Nigeria Food Consumption and Nutrition Survey 2001–2003

Summary

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Preface

This report summarizes the findings of the 2001–2003 Nigeria Food Consumption and Nutrition Survey (NFCNS) conducted by the International Institute of Tropical Agriculture (IITA), Ibadan in collaboration with the National Planning Commission (NPC), the Federal Ministry of Health, national institutes, and universities. Technical assistance was provided by the United States Department of Agriculture–Agricultural Research Services, Beltsville Human Nutrition Research Center–The Community Nutrition Research Group (CNRG). Funding was provided by the Mission of the US Agency for International Development, Abuja, and the US Agency for International Development, Bureau for Africa, Office of Sustainable Agricultural Development under the terms of grants no. 59-3148-0-013 and LAG-G-00-93-00042-00, the United Nation's Children Fund (UNICEF), and Helen Keller International (HKI).

The field data was collected between August and October 2001. The laboratory analysis for biochemical indices were compiled in 2002, data analysis and report writing was completed in September 2003.

Additional information on the Nigeria survey may be obtained from the Federal Ministry of Health, Nutrition Division, Federal Secretariat, Shehu Shagari Way, Maitama, Abuja; the National Planning Commission, Agriculture and Industry Department, National Committee on Food and Nutrition, Wuse Zone 1 Annex, Plot 409, Nouakchott St., Abuja; and the International Institute of Tropical Agriculture, PMB 5320, Oyo Road, Ibadan, Oyo State, Nigeria (Telephone 02 241 2626; Fax 02 241 2221; email: iita@cgiar.org). The summary report is for volume 1 of the survey report. Volume 2 will cover food consumption, nutrient intakes results, and focus group discussion results.

Acknowledgments

The International Institute of Tropical Agriculture (IITA) gratefully acknowledges the support from the Federal Government and the people of Nigeria. Special thanks go to the National Committee on Food and Nutrition in the National Planning Commission; the Nutrition Division in the Federal Ministry of Health; National Primary Health Care Development Agency; Federal Ministry of Agriculture, Natural Resources and Rural Development; various local government councils, universities, and the Principal Investigator/Project Coordinator, Dr B. Maziya-Dixon. It is difficult to envision the completion of the Food Consumption and Nutrition Survey 2001–2003 project without their contribution.

The survey was supported by the United States Agency for International Development grant no. 59-3148-0-013 and LAG-G-00-93-00042-00; and the United States Department of Agriculture grant no. 58-4001-0-F161. We are most grateful to Ms C. Jackson and Ms L. Adams for their unflinching support. Similarly, the contribution provided by United Nations Children's Fund and the support of Dr K. Varnomelingen and Prof. F. Onyezili. We are also grateful to Helen Keller International for their support.

Between October 2000 and September 2003, several individuals participated and spent time in planning and designing the survey, executing field operations, processing and analyzing the data, and producing this report. We would like to mention Dr Ellen Harris, Assistant Director, Beltsville Human Nutrition Research Center, for her technical input and guidance. We would also like to thank Dr S.O. Omojokun, Federal Ministry of Health, for facilitating the acquisition of the ethical clearance for the survey and Dr S. Benade, Director, Medical Research Council of South Africa, for his strategic contribution. The hard work and dedication of the entire survey team (zonal coordinators, state supervisors, interviewers, medical laboratory technologists, monitoring team, and resource persons) are highly appreciated.

Thanks are also due to Prof. E.B. Oguntona and Prof. S. Nokoe of the University of Agriculture, Abeokuta; Prof. I.O. Akinyele and Dr R.A. Sanusi, University of Ibadan, and Mr O. Owolabi, Ahmadu Bello University, who worked tirelessly with us in putting together this preliminary report.

Hartmann
Director General
International Institute of Tropical Agriculture
February 2004

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Introduction

Nigeria is the most populous country in Africa with a population of about 133 million. Approximately 75% of the population is women and children with over 70% residing and securing their livelihoods in the rural areas. Administratively, the country consists of 36 states, a federal capital territory, and 774 local government areas (LGAs). A three-tier government system is being implemented: federal, state, and local government levels. This administrative structure is meant to promote development at the community level. Nigeria is a nation with diverse cultures, ethnicity, and religious and political interests. There are estimated to be over 250 ethnic groups. The largest groups are Edo, Fulani, Hausa, Ibibio, Idoma, Igbo, Ijaw, Kanuri, Tiv, and Yoruba.

Background

When attempts are made to assess the prevalence of malnutrition, globally, regionally, or nationally, the first problem encountered is the paucity of available data. The data being currently used in nutrition circles in Nigeria are fairly old and drawn from different surveys of diverse or different methodologies and techniques, or notably focused on specific aspects of nutrition. Some of such data come from the Nigeria demographic and health survey (NDHS 1990), the Participatory information collection study (PIC 1993), the Multiple indicator cluster survey (MICS 1995), and the Benchmark survey (BMS 1996), among others. Some of these are often confined to a segment of the population, which may not include all groups most at risk. Inevitably, the design of any relevant action plan to mitigate the problem of micronutrient deficiencies will be constrained by not knowing how many people are affected, who they are, their location in the country, and to what extent they are affected.

