	2	4	6	
Sugar/Drinks	10	34	38	26

PERCENTAGE INTAKE OF INDIVIDUAL FOODS
Child group aged 12-23 months and Adult (Person Feeding Child)

CENTRAL SOUTH PROVINCE

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	61	64	69	88
Cassava Gruel	1	1	2	
Other Tubers	35	41	43	81
Plantain/Banana	49	51	59	83
Corn	22	26	27	81
Corn Gruel	5	4	6	
Rice	17	16	18	94
Rice Gruel	*	*	1	-
Millet/Sorghum	3	3	3	
Millet Gruel	0	0	0	-
Wheat/Bread	31	24	33	94
Nuts	68	76	78	87
Seeds	10	10	14	71
Beans	1	3	3	
Green Leafy Veg.	43	48	50	86
Fish	53	60	63	84
Meat (any)	26	27	30	87
Eggs	6	4	7	
Breast Milk	44	0	44	100
Milk and Derivatives	3	1	3	
Baby Food	2	0	2	
Fruits/Vegetables	56	54	59	95
Peppers	73	73	78	94
Palm Oil/Palm Nuts	68	67	73	93
Other Oils	7	7	9	
Sugar/Drinks	21	31	38	55

PERCENTAGE INTAKE OF INDIVIDUAL FOODS
Child group aged 6-11 months and Adult (Person Feeding Child)
EAST PROVINCE

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	41	73	77	53
Cassava Gruel	4	0	5	
Other Tubers	17	33	36	47
Plantain/Banana	27	50	54	50
Corn	10	22	22	45
Corn Gruel	12	5	12	100
Rice	4	4	6	
Rice Gruel	2	4	5	
Millet/Sorghum	0	2	2	
Millet Gruel	1	2	3	
Wheat/Bread	17	15	21	81
Nuts	30	73	75	40
Seeds	9	22	24	37
Beans	1	2	3	
Green Leafy Veg.	23	53	53	43
Fish	13	37	37	35
Meat (any)	11	34	34	32
Eggs	4	4	6	
Breast Milk	96	0	96	100
Milk and Derivatives	0	1	1	
Baby Food	7	0	7	
Fruits/Vegetables	19	45	49	39
Peppers	38	86	87	44
Palm Oil/Palm Nuts	22	34	36	61
Other Oils	6	17	17	35
Sugar/Drinks	5	18	21	24

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 12-23 months and Adult (Person Feeding Child)

EAST PROVINCE

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	66	73	75	88
Cassava Gruel	3	1	3	
Other Tubers	26	30	32	81
Plantain/Banana	45	50	56	80
Corn	23	26	26	88
Corn Gruel	6	5	7	
Rice	5	3	5	
Rice Gruel	5	4	5	
Millet/Sorghum	1	1	1	
Millet Gruel	1	1	1	
Wheat/Bread	20	15	21	95
Nuts	60	66	68	88
Seeds	18	25	25	72
Beans	1	1	1	
Green Leafy Veg.	42	48	50	84
Fish	33	39	41	80
Meat (any)	30	37	39	77
Eggs	6	3	7	
Breast Milk	73	0	73	100
Milk and Derivatives	2	1	2	
Baby Food	*	0	0	
Fruits/Vegetables	39	46	48	81
Peppers	71	81	86	83
Palm Oil/Palm Nuts	34	37	40	85
Other Oils	9	9	11	82
Sugar/Drinks	13	19	21	62

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 6-11 months and Adult (Person Feeding Child)

NORTH PROVINCE

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	4	10	11	36
Cassava Gruel	0	0	1	
Other Tubers	3	5	6	
Plantain/Banana	2	3	3	
Corn	4	10	11	36
Corn Gruel	8	11	13	62
Rice	2	5	6	
Rice Gruel	3	6	7	
Millet/Sorghum	17	77	77	22
Millet Gruel	30	28	44	68
Wheat/Bread	5	14	14	36
Nuts	12	33	35	34
Seeds	4	17	17	23
Beans	5	24	24	21
Green Leafy Vegetables	9	39	40	22
Fish	9	49	49	18
Meat (any)	6	34	34	18
Eggs	1	1	2	
Breast Milk	99	0	99	100
Milk and Derivatives	12	12	20	60
Baby Food	2	0	2	
Fruits/Vegetables	11	46	46	24
Peppers	16	62	64	25
Palm Oil/Palm Nuts	4	7	7	
Other Oils	15	35	38	39
Sugar/Drinks	13	26	28	46

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 12-23 months and Adult (Person Feeding Child)

NORTH PROVINCE

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	5	7	7	71
Cassava Gruel	1	0	1	
Other Tubers	5	6	6	
Plantain/Banana	3	3	3	
Corn	12	12	14	86
Corn Gruel	6	5	8	
Rice	9	9	11	82
Rice Gruel	10	9	11	91
Millet/Sorghum	60	78	79	76
Millet Gruel	45	34	47	96
Wheat/Bread	19	21	25	76
Nuts	33	41	44	75
Seeds	7	11	13	54
Beans	16	19	20	80
Green Leafy Veg.	34	44	44	77
Fish	32	43	44	73
Meat (any)	29	36	37	78
Eggs	1	2	2	
Breast Milk	87	0	87	100
Milk and Derivatives	15	10	16	94
Baby Food	*	*	*	
Fruits/Vegetables	40	52	54	74
Peppers	42	54	57	74
Palm Oil/Palm Nuts	4	4	5	
Other Oils	36	42	44	82
Sugar/Drinks	22	29	32	69

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 6-11 months and Adult (Person Feeding Child)

SOUTH-WEST AND LITTORAL PROVINCES

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	21	38	39	54
Cassava Gruel	3	3	5	
Other Tubers	45	67	70	64
Plantain/Banana	34	54	60	57
Corn	14	19	22	64
Corn Gruel	22	6	23	96
Rice	13	13	17	76
Rice Gruel	0	2	2	
Millet/Sorghum	0	1	1	
Millet Gruel	0	0	0	-
Wheat/Bread	24	26	33	73
Nuts	25	38	39	64
Seeds	9	25	26	35
Beans	2	10	10	20
Green Leafy Vegetables	27	46	47	57
Fish	41	79	82	50
Meat (any)	11	19	22	50
Eggs	7	3	9	
Breast Milk	100	0	100	100
Milk and Derivatives	9	14	13	69
Baby Food	16	0	16	100
Fruits/Vegetables	23	63	46	50
Peppers	42	84	84	50
Palm Oil/Palm Nuts	61	91	93	66
Other Oils	1	5	5	
Sugar/Drinks	19	37	49	39

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 12-23 months and Adult (Person Feeding Child)