Even the most recent findings of the Multiple indicator cluster survey (MICS 1999), the Baby-friendly hospital initiative impact evaluation (BFHI 1999), and the National demographic and health survey (NDHS 1999) fall short of covering all the relevant aspects of nutrition. The shortcomings of some of these surveys are that they had objectives other than nutrition but included some of the nutrition indicators as secondary foci. Others fell short technically because of the difficulties of combining biochemical techniques with participatory social sector and scientific methods in eliciting holistic nutrition data.

Generally, most of these surveys that attempted to address nutrition indicators used classical techniques that had little or no community participation, a key aspect of current techniques for eliciting information and feedback to beneficiaries as active participants in the development process. Further, the changing socioeconomic conditions have not only dimmed the relevance of these information sources but also made some of them obsolete and sometimes misleading as programming and planning tools.

More specifically, limited studies have been conducted in Nigeria to determine the prevalence of micronutrient deficiencies. Available data from smaller scale studies indicated that micronutrient deficiencies (vitamin A and Iron, among others) were evident in many subpopulations. Data available

on zinc deficiency, for example, are minimal. Although some progress has been made in combating micronutrient deficiency, urgent action is needed to accelerate the efforts to bring micronutrient malnutrition under control. Assessment of the micronutrient problem and knowledge on nutrients supplied by the diet can play an important role in accelerating the efforts for combating micronutrient malnutrition.

It is therefore pertinent to undertake a holistic national survey to generate, in a participatory manner, current data on all aspects of nutrition, covering food security, health practices, and care for both planning and programming in Nigeria. The information should also be useful to all agencies with primary and secondary mandates and foci in nutrition.

Goal

The overall goal of the Food consumption and nutrition survey (FCNS) is to assess the prevalence and spread of micronutrient deficiencies and determine the nutritional status and nutrient intakes of the rural and urban populations in Nigeria.

Specific objectives

- Determine the level of food insecurity, nutritional status, and nutrient intakes of the rural and urban populations in Nigeria.
- Assess the vitamin A, Iron, zinc, and iodine status of under-5 children, mothers, and pregnant women from food intake and biochemical indices.
- Elicit from household and communities information on home health practices, food processing, and preference.

Survey design and sampling

The 2001 FCNS was a national survey from which data on the nature and extent of food security, food and nutrient intakes, and anthropometric and biochemical parameters were collected and used to determine the nutritional status of women and children in rural and urban populations in Nigeria. The survey design targeted the entire federation of Nigeria. Because of the obvious and documented relationships between (a) the agroecological zone (AEZ) and type of farming systems; (b) crops grown and foods consumed; and (c) type of food consumed (intake) and micronutrient deficiencies, the federation of Nigeria was initially stratified according to major AEZ and predominant food crops within AEZ (Figs 1 and 2).

Twelve states, representing a third of the states of the federation were randomly selected. A total of 72 LGAs, 216 enumeration areas (EA), and 30 households from each EA were selected from the selected states, making a total of 6480 households. A subsample of 1080 pregnant women was also included.

Survey tools and manuals

The main data collection instrument (questionnaire) had several sections: questionnaire identification, household/demographic information, socioeconomic characteristics of households, food security (food availability and affordability, food consumed away from home, and food-related coping strategies), 24-hr dietary recall, health and care, anthropometry, and biochemical measurements. The following manuals were developed: Survey design and operations manual, Interviewers' manual, Food instruction booklet, and other survey supporting documents.

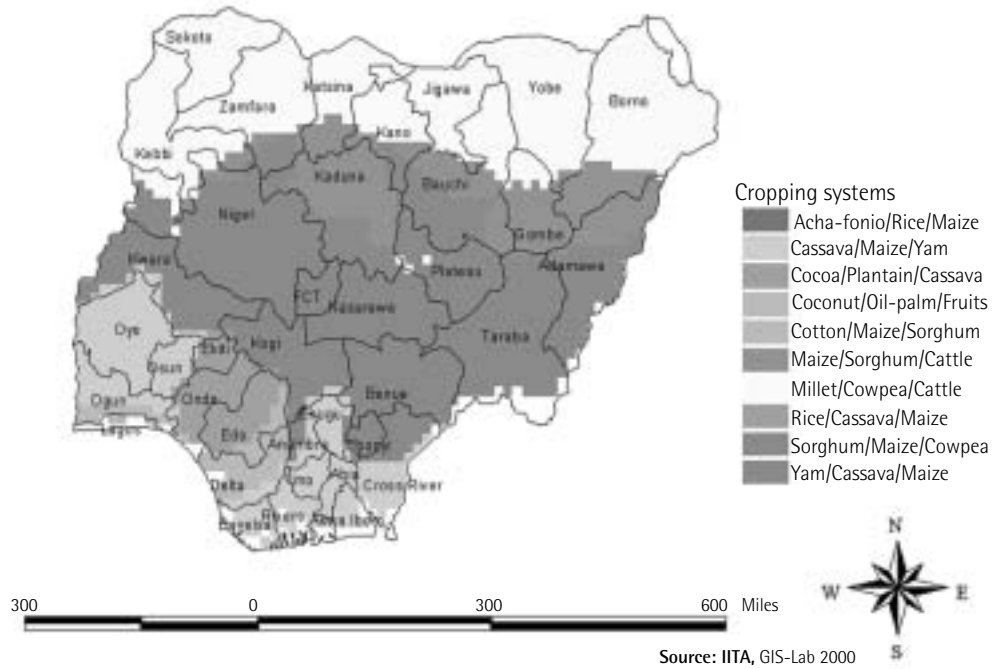

Figure 1. Nigeria showing the different principal food crops (PFCs).

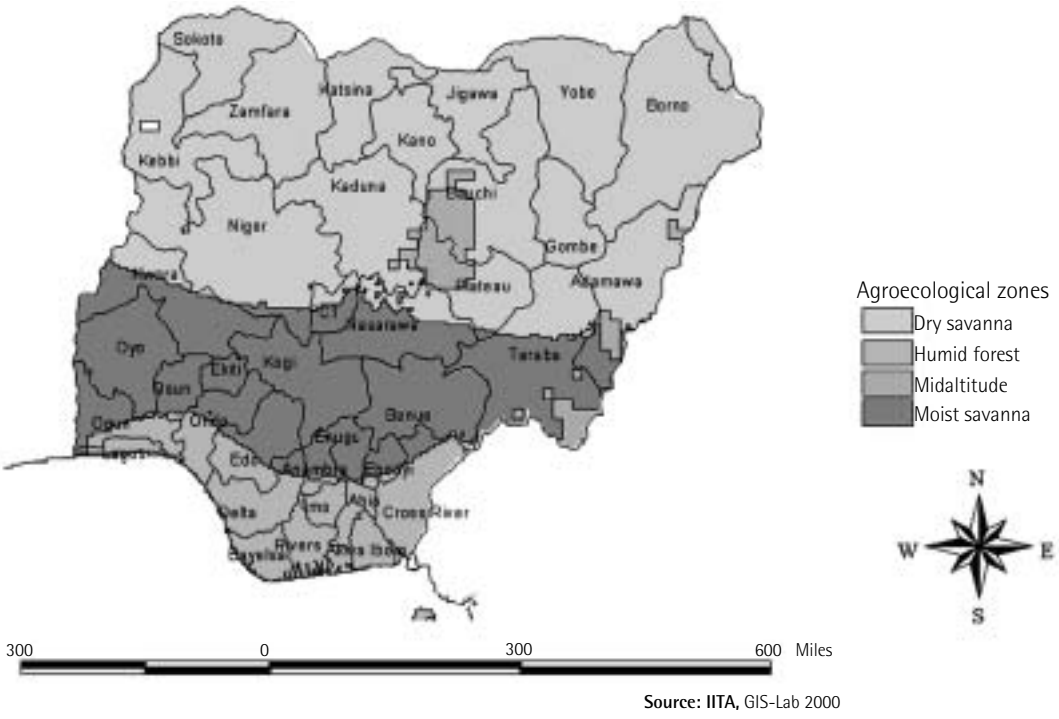

Figure 2. Nigeria showing the different agroecological zones.

The procedures for data collection involved:

- Visits to community leaders to introduce the survey.
- Mobilization of communities in support of the survey.
- Numbering and listing of households and use of maps and local guides to locate sampled households and verify that they met the selection criteria.
- Administering the household questionnaire to all selected households.
- Conducting the 24-hr dietary recall with the selected households.
- Collecting biochemical samples from mothers and their children under 5 used for the 24-hr dietary recall.
- Conducting the 24-hr dietary recall and collecting biochemical samples from a subsample of pregnant women.
- Conducting focus group discussions.
- Collecting food and salt samples.

A critical component of the FCNS was the food intake portion of the 24-hr dietary recall questionnaire. Respondents were asked to recall what they had eaten the day before the interview. A guidebook called the Food instruction booklet (FIB) was used to aid interviewers in obtaining detailed information on the types of food eaten and the quantity. Results from analysis of the data collected will be presented as volume 2 of the survey report.

The research team in each state was made of a state supervisor and four interview teams with two interviewers per team.The medical laboratory technologists were one pair of the interview team who were responsible for biological sample (blood and urine) collection and processing. Data collection took place between August and October 2001.

Laboratory analysis of biological and salt samples

The vitamin A and E status of children under 5, their mothers, and pregnant women was assessed by determining the serum retinal and tocopherol concentrations. Iron status was assessed by determination of serum ferritin while serum zinc was used in determining zinc status. Urinary iodine concentration was used to assess the iodine status of children under 5, mothers, and pregnant women. All samples, including salt samples, were analyzed at the Medical Research Council, Tygerberg, Capetown, South Africa.

Data sets processed for analysis

Variable	Children under 5	Mothers	Pregnant women
Household questionnaire	N/a	5325	960[1]
Anthropometry	5028	N/a	N/a
Vitamin A	3027	3148	684
Vitamin E	3027	3148	684
Iron	3091	3949	829
Zinc	2725	3779	795
Iodine	2428	3104	660
Body mass index	N/A	5031	N/A

[1]Refers to questionnaire for 24-hr dietary recall.