SOUTH-WEST AND LITTORAL PROVINCES

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	31	35	40	78
Cassava Gruel	3	3	6	
Other Tubers	58	57	63	97
Plantain/Banana	51	62	68	75
Corn	17	17	18	94
Corn Gruel	6	3	7	
Rice	30	25	32	94
Rice Gruel	1	1	1	
Millet/Sorghum	*	1	1	-
Millet Gruel	0	*	*	-
Wheat/Bread	41	35	44	93
Nuts	47	51	55	93
Seeds	20	22	23	87
Beans	13	14	15	87
Green Leafy Veg.	35	40	43	81
Fish	65	71	76	86
Meat (any)	24	23	27	89
Eggs	6	3	6	
Breast Milk	65	0	65	100
Milk and Derivatives	11	6	12	92
Baby Food	3	0	3	
Fruits/Vegetables	49	49	56	88
Peppers	83	90	92	90
Palm Oil/Palm Nuts	90	92	96	94
Other Oils	4	5	5	
Sugar/Drinks	27	37	42	64

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 6-11 months and Adult (Person Feeding Child)

NORTH WEST AND WEST PROVINCES

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	4	20	20	20
Cassava Gruel	0	0	0	-
Other Tubers	40	59	64	63
Plantain/Banana	26	46	52	50
Corn	30	53	56	54
Corn Gruel	34	13	34	100
Rice	10	11	15	67
Rice Gruel	0	0	0	-
Millet/Sorghum	3	10	10	30
Millet Gruel	0	0	0	-
Wheat/Bread	12	28	30	40
Nuts	20	46	48	42
Seeds	11	23	24	46
Beans	10	24	25	40
Green Leafy Veg.	17	34	35	49
Fish	20	51	53	38
Meat (any)	8	19	19	42
Eggs	6	4	7	
Breast Milk	100	0	100	100
Milk and Derivatives	7	0	7	
Baby Food	3	0	3	
Fruits/Vegetables	24	45	46	52
Peppers	32	79	79	40
Palm Oil/Palm Nuts	47	88	90	52
Other Oils	3	3	5	
Sugar/Drinks	25	40	47	53

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 12-23 months and Adult (Person Feeding Child)

NORTH-WEST AND WEST PROVINCES

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	9	18	19	47
Cassava Gruel	1	1	2	
Other Tubers	57	65	68	84
Plantain/Banana	39	43	52	75
Corn	52	61	64	81
Corn Gruel	10	5	12	83
Rice	17	16	20	85
Rice Gruel	2	2	2	
Millet/Sorghum	4	5	5	
Millet Gruel	*	*	1	-
Wheat/Bread	20	19	24	83
Nuts	40	50	54	74
Seeds	18	19	20	90
Beans	27	29	30	93
Green Leafy Veg.	26	37	38	68
Fish	41	49	52	79
Meat (any)	24	27	28	86
Eggs	12	7	12	100
Breast Milk	81	0	81	100
Milk and Derivatives	9	4	10	90
Baby Food	1	0	1	
Fruits/Vegetables	47	51	54	87
Peppers	61	68	73	84
Palm Oil/Palm Nuts	84	88	93	90
Other Oils	6	5	7	
Sugar/Drinks	21	38	42	50

PERCENTAGE INTAKE OF INDIVIDUAL FOODS

Child group aged 6-11 months and Adult (Person Feeding Child)

YAOUNDE AND DOUALA

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	21	44	47	45
Cassava Gruel	4	4	5	
Other Tubers	23	35	42	55
Plantain/Banana	17	35	40	43
Corn	22	26	31	71
Corn Gruel	28	11	31	90
Rice	23	28	32	72
Rice Gruel	0	0	0	-
Millet/Sorghum	0	0	0	-
Millet Gruel	0	0	0	-
Wheat/Bread	55	69	80	69
Nuts	38	57	61	62
Seeds	8	17	19	42
Beans	8	17	20	40
Green Leafy Veg.	16	28	30	53
Fish	37	69	73	51
Meat (any)	19	37	39	49
Eggs	7	10	12	58
Breast Milk	96	0	96	100
Milk and Derivatives	30	12	33	91
Baby Food	28	0	28	100
Fruits/Vegetables	56	73	80	70
Peppers	43	74	77	56
Palm Oil/Palm Nuts	49	72	78	63
Other Oils	17	31	33	52
Sugar/Drinks	23	45	50	46

PERCENTAGE INTAKE OF INDIVIDUAL FOODS
Child group aged 12-23 months and Adult (Person Feeding Child)
YAOUNDE AND DOUALA

	EATEN BY Child (1)	EATEN BY Adult (2)	EATEN BY Child or Adult (3)	CHILD-FAMILY Ratio (4)
Cassava	30	30	35	86
Cassava Gruel	3	3	3	
Other Tubers	39	40	45	87
Plantain/Banana	35	40	47	74
Corn	25	26	30	83
Corn Gruel	18	10	19	95
Rice	37	33	41	90
Rice Gruel	*	1	2	-
Millet/Sorghum	1	2	3	
Millet Gruel	0	*	1	-
Wheat/Bread	83	69	88	94
Nuts	48	52	58	83
Seeds	19	23	24	79
Beans	12	15	18	67
Green Leafy Veg.	22	23	26	85
Fish	69	74	77	90
Meat (any)	32	33	37	86
Eggs	7	7	10	70
Breast Milk	34	0	34	100
Milk and Derivatives	27	12	27	100
Baby Food	10	0	10	100
Fruits/Vegetables	76	76	81	94
Peppers	74	79	82	90
Palm Oil/Palm Nuts	77	78	85	91
Other Oils	24	23	27	89
Sugar/Drinks	37	47	55	67

APPENDIX 22 ANTHROPOMETRIC DISTRIBUTIONS

The following six tables show the percentage frequency distributions for the indices describing the prevalence of undernutrition in this report (see also p. 78) based on different areas of the country:

Height-for-Age
Weight-for-Height
Weight-for-Age
Arm Circumference-for-Age
Arm Circumference-for-Height
Fatfold-for-Age

It is noteworthy that the prevalence rate for relatively tall children (100%+ height-for-age) is greatest in the special group, followed by those in Yaounde, Douala and Central South Province. These findings reflect the prevalence rates for chronic undernutrition, which were the lowest in these areas.

The prevalence rates for extreme underweight (under 60% weight-for-age) were highest in the North Province (1.6%).