Implementation

The survey was implemented by the International Institute of Tropical Agriculture (IITA) in collaboration with the Federal Government of Nigeria as a component of the project on "Micronutrient enhancement of maize and plantains in Nigeria: a sustainable approach to mitigate hidden hunger" which is funded by the USAID-Mission, Abuja and USDA-ARS. Researchers from national universities and other institutions were selected as zonal coordinators and state supervisors. Interviewers were recruited from each state.

Household/demographic characteristics

The section presents information on selected socioeconomic and demographic characteristics of the households studied. Some of the characteristics presented are age, sex, education, primary occupation of household heads, primary sources of energy and water available to households, methods of refuse disposal, types of toilets used, and estimated annual household income. Information on these characteristics provide the socioeconomic context for explaining and understanding issues on household food security and food consumption patterns, status of maternal and child health care, malnutrition, and micronutrient status of mothers and children under 5.

Age distribution of head of households

- At the national level, 44.5% of the heads of household were in the 35–50 year age group, followed by 38.3% of those in the 18–34 age group (Table 1). Twenty-seven percent of the heads of households were above the age of 50.
- The dry and moist savanna zones were similar for the age group 18–34 when compared to the humid forest.
- The medium sector had the highest percentage (41.5%) of heads of household in the 18–34 age group.

Table 1. Percentage age distribution of households' heads: national and by AEZ and sector.

Age group	National	Dry savanna	Moist savanna	Humid forest	Rural	Medium	Urban
18–34	38.3	40.8	39.7	35.6	37.1	41.5	32.5
35–50	44.5	44.6	46.1	43.5	44.0	43.5	49.1
51–64	14.4	13.2	12.6	16.6	16.1	12.8	14.7
> 64	2.8	1.6	1.7	4.4	2.9	2.2	3.7

Household size

- The demographic characteristics of the households are presented in Table 2. About half of the households (49%) had between three and five persons while 35.1% of the households had between six and eight persons, with about 11% having between nine and 11 persons.
- This trend was consistent across the AEZ, though there were more households with over 11 members in the moist savanna (8%), intermediate (4.7%) in the dry savanna, and low (2.2%) in the humid forest.
- Across the sectors, there were more households with between nine and 11 persons in the rural and urban sectors than in the medium sector. Only 5.7% of households in the urban sector had over 11 persons.

Table 2. Percentage distribution of household size: national, AEZ, and sector.

		AEZ			Sector		
Household size	National	Dry savanna	Moist savanna	Humid forest	Rural	Medium	Urban
1–2 persons	0.6	0.4	0.1	1.0	0.8	0.3	0.3
3–5 persons	48.9	49.0	47.4	50.0	48.2	51.1	47.3
6–8 persons	35.1	33.7	33.9	36.9	34.9	35.7	34.6
9–11 persons	10.8	12.2	10.7	9.8	11.5	9.0	12.0
>11 persons	4.6	4.7	8.0	2.2	4.6	3.9	5.7

Percentage distribution of household members by age group

The distribution of household members by age group at the national level is presented in Table 3. From a total sample of 31 374 persons, slightly over 50% of the persons were 0–14 years old with 25.1% being children under 5. Those between 15 and 34 years old were 30.8%. Approximately 1% of the population was over 65.

Table 3. Percentage distribution of household members by age group at the national level.

Age group	National
Under 5	25.1
5–14 years	27.6
15–24 years	15.8
25–34 years	15.1
35–65 years	15.8
Over 65 years	0.7

Educational levels of household heads

As part of the basic socioeconomic characteristics of the respondents, information on the educational levels of household heads was collected. Nationally, 48.7% of the respondents had no form of education (Fig. 3). This suggests a literacy rate of slightly over 50% among household heads. Most of the literate household heads did not complete primary school and there was a progressive decline in the percentage of literate household heads as the educational level rose.

The percentage of household heads without any form of education was 57.5% in the dry savanna, 57.7% in the moist savanna, and 35.4% in the humid forest zone. While the same trend of declining percentage of literate household heads as educational level rises was consistent across the zones, the humid forest zone had the highest percentage of household heads in all the literate categories (Fig. 4).

Even across the sectors the same trend was evident with the lowest percentage of illiterate household heads in the urban sector (44.62%) and the lowest percentage of household heads that had post-secondary education in the rural areas (0.8%).

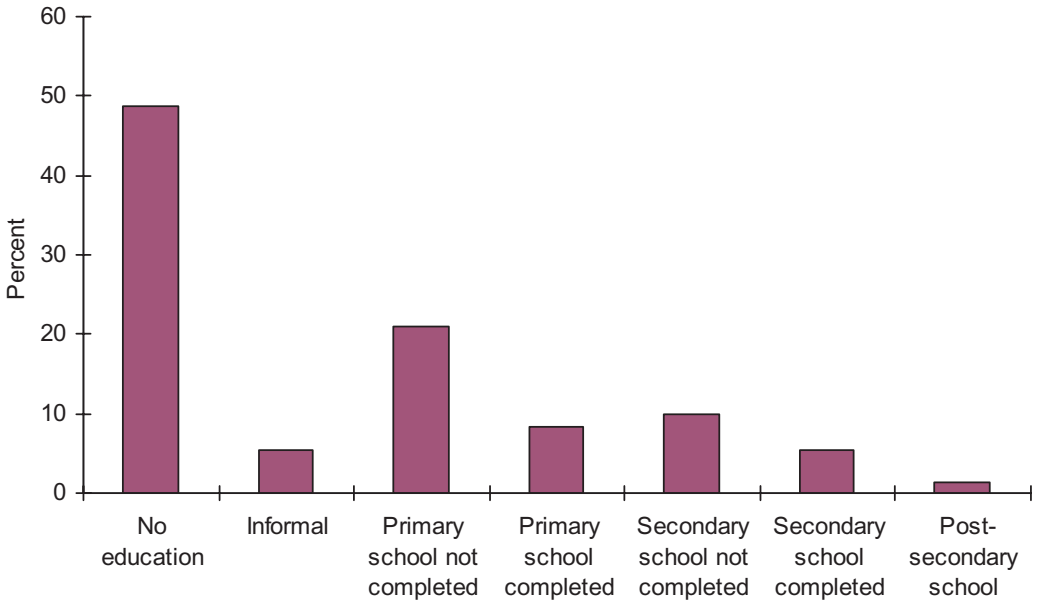

Figure 3. National percentage distribution of the educational levels of household heads.

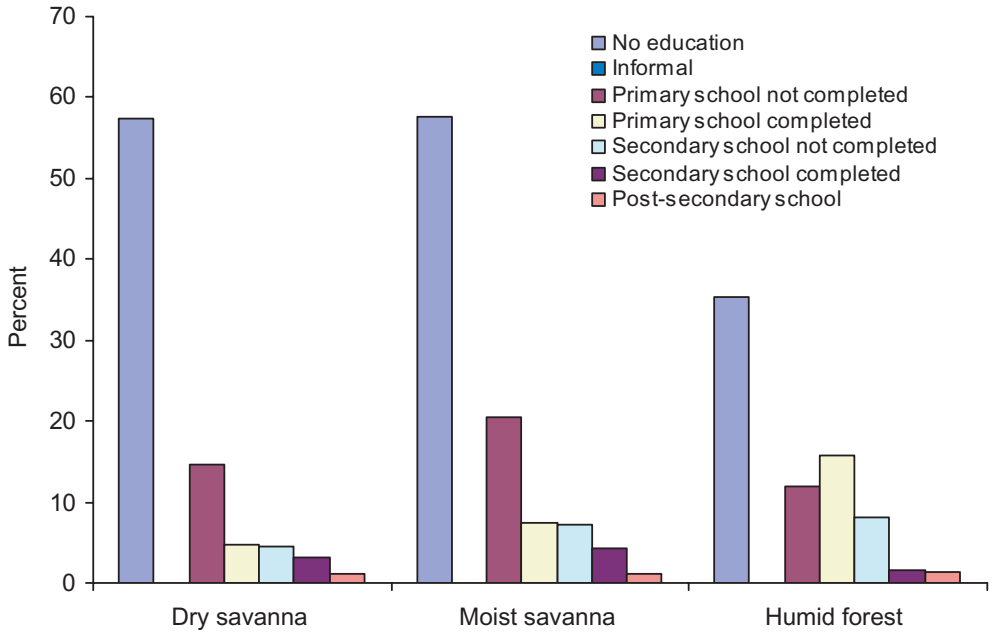

Figure 4. Percentage distribution of educational level of household heads by AEZ.

Socioeconomic characteristics of households

Primary occupation of head of household

Over 40% of household heads were farmers (Fig. 5) with about 15% each as traders, civil servants, and artisans. Fishing was the occupational category with the lowest percentage of household heads (1.3%).