Obesity was rare throughout all areas of the country. (based on 120%+ weight-for-height and 120%+ fatfold-for-age)

HEIGHT-FOR-AGE DISTRIBUTION ACCORDING TO PERCENTAGE OF REFERENCE MEDIAN- 3-59 MONTHS - BY AREA (w)

Area	Percentage of Reference Median									
PROVINCE	<80	80 - 84.9	85 - 87.4	87.5- 89.9	90 - 92.4	92.5- 95	95.5 99.9	100 - 104.9	105+	<90%
Central South*	0.9	4.0	3.1	10.8	15.7	19.9	31.0	12.5	2.1	18.8
East	1.1	5.0	5.8	14.8	19.6	19.8	23.0	7.3	3.6	26.7
North	1.4	3.7	5.3	10.7	18.4	19.6	27.6	9.5	3.8	21.1
S. West	0.6	3.4	5.6	10.5	20.8	24.2	27.2	6.4	1.4	20.1
Littoral*	0.3	5.4	7.2	11.1	19.8	20.1	26.5	8.0	1.8	24.0
N. West	0.7	3.6	6.7	13.2	20.2	19.5	24.9	9.2	2.0	24.2
West	1.6	6.5	8.1	14.8	14.8	20.1	25.1	7.2	2.0	16.2
Total Provinces	1.1	3.7	4.8	10.3	16.2	18.0	24.7	8.5	2.7	19.9
URBAN/RURAL										
Yaounde	0.3	1.6	2.6	4.7	13.7	17.1	38.6	18.1	3.4	9.2
Douala	0.2	1.8	4.3	7.3	13.4	18.5	37.9	14.3	2.4	13.6
Urban*	0.7	3.5	5.4	9.8	17.6	20.4	30.6	9.5	2.4	19.4
Rural	1.1	4.1	5.4	11.8	18.6	30.3	26.8	9.0	2.0	22.4
Total Cameroon	1.1	3.9	5.1	11.0	17.6	19.8	28.6	10.1	3.0	21.1
Special	0.0	0.6	0.2	3.4	5.4	14.3	42.2	27.1	6.9	4.2

* Excluding Yaounde and Douala
(w) Weighted Percent

WEIGHT-FOR-HEIGHT DISTRIBUTION ACCORDING TO PERCENT OF REFERENCE MEDIAN - AGE 3-59 MONTHS-BY AREA (w)

Area	Percentage of Reference Median									
PROVINCE	<80	80 - 84.9	85 - 89.9	90 - 94.9	95 - 99.9	100 - 104.9	105 - 109.9	110 - 119.9	120+	<80
Central South*	0.7	3.0	4.9	12.3	22.4	22.5	15.7	15.8	2.8	0.7
East	0.8	2.2	5.1	15.3	17.8	24.1	17.7	13.7	3.2	0.8
North	1.4	6.1	11.8	21.1	20.0	18.9	10.7	7.9	2.0	1.4
S. West	0.8	2.2	6.0	14.9	22.7	20.3	15.1	14.7	3.2	0.8
Littoral*	0.7	1.3	2.3	12.3	16.7	20.0	21.3	20.3	4.9	0.7
N. West	0.7	1.1	2.7	11.0	16.8	24.9	17.9	16.6	8.3	0.7
West	0.7	2.0	5.6	9.2	20.6	22.4	18.4	16.6	4.5	0.7
Total Provinces	1.0	3.8	7.4	14.9	18.2	18.7	11.1	10.8	2.8	1.0
URBAN/RURAL										
Yaounde	0.3	0.5	4.7	7.2	17.9	19.9	22.3	19.7	7.5	0.3
Douala	0.9	1.0	5.9	11.2	21.6	17.3	18.3	17.3	6.5	0.9
Urban*	0.7	1.5	4.1	11.1	18.8	18.3	21.0	19.0	5.4	0.7
Rural	1.1	4.2	8.2	17.1	20.4	21.1	13.4	11.7	2.8	1.1
Total Cameroon	1.1	3.9	7.9	15.9	20.2	20.6	13.1	12.6	3.5	1.0
Special	0.0	0.6	0.2	3.4	5.3	14.3	42.2	27.1	6.9	0.0

* Excluding Yaounde and Douala
(w) Weighted Percent

WEIGHT-FOR-AGE DISTRIBUTION ACCORDING TO PERCENTAGE OF REFERENCE MEDIAN - AGE 3-59 MONTHS- BY AREA (w)

Area	Percentage of Reference Median									
PROVINCE	<60	60 - 69.9	70 - 74.9	75 - 79.9	80 - 84.9	85 - 89.9	90 - 99.9	100 - 109.9	110+	<80
Central South	0.9	1.8	3.7	8.4	12.8	18.0	31.2	15.3	7.9	14.8
East	0.9	4.1	6.2	10.0	15.0	17.6	25.5	13.7	7.0	21.2
North	1.6	5.3	8.5	11.9	15.6	17.6	25.5	10.3	3.8	27.3
S. West	1.2	2.4	4.8	10.7	14.5	20.4	28.6	11.7	5.8	19.1
Littoral*	0.0	2.6	5.4	8.7	10.8	16.9	31.3	16.2	8.2	16.7
N. West	0.5	1.8	3.6	9.6	13.9	15.5	30.0	14.6	10.5	15.5
West	0.7	4.7	6.5	10.0	12.1	16.7	27.9	12.7	8.7	21.9
Total Provinces	1.2	3.9	6.6	10.6	14.4	17.6	27.5	12.3	6.0	22.3
URBAN/RURAL										
Yaounde	0.0	1.0	2.1	5.2	7.5	13.5	25.7	28.8	16.1	8.3
Douala	0.4	1.8	4.5	5.7	10.8	14.3	30.8	19.1	12.6	12.4
Urban*	0.3	2.0	4.0	7.3	11.8	16.5	32.6	16.5	9.0	13.6
Rural	1.2	4.0	6.7	11.1	14.4	18.0	27.5	11.6	5.5	23.0
Total Cameroon	1.1	3.7	6.3	10.0	13.9	17.3	27.6	13.4	6.7	21.1
Special	0.0	0.2	1.6	1.8	6.3	9.3	31.7	27.3	21.8	3.6

*Excluding Yaounde and Douala
(w) Weighted Percent

ARM CIRCUMFERENCE-FOR AGE DISTRIBUTION ACCORDING TO PERCENT OF REFERENCE MEDIAN-AGE 3-59 MONTHS-BY AREA (w)

Area	Percentage of Reference Median									
PROVINCE	<80	80 - 82.4	82.5- 84.9	85 - 89.9	90 - 94.9	95 - 99.9	100- 105	105 109.9	110+	<82.5
Central South*	6.7	5.1	6.8	22.6	23.3	19.8	10.6	3.5	1.8	11.8
East	7.7	5.7	7.8	24.0	23.0	18.2	8.1	2.3	1.1	13.4
North	10.3	6.6	9.2	26.4	22.4	14.4	7.3	2.3	1.1	16.9
S. West	7.3	4.7	6.5	25.1	25.3	16.4	8.5	4.7	1.2	12.0
Littoral*	3.3	3.1	3.3	18.5	22.1	23.9	13.6	7.2	5.1	6.4
N. West	3.6	3.4	6.5	19.8	23.8	22.3	12.8	3.6	4.3	7.0
West	6.0	3.6	5.6	21.4	22.5	22.1	11.8	4.0	3.1	9.6
Total Provinces	8.2	5.5	7.8	24.3	23.0	17.3	9.1	3.1	1.8	13.7
URBAN/RURAL										
Yaounde	1.3	1.6	3.6	9.9	21.8	26.2	21.3	9.6	4.7	2.9
Douala	4.1	4.5	3.9	16.1	24.3	21.0	16.1	5.9	4.1	8.6
Urban*	2.6	3.1	4.4	18.7	23.2	23.5	14.2	5.6	4.6	5.7
Rural	8.8	5.6	7.9	25.1	23.2	16.4	8.3	3.1	1.5	14.4
Total Cameroon	7.7	5.3	7.4	23.2	23.0	17.9	10.0	3.5	2.1	13.0
Special	0.0	0.8	2.8	13.0	21.2	25.9	21.2	8.7	6.5	0.8

* Excluding Yaounde and Douala
(w) Weighted Percent

ARM CIRCUMFERENCE-FOR-HEIGHT DISTRIBUTION ACCORDING TO PERCENTAGE OF REFERENCE MEDIAN-AGE 3-59 MTHS-BY AREA(w)

Area	Percentage of Reference Median									
PROVINCE	<80	80 - 82.4	82.5 - 84.9	85 - 89.9	90 - 94.9	95 - 99.9	100-105	105 - 109.9	110+	<82.5
Central South*	2.1	1.8	2.5	13.9	22.9	24.2	19.5	8.7	4.5	3.9
East	1.6	1.8	3.3	14.4	24.6	26.4	17.2	7.1	3.7	3.4
North	3.1	2.3	4.4	17.0	26.9	22.2	14.7	6.1	3.4	5.4
S. West	2.0	1.6	4.6	10.3	27.8	22.8	15.9	10.3	4.8	3.6
Littoral*	1.0	0.8	1.8	7.2	16.5	22.9	23.9	14.9	11.1	1.8
N. West	0.5	0.9	1.6	9.4	22.5	24.0	18.9	15.5	6.7	1.4
West	0.7	0.9	3.4	11.2	18.6	26.0	19.2	12.1	8.1	1.6
Total Provinces	2.3	1.8	3.6	14.5	24.7	23.3	16.9	8.4	4.6	4.1
URBAN/RURAL										
Yaounde	0.3	0.5	0.5	7.5	10.2	24.1	26.3	18.3	17.8	0.8
Douala	1.8	0.4	2.0	10.0	17.5	24.6	20.0	15.9	7.9	2.2
Urban*	0.7	1.0	1.2	8.0	20.1	22.6	21.1	16.0	9.3	1.7
Rural	2.5	1.9	4.0	14.7	25.2	23.3	16.3	7.6	4.3	4.4
Total Cameroon	2.2	1.7	3.4	14.0	23.7	23.4	17.5	9.2	5.3	3.9
Special	0.0	0.0	0.0	5.4	15.6	24.6	26.7	16.2	11.5	0.0

*Excluding Yaounde and Douala
(w) Weighted Percent

FATFOLD-FOR-AGE DISTRIBUTION ACCORDING TO PERCENTAGE OF REFERENCE MEDIAN-AGE 3-59 MONTHS- BY AREA (w)

Area	Percentage of Reference Median									
PROVINCE	<50	50 - 59.9	60 - 69.9	70 - 79.9	80 - 89.9	90 - 99.9	100 - 109.9	110. - 119.9	120+	<60
Central South*	5.5	14.4	19.5	19.5	18.1	9.6	6.2	3.0	4.4	19.9
East	4.9	14.9	21.2	20.4	16.2	11.5	6.4	2.1	2.4	19.8
North	4.4	12.4	20.4	20.0	17.5	9.9	7.8	3.8	4.2	16.8
S. West	6.2	16.1	18.8	20.2	15.1	11.2	5.1	3.9	3.4	22.3
Littoral*	3.7	7.9	15.7	17.1	16.9	12.9	9.6	7.3	9.0	11.8
N. West	3.0	14.6	16.4	23.2	18.6	10.2	5.7	2.7	5.7	17.6
West	3.1	6.2	17.9	19.6	20.7	12.0	7.8	5.6	7.0	9.3
Total Provinces	4.5	12.6	19.5	20.1	17.5	10.3	7.1	3.7	4.6	17.1
URBAN/RURAL										
Yaounde	1.9	10.8	15.2	21.2	20.8	11.5	7.8	5.6	5.2	12.7
Douala	3.3	14.5	24.4	17.3	15.6	12.9	6.3	3.3	2.5	17.8
Urban*	2.4	9.1	15.5	18.0	17.6	12.4	10.7	5.5	8.8	11.5
Rural	5.2	13.4	20.1	20.0	17.0	10.3	6.4	3.7	4.0	18.6
Total Cameroon	4.3	12.6	19.6	20.0	17.5	10.5	7.1	3.8	4.5	17.0
Special	1.5	12.5	21.1	25.7	18.1	10.3	5.8	2.8	2.2	14.0

*Excluding Yaounde and Douala

(w) Weighted Percent

APPENDIX 23 CONCURRENT ACUTE AND CHRONIC UNDERNUTRITION

Based on the anthropometric indices as defined on page 53, Table 6, children are classified as being either normal, stunted, wasted or stunted and wasted. Categorising the children in one of these four groups helps to quantify the extent of the undernutrition problem (29,32).

Age Group Cameroon Sample	Percentage of Children (w)			
	Wasted& Stunted	Wasted	Stunted	Normal
3-11 months	0.5	0.7	8.6	90.2
12-23 months	1.1	0.3	18.6	78.0
24 + months	0.3	0.6	26.4	72.7
3-59 months	0.5	0.5	21.2	77.8

Because of the low prevalence rates found for wasting or acute undernutrition (under 80% weight-for-height of reference median) the prevalence rates for stunting or chronic undernutrition (under 90% height-for-age)alone or with concurrent wasting are similar (21.2% v. 21.7%). It is pertinent to note however from the above table, that the prevalence rate for children aged 12-23 months with both wasting and stunting (1.1%) appears greater than for other age groups.

PERCENTAGE FREQUENCY NUMBER OF TIMES DURING THE PAST WEEK MOTHER SELLS AT MARKET (w) - BY AREA

	Number of times sells at market past week			
PROVINCE	Nil	1	2	3+
Central South*	84.6	11.5	2.6	1.3
East	78.4	11.6	6.5	3.5
North	87.5	7.7	2.4	2.5
N. West	80.7	13.7	3.6	2.0
West	94.8	2.6	1.3	1.3
S. West	85.9	8.1	3.9	2.1
Littoral*	96.0	3.1	0.9	0.0
Total Provinces*	86.7	8.5	2.7	2.1
ECOLOGICAL AREA				
North	86.7	8.2	2.4	2.8
Central Savannah	83.4	11.0	4.0	1.7
West Plateau	87.5	8.3	2.5	1.6
West Plains	90.3	5.9	2.6	1.2
South Forest	85.7	9.1	3.1	2.2
URBAN/RURAL				
Yaounde/Douala	94.6	0.3	0.4	4.[illegible]
Urban Cameroon*	92.6	4.3	2.1	1.0
Rural Cameroon	85.6	9.3	2.9	2.3
TOTAL CAMEROON	87.1	8.1	2.6	2.2

* Excluding Yaounde and Douala
(w) Weighted Percent

APPENDIX 24 MARKET INFORMATION REGARDING THE MOTHER

This section was excluded from the presentation of result in the major report because of questionable validity of the findings and problems in their interpretation. In its report review the Technical Committee indicated that " A single period information on marketing sales of women can only be a very poor indicator of their earnings as this is greatly influenced by seasonality. A proper indicator can only be based on the average of repeated information obtained in the same markets during at least the main seasons of the year. It is even far more remote as an indicator of her control over the purchase of food and other items for her family and children, as all husbands contribute variously to this according to their ability, especially those that earn a regular income or sell cash crops and cash crop products such as palm wine, palm oil, plantains, etc." It was agreed to put the information in the Appendix.