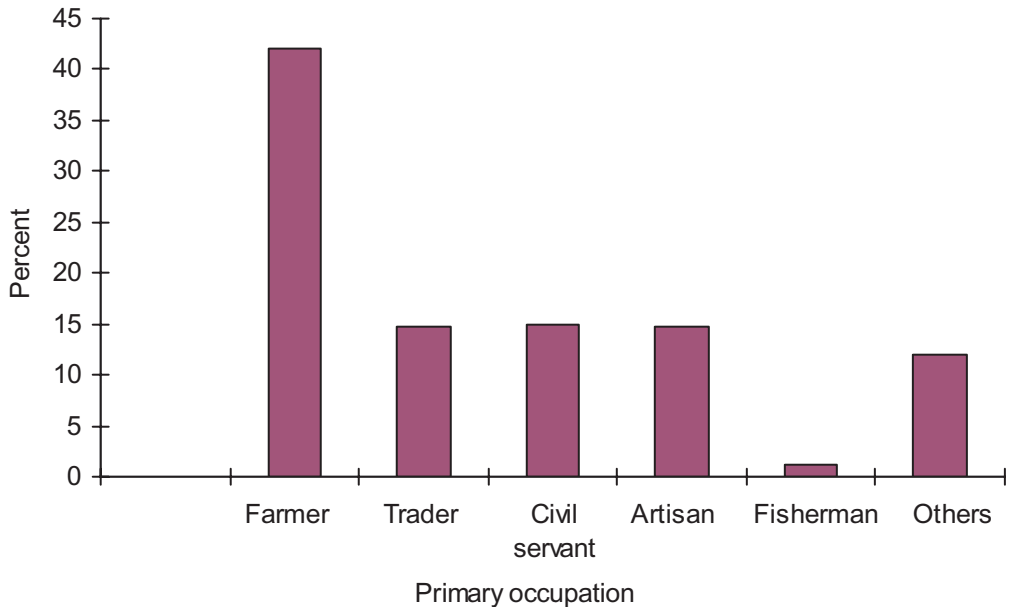

Figure 5. Percentage national distribution of primary occupation of household heads.

Marked differences were observed across the zones. While over 50% of the household heads in the dry and moist savanna were involved in farming, only 25% were involved in farming in the humid forest zone.

About 15% of household heads were civil servants across the zones; artisans were disproportionately higher in the humid forest zone (24%), about half in the moist savanna zone (11.4%), and 6.2% in the dry savanna zone (Fig. 6).

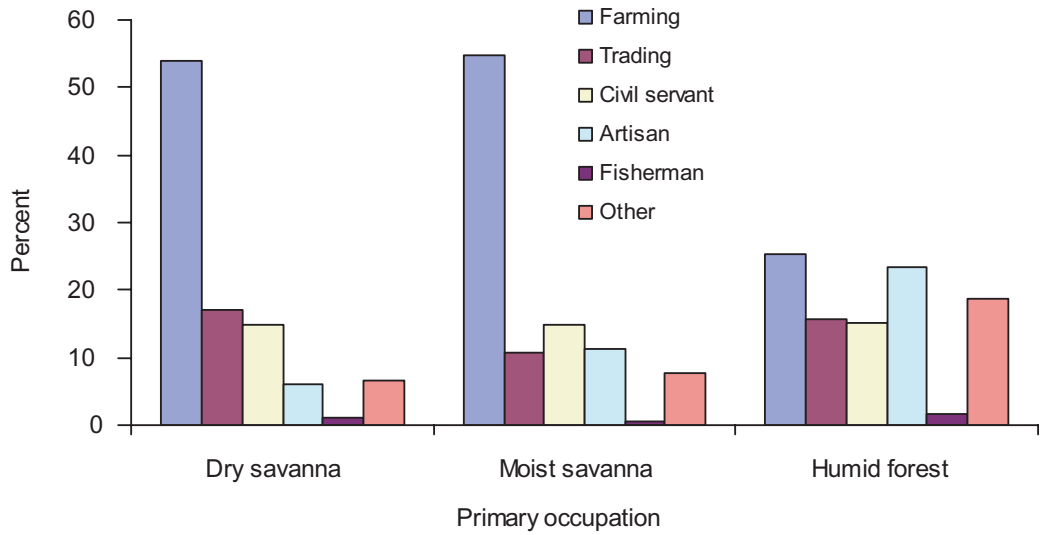

Figure 6. Percentage distribution of household heads according to type of primary occupation by AEZ.

When the data were disaggregated by sector, they showed that the highest percentages in all the occupational categories, with the exception of trading, were found in urban areas. While most civil servants reside in urban areas, it is interesting to note that the majority of the fishermen (18.4%) were located in the urban areas, 16.3% in the medium, and 11.8% in the rural.

Primary energy source

There are a variety of community-level characteristics that may be associated with food security for households in that community. At the community level, infrastructure is a major determinant of food security. Indicators of infrastructure development are proximity to the market, whether or not the community has electricity, availability of medical clinics in the area, and availability of pipe-borne water.

- The predominant source of energy was electricity used by about 38.4% of households, thus implying that about 62% of the households did not have access to the national electricity supply. Access to other sources of electricity was, however, very low with less than 1% of households using personal generators and 3.5% utilizing rural electricity.
- About 75% of the households did not have electricity in the dry savanna, 45% in the humid forest, and 57% in the moist savanna. Access to national electricity power supply was highest in the humid forest zone (48.3%) and least in the dry savanna zone (23.4%).

Households' access to primary sources of water

The most common source of water available to households nationally was the well (37%) as shown in Figure 7. Next to this source were springs or rivers (24%), and pipe-borne water (20%). The use of boreholes (11.8%) was becoming increasingly popular, with only about 5% depending on rain as the primary source of water.

Wells were the main source of water in the dry and moist savanna and the least common in the humid forest zone. Springs and rivers constituted the major sources of water in the humid forest zone with the use of boreholes disproportionately higher there than in other zones.