The findings are presented here, as they include the only monetary data obtained on this survey. Indicators of socio-economic status (e.g. type of house) have already been shown to be strongly related to undernutrition prevalence in the child (see pages 254-257).

Number of Times Past Week Mother at Market to Sell Goods (p.360)

In the Cameroon sample, approximately 13% of mothers of young children attended a market to sell goods at least once the previous week. Attendance was least common in the West and Littoral Provinces (4.5%) and Yaounde/Douala(5.4%) and urban Cameroon (7.4%).

Mothers were at a market usually only once the previous week, the exception being Yaounde/Douala, where multiple visits were generally the case. This is probably due to the fact that there is a daily market in the cities.

PERCENTAGE FREQUENCY DISTRIBUTION FOR AMOUNT OF CFA EARNED BY MOTHER AT MARKET PAST WEEK BY AREA (w)

CFA Groupings (250 CFA = $1) - October 1977

PROVINCE	-250	250-499	500-999	1000-1999	2000-2999	3000-3999	4000-4999	5000-7499	7500+	Sample Size
Central South*	15.2	21.7	12.0	29.3	9.8	5.4	2.2	3.3	1.1	92
East	16.0	24.4	10.1	26.9	10.9	4.2	1.7	5.0	0.8	119
North	33.3	18.6	11.8	22.5	6.9	5.9	1.0	0.0	0.0	102
N-West	4.0	36.0	18.0	30.0	4.0	6.0	0.0	2.0	0.0	50
West										12
S-West	20.9	25.6	14.0	20.9	11.6	7.0	0.0	0.0	0.0	43
Littoral*										10
Total Provinces*	23.2	22.4	12.7	25.1	7.8	5.5	1.3	1.6	0.3	428
ECOLOGICAL AREA										
North	34.8	17.4	12.0	20.7	7.6	6.5	1.1			92
Central Savannah	19.0	22.1	13.2	28.9	9.4	3.4	1.4	2.6		85
West Plateau	6.5	33.9	16.1	29.0	4.8	4.8	1.6	3.2		62
West Plains	16.9	28.1	20.7	19.1	9.4	5.6	0.1	0.1		59
South Forest	14.6	25.0	9.2	28.8	10.4	5.4	0.8	4.2	1.7	130
URBAN/RURAL										
Yaounde/Douala	4.2	0.0	4.2	26.8	15.5	5.6	8.4	19.7	15.5	27
Urban Cameroon*	17.4	21.5	23.4	24.2	3.2	4.5	2.9	2.9	0.0	53
Rural Cameroon	24.3	22.0	12.2	24.6	8.4	5.5	1.3	1.4	0.4	375
TOTAL CAMEROON	22.8	21.9	12.5	25.1	8.0	5.5	1.5	2.0	0.7	455

Special Group

*Excluding Yaounde and Douala
(w) Weighted Percentage

Amount of Money (CFA) Earned by Mother Past Week at Market

Information was obtained on the total gross amount that the mother earned during her visits to the market the past week. It was felt this might give an indication of her earning capacity.

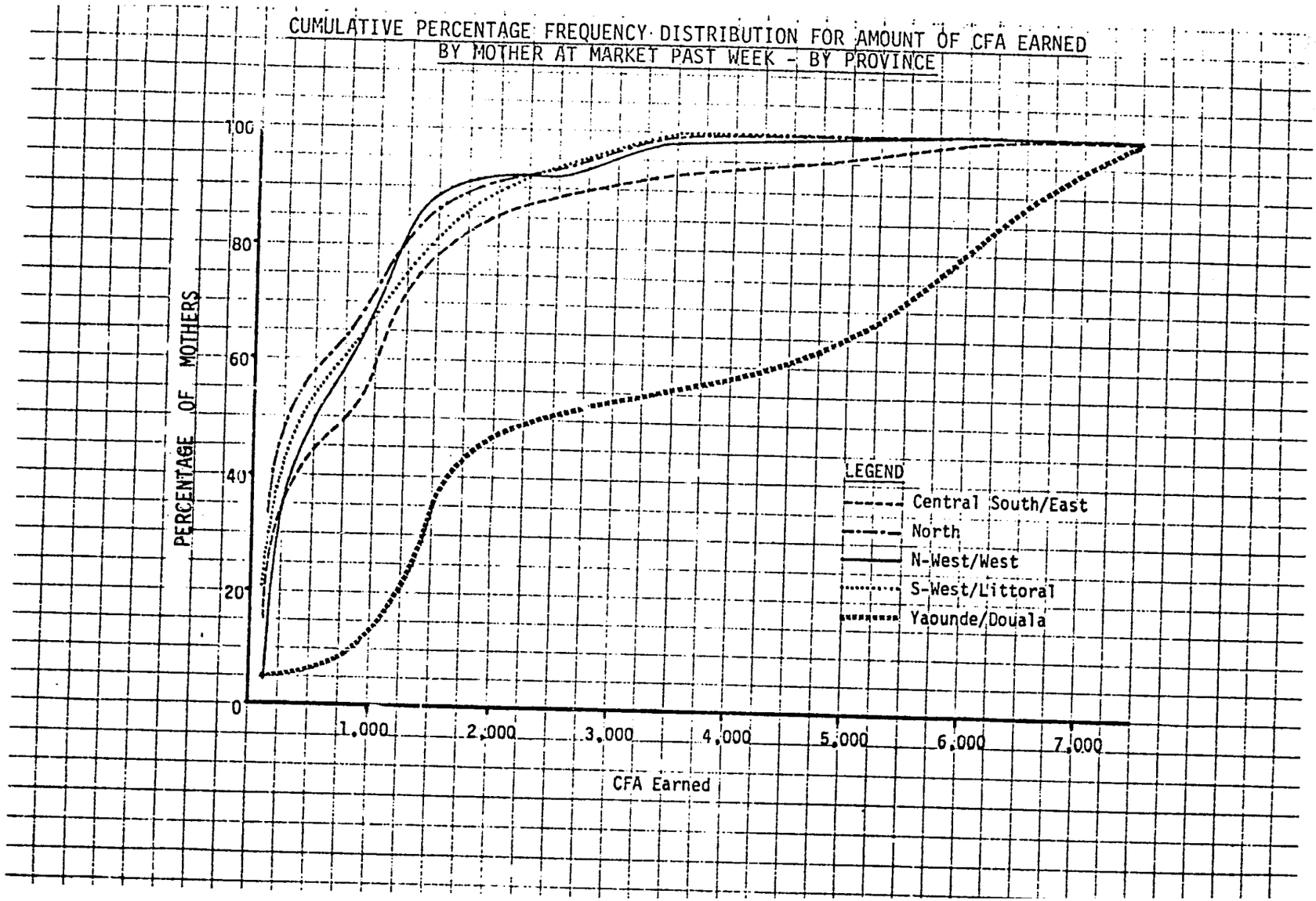
Almost one-quarter of all mothers (22.8%) earned less than 250 CFA, just over one-half (57.2%) less than 1000 CFA and 82.3% of mothers less than 2000 CFA.(p.362).