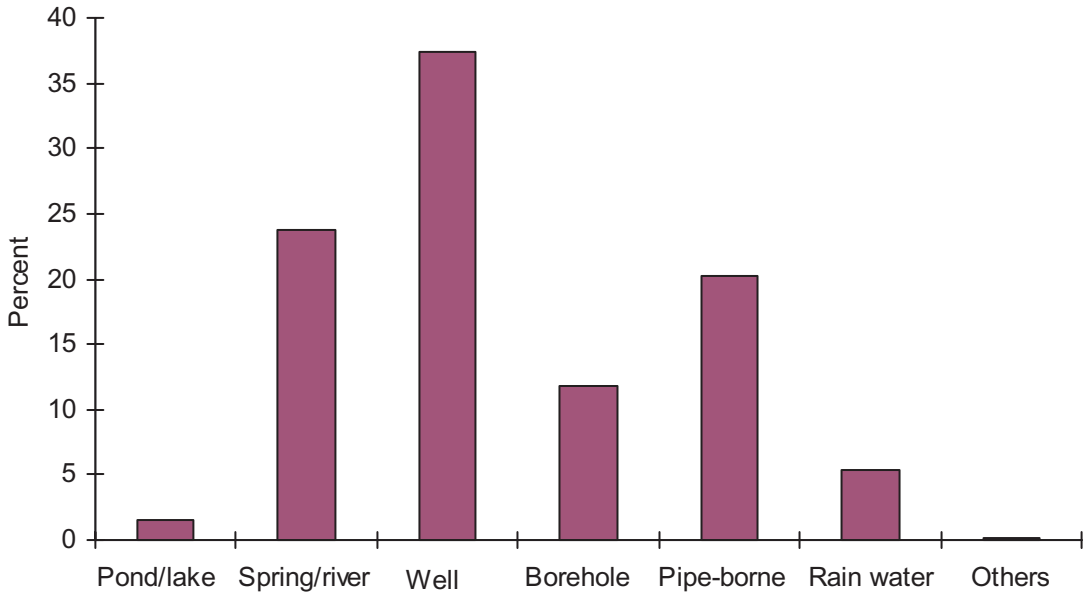

Figure 7. Percentage national distribution of primary source of water for drinking and other domestic uses.

The primary sources of water differed markedly across the sectors. Wells were the main source in the rural (44%) and medium (40%) areas, with pipe-borne water as the main source in the urban areas. Rainwater was least used in urban areas (2.9%).

Households' primary methods of refuse disposal

The predominant pattern of refuse disposal among households was the use of the bush (78%). Less than 2% used the city service nationally.

Across the zones, this trend was consistent, though the use of the bush and other methods was highest in the humid forest zone. The use of refuse dumps was highest in the moist savanna zone (27%); city service was about 2% in the dry savanna and humid forest zones, and least in the moist savanna zone (1%).

The predominant method of refuse disposal in the rural and medium areas (over 80%) is the bush. Over 50% of urban households also used this method. Refuse dumps were the next method commonly used across the sectors. While the city service is the least used method, its usage was essentially an urban phenomenon (7%).

Main type of toilet used by households

Results obtained indicated that over 65% of households used pit latrines, with about one-quarter using the bush (Table 4). Only about 5% of the households used the water closet system.

While the use of pit latrines was predominant and consistent across the zones and sectors, over 80% of the households in the dry savanna used pit latrines, 59.2% in the moist savanna, and 58.2% in the humid forest. Rivers were used only in the humid forest zone.

The use of the bush was, however, lower in the urban areas (11%) than in the rural (30%) and medium (27%) areas.

Estimated annual household income (per thousand Naira)

The annual estimated household incomes were presented in six categories which are:

5–14.99
15–24.99
25–34.99
45–54.99
55–and above

Table 4. Types of toilets (%) used by households at the national, agroecological zone, and sector levels.

Category	Bush	Pit latrines	VIP latrines	Water system	Rivers	Others
National	25.0	65.4	1.4	5.2	2.7	0.2
AEZ						
Dry savanna	18.1	80.2	1.4	0.4	0.0	0.0
Moist savanna	33.5	59.2	1.3	6.0	0.0	0.1
Humid forest	25.0	58.2	1.6	8.3	6.5	0.4
Sector						
Rural	30.2	65.4	0.9	1.4	2.1	0.1
Medium	27.5	66.8	1.0	2.5	2.3	0.1
Urban	11.3	63.4	3.3	16.7	4.8	0.5

While over 10% of the households had an estimated annual income of less than 15 000 Naira/annum, about 15% of the households estimated their annual incomes as less than 35 000 Naira. The modal income category was between N55 000 and above (31%).

Across the AEZ, most of the households had estimated annual incomes of N55 000 and above, though the percentage of households in this group was highest (35%) in the humid forest zone. Also across the sectors, most of the households had estimated annual incomes of N55 000 and above with 21.4% in the rural sector, 32.2% in the medium, and 45.5% in the urban sector.

Food security

Food availability and affordability

Households are food secure when they have year-round access to the quantity and variety of foods their members need to lead active and healthy lives. At the household level, food security refers to the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all its members. The nutritional status of each member depends on several conditions: the food available must be shared according to individual needs; the food must be of sufficient variety, quality, and safety; and each household member must have a good health status in order to benefit from the food consumed. The objective of this section is to analyze the socioeconomic and demographic factors that determine households' food security level as measured by the joint availability and affordability of food over a period of 12 months.