The highest proportion of mothers earning less than 250 CFA was in the North Province.

The relatively few mothers selling goods in Yaounde/Douala earned much more than the rest of the country. This is illustrated in the table showing average earnings and in the cumulative frequency graph. The graph also suggests that mothers in the Central South and East Province perhaps earned more than those in other provinces.(p. 364-5).

AVERAGE AMOUNT OF CFA EARNED BY MOTHER AT MARKETS DURING PAST WEEK - BY AREA

PROVINCE	Average	Standard Deviation	Sample Size
Central South*	1270	1461	92
East	1363	1684	120
North	855	894	102
N-West	1030	984	50
West	(1554)	1696	(12)
S-West	917	829	44
Littoral*	(590)	231	(10)
Total Provinces*	1126 (w)		430
Yaounde/Douala	(3836)		(27)
TOTAL CAMEROON	1288 (w)		457


CUMULATIVE PERCENTAGE FREQUENCY DISTRIBUTION FOR AMOUNT OF CFA EARNED
BY MOTHER AT MARKET PAST WEEK - BY PROVINCE
PERCENTAGE OF MOTHERS
100
80
60
40
20
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
CFA Earned
LEGEND
Central South/East
North
N-West/West
S-West/Littoral
Yaounde/Douala

Mother at Market and Prevalence of Undernutrition in Her Child

Mother Sells at Market

There was a lower prevalence of underweight in the North and chronic undernutrition in the South-West/Littoral in children of mothers who sold goods at the market compared with those of mothers who sold no goods during the past week.

Amount Earned by Mother at Market

The only significant association found was for arm wasting in the whole country, where its prevalence was less for children of mothers who earned a relatively large amount (1500-900C CFA) at the market. Small sample sizes for many provinces restricted the application of the test.

Percent of children undernourished by market indicators

Mother Sells at Market		Sample Size	Percent Chronic Nutrn	Percent Under-Weight	Percent Arm Wasting
North	Yes	135		18.5	
	No	901		29.3	
SW/Littoral	Yes	78	10.3		
	No	618	22.6		
Amount Earned at Market					
Total Country	10- 249	71			19.5
	250- 499	83			14.5
	500-1499	272			13.2
	1500-9000	182			7.1

Discussion

The difficulty in obtaining useful information about income from specific sources on a cross-sectional survey has been indicated. This is particularly the case in many parts of rural Africa. It is supported by the fact that in this survey, a relationship was found between money earnt at market recently and undernutrition only in the arm wasting category of undernutrition. It was not found for underweight children.

APPENDICES 25-31 MISCELLANEOUS

APPENDIX 25 SURVEY SCHEDULE

March, 1977	U.S.A.I.D./Yaounde discussed with the Government of Cameroon the possibility of a nutrition survey in Cameroon.
April 19 - May 11	Initial visit by UCLA Nutrition Assessment Unit Director to Cameroon.
May - October	Beginning of survey planning in Cameroon. Technical Committee formed.
October	U.S.A.I.D./Yaounde received formal request from Government of Cameroon for assistance in a national nutrition survey.
October 7, 11	Arrival of Director, Assistant Director and Diet Consultant of the UCLA Nutrition Assessment Unit.
October 12 - November 5	Final technical and administration in country preparation for survey.
November 7 - 19	Supervisor training; beginning of Administrative staff training of technical measurement procedures.
November 16	Technical survey test given for selection of 10 supervisors from initial 27.
November 18	Standardization test given for final selection of 5 supervisors from 10.
November 23 - December 14	Interviewer training.
November 25	Technical survey test given for final selection of 22 interviewers from initial 29.

November 28	Survey team selection.
November 28	Arrival of vitamin A specialist who investigated vitamin A problems in the north of the country.
November - December	Diet investigation in the north, east and west provinces.
December 1	Field trial-village practice session.
December 2	Standardization test - child height.
December 6	Standardization test - child weight.
December 7	Final vitamin A report given by vitamin A specialist to survey administrative staff.
December 8	Standardization test - child length.
December 9	Standardization tests - child fatfold, adult arm circumference.
December 12	Field trial - village practice session.
December 14	Standardization test - child length.
December 15	UCLA Diet Consultant departure.
December 15 - March 31	Field phase.
December 23 - January 4, 1978	Survey field phase holiday intermission.
February 27	Standardization test - child fatfold, arm circumference, weight, height and length.
April 1 - 8	Post field phase discussions.
April 11, 12	UCLA Nutrition Assessment Unit members' departure.
April - July	Data analysis and report writing.

June 5 - 23	Report preparation assistance at UCLA by two designated Cameroonians.
June - August	Draft report review by Government of Cameroon.
September	Final report review, writing and presentation to Government of Cameroon.

APPENDIX 26 SURVEY PREPARATION (May - November, 1977)

Immediately after the initial UCLA visit to Cameroon, survey planning and preparation began in Cameroon under the direction of the Ministry of Economy and Planning. A special committee, the Technical Committee was formed to review all technical information of the survey. Work began on the survey questionnaire form and training manual. Technical and administrative planning also began at UCLA.

Survey planning was finalized when the UCLA staff arrived in October. The questionnaire forms and training manual were reviewed, modified and produced in Yaounde in French. The forms were field tested and approved by the technical committee. Some questions were eliminated because of feasibility problems under field conditions (See Appendix 14, Form Clarification). Sampling procedures were discussed with GURC statisticians and maps obtained. Height/Length boards were constructed in Yaounde and other anthropometric equipment was imported. Personnel, a training facility and vehicles were obtained for the survey, and other administrative and organizational matters resolved in coordination with the Government of Cameroon, USAID and UCLA.

APPENDIX 27 SURVEY TRAINING

Training took place primarily at the Census Bureau from November 7 to December 14, 1977. The chief of Nutrition Service, Ministry of Health and various staff members conducted training sessions in survey components such as sampling procedures, explanation of the socio-economic sections, etc. There were three stages of training for the anthropometric and blood taking procedures. First, the UCLA Unit Assistant Director trained the survey administrative staff. Next, with the assistance of the other members of the staff, the Chief of Nutrition Service led the training of the supervisors (November 7-19, 1977). Finally, the interviewers were taught the procedures led by the survey staff with the assistance of the supervisors (November 23 to December 14, 1977). The UCLA Diet Consultant led the training of the dietary segment.

Supervisor training lasted two weeks followed by interviewer training for three weeks. The usual schedule consisted of between three to five hours of training per day, Monday through Friday with a half workday on Saturday. There was approximately one hour of explanation for each anthropometric measurement followed by closely supervised practice in the training center.

Two technical and six standardization tests (eight separate sessions) were conducted in the training phase to insure quality control of the anthropometric measurements and other indices. Selection of the survey members was based on these tests. Two separate field trials took place in villages near Yaounde where the teams conducted interviews and practiced measurements.

Survey staff meetings were scheduled on nearly a daily basis, where extensive discussions were held on survey content, planning, preparation, logistics and administration. Technical procedures were periodically reviewed.

APPENDIX 28 QUALITY CONTROL

In addition to the tests administered in training, a final session of five standardization tests was administered after approximately three-fourths of the field phase was completed. As a further check on work quality, supervisors duplicated and recorded some of the team measurements in the field. Survey forms were checked for clarity and completeness by the teams and supervisors immediately after each child and site. Forms were submitted to the administrative staff at the staging area for further checking where specific site problems were immediately discussed with the supervisors and teams. The survey staff observed the interviewers' work in the field, solving problems and correcting procedures where necessary. Discussions were held regarding quality of work, both at the staging area and at the survey sites.

APPENDIX 29 LOGISTICS

a. Team Composition

There were 11 teams consisting of two interviewers for each team, and five supervisors who were responsible for specifically assigned teams for the duration of the survey. (Four supervisors for two teams each, and one supervisor for the remaining three.) At the beginning of the Northern survey sites, one supervisor was placed in charge of reviewing survey forms. Consequently, one interviewer was given a dual supervisor/interviewer role.

b. Field Phase

There were fifteen vehicles used during the survey. Survey members travelled together to each staging area (see section c.), before branching out to the survey sites. Team members slept in villages when more than one day was required to complete a site. Survey members frequently brought their own cooking facilities and food to the site. Beds were provided for all survey members by the survey.

School sleeping facilities were provided at some staging areas (e.g., Maroua and Bamenda).

Before the teams arrived in an area, the survey director and various other staff members visited government representatives where the survey's arrival was discussed, necessary arrangements made and questions answered. The survey staff coordinated activities at the staging area.

Two logistics officers were responsible for management and maintenance of survey supplies, equipment and vehicles. They were in charge of the drivers' and mechanics' activities, coordination of vehicles in the field, and assisted in management of survey finances. They often went to staging areas before the teams arrived in preparation for the next survey sites.

c. Field Phase Schedule (December 15 - March 31)

The total time for the field phase was 3 months. Survey field

work was suspended from December 23 to January 4 for the holidays. The following is a schedule of the field phase:

Yaounde — 13 sites (Dec 15-22) — Staging Area: Yaounde

Central South — 30 sites — Staging Area: Yaounde

South of Yaounde: January 3-9
North of Yaounde: January 11-17

East — 30 sites — Staging Area: Bertoua

Haut-Nyong and Lom-Et Djerem Departments: January 19-22
Kadey and Boumba-Ngoko Departments : January 23-28

North — 40 sites — Staging Areas: Ngaoundere, Maroua

Adamaoua Department : February 1-6
Benoue and Diamare Departments: February 8-12
Margui-Wandala, Mayo-Danay and Logone-Et-Chari Departments : February 14-18

North-West and West — 30 sites — Staging Area: Bamenda

North-West Province : February 27-March 3
West Province : March 4-9

South-West and Littoral — 30 sites

Both Provinces visited simultaneously : March 13-20

Douala — 17 sites — Staging Area: Douala

Douala : March 14-20
Special Group : March 15-25

APPENDIX 30: PARTICIPATING ORGANIZATIONS

The survey was administered through the Ministry of Economic Affairs and Planning (MIN.E.P.) which was the center of activity where office and storage space was provided. Personnel who participated on the survey from MIN.E.P. included the survey director, the nutrition planner, a programmer and a sampling consultant from the Census Bureau of MIN.E.P. All the Interministerial Committee meetings took place in MIN.E.P. and were chaired by the Director of Planning or the Chief of Human Resources Division. MIN.E.P. also provided twelve four-wheel drive vehicles with eight drivers for the entire survey. The remaining drivers were temporarily hired by the survey.

The Ministry of Health provided 19 interviewers who were all Health Assistants. The Ministry also provided five supervisors, four of whom were Health Technicians graduated from the University Center of Health Sciences (U.C.H.S.). In addition, the Ministry of Health provided a four-wheel drive vehicle during training. The Nutrition Service of the Ministry of Health provided its Chief of Service for the training phase, a state registered nurse as one of the five supervisors and an assistant diet consultant.

The Ministry of Social Affairs provided three interviewers who were all social welfare assistants.

The Ministry of Agriculture made available agricultural schools to the survey for lodging in the field (e.g. Maroua and Bamenda).

The University of Yaounde, through U.C.H.S. provided the Chairman of the Technical Committee, a hematologist, laboratory facilities and various technical assistance.

U.C.H.S. provided the saliva filter paper tests for the survey.

The National Office for Scientific and Technical Research (O.NA.RE.S.T.) provided the Chief Supervisor for the survey.

The Ministry of Armed Forces provided two mechanics for the field phase of the survey.

The United Nations Development Program (UNDP), and the United Nations International Childrens Fund (UNICEF) each provided one long-wheel based four-wheel drive vehicle.

Two former Peace Corps Volunteers were hired by the survey as logistic officers.

The Office of Nutrition, Development Support Bureau, Agency for International Development (A.I.D.) provided the funds for the UCLA Nutrition Assessment Unit personnel and consultants, survey equipment, planning, data preparation analysis and report writing. The Office of Nutrition and Africa Bureau, A.I.D., provided funds for conducting the survey in Cameroon from mid-October 1977 to mid-April 1978. Part of these in-country funds were also used for most of the funding of the two designated Cameroonians to work at UCLA for three weeks to assist in the report preparation.

U.S.A.I.D./Yaounde provided necessary administrative assistance and backup support and partial funding of the two Cameroonians to UCLA.

UCLA provided technical and administrative assistance in the following areas: establishment of survey methodology (anthropometric, clinical and laboratory indices) and quality control, training of survey personnel, field supervision, management of in-country survey funds, analysis and interpretation of results and provided the anthropometric equipment (see Appendix 19). The UCLA Nutrition Assessment Unit's Director made periodic visits to Cameroon for a total of four months, which included the initial three week country visit in April-May 1977. The Unit's Assistant Director was in Cameroon for six months and a diet consultant spent the first two months of the planning, training and initial part of the field phase of the survey in Cameroon.

The Government of Cameroon provided technical and administrative support and worked together with the UCLA technicians on all aspects of the survey. GURC established a special temporary committee, the Technical Committee, which reviewed all technical components of the survey. The names of the members of the Technical Committee appear in Appendix 31.

The following ministries and organizations were represented at the Interministerial Committee meetings:

Ministry of Economic Affairs and Planning (MIN.E.P.)
Ministry of Health
Ministry of Social Affairs
Ministry of Education
Ministry of Agriculture
National Office for Scientific and Technical Research (O.NA.RE.S.T.)
University of Yaounde (U.C.H.S.)
United Nations Development Program (UNDP)
United Nations International Childrens Fund (UNICEF)
United States Agency for International Development (USAID)
University of California at Los Angeles (UCLA)
World Health Organization (WHO)

APPENDIX 31 PERSONNEL

Personnel participating in the Cameroon National Nutrition Survey or in its preparation and analysis are listed below. Unless otherwise indicated, personnel are officials of the Government of Cameroon.

AWANTANG, Felix - M.P.H.	Nutrition Officer, USAID, Yaounde
AKAMBA, Madeleine	Survey Interviewer, Health Assistant Ministry of Health
BELONG, Philipe	Biochemist; Survey Assistant Diet Diet Consultant (Training Phase); Nutrition Service, Ministry of Health
BINGONO, Emmanuel	Survey Interviewer; Health Assistant, Ministry of Health
BITJONG-MBEY, Telesphore	Survey Interviewer; Health Assistant, Ministry of Health
BROWDY, Benjamin - Ph.D.	Statistical Consultant, UCLA School of Public Health
CHAIN, Jolie A.	Research Assistant, UCLA Nutrition Assessment, UCLA School of Public Health
CUMBERLAND, William G.- Ph.D.	Statistical Consultant, UCLA School of Public Health
EBAKISSE, Rene	Chargé of Studies, Ministry of Economy and Planning (MIN. E.P.)
ECKERSON, David	Member of Technical and Administrative Survey Staff; Nutrition Planner (New Transcentury Foundation), MIN. E.P.
EKANI, Isabelle	Nurse, Nutritionist; Technical Committee; Deputy Chief of Service, Nutrition, Ministry of Health
EKOTTO-ZE, Roger	Survey Interviewer; Health Assistant, Ministry of Health

Personnel (continued)

EMOK, Jean-Bosco	Survey Supervisor; Health Technician, Ministry of Health
FOTSO, Etienne	Technical Committee, Demographic; Assistant Chief of Service, Census Bureau, MIN. E.P.
GOLDMAN, Heather	Survey Diet Consultant, Nutritionist, UCLA School of Public Health
HENN, Albert - Dr.	Chief, Division of Health, Nutrition and Population, USAID, Yaounde.
HIE, Jean-Marc	Technical Committee, data analysis; Statistician; Chief, Service of Data Processing, Direction of Statistics and National Accounts, MIN. E.P.
JELLIFFE, Derrick B. - Dr. Professor	Principal Investigator, UCLA Nutrition Assessment Unit, UCLA School of Public Health
JELLIFFE, Patrice E.F.	Diet Consultant, UCLA School of Public Health
JUE JUE, Elisabeth	Survey Interviewer; Health Assistant, Ministry of Health
KAKOUANDE-NEREE, Rufine	Survey Interviewer; Health Assistant, Ministry of Health
KAPTUE-NOCHE, Lazare-Dr. Professor	Technical Committee, Survey Hematologist; Hematology Unit, University Center of Health Sciences (C.U.S.S.)
KAYA, Marie-Therese	Survey Supervisor; Principal Nurse, Nutrition Service, Ministry of Health
KILEM-MBILA, Daniel	Former Director of Planning, MIN. E.P.
KONWO, David	Survey Interviewer; Health Assistant, Ministry of Health

Personnel (continued)

KOEHRING, John W.	Director, USAID, Yaounde
KOUAM, Jean-Paul	Survey Interviewer; Health Assistant, Ministry of Health
LANTAM, Dan. N - Dr. Professor	Chairman Technical Committee; Former Coordinator Public Health Unit, C.U.S.S.; Director of C.U.S.S.
LOWE, Jean-Claude - Dr.	Technical Committee, Survey Technical Trainer; Chief, Nutrition Service, Ministry of Health
MAFOGANG, Marie-Noelle	Survey Interviewer; Social Assistant, Ministry of Social Affairs
MAKONGO, Jean	Survey Interviewer; Health Assistant, Ministry of Health
MANDENG, Patrice Dr. of Sociology	Chief, Human Resources Division, MIN. E.P.
MBASSI, Rene-Nicholas	Survey Interviewer; Health Assistant, Ministry of Health
MEDJO-NNA, David	Survey Supervisor; Health Technician, Ministry of Health
MEZO'O, Lucie	Survey Interviewer; Social Assistant, Ministry of Social Affairs
MINLEND-NYOBE, Joseph	Director of Planning, MIN. E.P.
MONEKOSSO, G.L. - Dr. Professor	Former Director, C.U.S.S.
MOMBO, Jean	Survey Interviewer; Health Assistant, Ministry of Health
MOTOUBO, Emilienne	Survey Interviewer; Health Assistant, Ministry of Health

Personnel (continued)

NEMETE, Theodore	Survey Supervisor/Interviewer; Health Assistant, Ministry of Health
NGANGO, Cecile - Dr.	Technical Committee; Chief of Service of Demography, (Promotion of Women's Affairs), Ministry of Social Affairs
NGUEMO, Albert	Survey Interviewer; Health Assistant, Ministry of Health
NGUIMATSIA, Francois	Nutritionist; Technical Committee; Chief Survey Supervisor; Nutrition Laboratory, O.NA.RE.S.T.
NINGOULOUBEL, Jean-Marie Thomas	Survey Supervisor; Health Technician, Ministry of Health
NJI, Agatha - B. Ed.	Home Economist/Nutritionist; Technical Committee; Women's Agricultural Projects, Ministry of Agriculture; Women's Action in Agriculture
NLATTE-EMANE, Samuel	Survey Interviewer; Health Assistant, Ministry of Health
OMOLOKO, Cecile	Nutritionist; Technical Committee; Nutritionist, C.U.S.S.
PIERSON, Rogers - Dr.	Vitamin A Consultant; Department of Ophthamology, Montreal General Hospital; McGill University, Montreal, Quebec, Canada
POYNOR, George - Dr.	Consultant for Office of Nutrition, AID. Poynor International Inc., Maryland, USA
SHORR, Irwin J. -MPH	UCLA Administrative and Technical Representative for Survey. Assistant Director, UCLA Nutrition Assessment Unit, UCLA School of Public Health, California, USA.

TABI-ABODO, Alphonse	Demographer; Survey Director; Assistant Charge of Studies for the Planning of Employment and Professional Training, MIN.E.P.
TABI-OYOA, Blandine	Survey Interviewer; Health Assistant, Ministry of Health
TANGYIE-SHU, Gerard	Technical Committee; Ministry of Education
TAYO, Jacob	Statistician; Technicial Committee, Survey Sampling Consultant; Chief, Service of Surveys, Census Bureau, MIN. E.P.
TCHINDA, Andre	Survey Interviewer; Health Assistant; Ministry of Health
TSHACHOUA, Roger	Survey Interviewer; Health Assistant, Ministry of Health
VAN EYKEN, Robert	Survey Logistic Officer; former Peace Corps Volunteer
YOUNG, Michele	Survey Logistic Officer, former Peace Corps Volunteer
ZERFAS, Alfred J. - Dr.	Survey Technical Advisor; Director UCLA Nutrition Assessment Unit, UCLA School of Public Health

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