Availability and affordability of major staples and nonstaples

Food availability and affordability constitute the major indices of food security. During the survey, respondents were requested to indicate the number of months within a period of 12 months that different food items were available or affordable to their households.

Nationally, most households indicated that staple foods were available to them for 9–12 months (Table 5). It was observed that especially within the 9–12 months range, the percentage of households that could afford the foods available was usually lower than the percentage that indicated availability.

The most available staple foods that are major sources of energy (calories) were rice (14.8%), cassava (12.9%), maize (10.6%), and yam (10.1%). Cowpea, groundnut, and soybean are major sources of plant proteins. Cowpea was the most available, followed by groundnut, and soybean.

Table 5. Percentage distribution: availability and affordability of major staple foods at the national level.

	1–4 months		5–8 months		9–12 months	
Staple food	Available	Affordable	Available	Affordable	Available	Affordable
Cassava	1.58	2.87	2.09	2.30	12.90	11.04
Cowpea	0.08	0.68	0.16	1.14	10.75	9.47
Groundnut	0.31	1.12	0.77	1.39	9.31	8.11
Maize	6.11	7.81	2.62	3.00	10.62	8.66
Plantain	0.21	1.01	0.98	1.33	4.74	3.50
Rice	0.16	1.45	0.21	1.19	14.83	12.30
Sorghum	0.06	0.57	0.19	0.94	6.03	4.80
Soybean	0.02	0.31	0.18	0.28	2.87	2.12
Yam	0.50	2.14	1.52	3.10	10.13	6.80

For affordability, the same trends were observed. Rice was the most affordable, followed by cassava, maize, and yam. For legumes, cowpea was the most affordable followed by groundnut and soybean.

Nationally, most households indicated that nonstaple foods are available to them for 9–12 months (Table 6). The most available nonstaple foods were meat products (14%), nonleafy vegetables (13%), leafy vegetables (9.5%), and fats and oils (8.9%). The same trend was observed for affordability. The least available and affordable were banana, bakery products, fruit, and beverages.

Within the 9–12 month period, rice was more available (16.4%) and affordable (13%) in the dry savanna zone, followed by maize at 12.7% (availability) and 10.5% (affordability), and sorghum at 11.6% (availability) and 10.3% (affordability). Cassava and yam were the least available and affordable.

In the dry savanna, the most available nonstaple foods were meat products (12.4%), nonleafy vegetables (15.4%), dairy products (8.2%), and fats and oils (10.6%). The same trend was observed for affordability. The least available and affordable were bakery products, fruit, and beverages.

In the moist savanna for the 9–12 month period, rice was more available (12%) and affordable (9%), followed by cassava and maize (11%) and yam (10.5%). Soybean, plantain, and sorghum are the least available and affordable. Among legumes, cowpea was the most available and affordable followed by groundnut and soybean.

The most available staple foods that are major sources of energy (calories) were rice (15.7%), cassava (18.0%), maize (9.3%), and yam (12%) in the humid forest. Cowpea, soybean, and groundnut are major sources of plant proteins. Cowpea was the most available, followed by groundnut. Soybean was the least available. For affordability, the same trends were observed. Cassava was the most affordable, followed by rice, yam, and maize. For legumes, cowpea was the most affordable followed by groundnut.

In the humid forest zone, the most available nonstaple foods were meat products (15.2%), nonleafy vegetables (11.8%), leafy vegetables (10.8%), fats and oils (8.0%), and fish (8.5%). The same trend was observed for affordability. The least available and affordable were banana, bakery products, fruit, and dairy products.

Table 6. Percentage distribution: availability and affordability of major nonstaple foods at the national level.

	1–4 months		5–8 months		9–12 months	
Nonstaple food	Available	Affordable	Available	Affordable	Available	Affordable
Bakery prod.	0.00	0.26	0.02	0.35	4.29	3.82
Banana	0.22	0.77	0.55	0.74	2.66	1.93
Beverages	0.01	0.37	0.04	0.47	5.60	4.17
Dairy prod.	0.11	0.88	0.30	0.79	7.41	5.56
Fats and oils	0.02	0.53	0.12	0.57	8.89	7.84
Fish	0.13	0.48	0.16	0.53	6.91	6.30
Fruits	7.83	10.30	5.59	5.00	5.10	3.55
Leafy veg.	1.24	1.96	1.94	2.10	9.53	8.79
Meat prod.	0.26	2.88	0.80	2.01	14.00	9.42
Nonleafy veg.	1.50	2.42	1.40	1.83	12.96	11.91

Frequency of consumption of major staple food crops

Presented here are the overall frequencies of consumption of major staples and nonstaples nationally, by AEZ and by sector, based on total responses. Information on amount consumed will be presented in volume 2. The major staples were cassava, cowpea grain, groundnut, maize, plantain, rice, sorghum, soybean, and yam. The nonstaples broadly were bakery products, banana, beverages, dairy products, fats and oil, fish, fruit, leafy and nonleafy vegetables, and meat.

Table 7 shows that, overall, maize was the frequently consumed staple with 20% of the studied population consuming it at various numbers of times in a week, either as maize grain that had been processed to flour or as green maize.

Other staples with a high frequency of consumption included cassava (16.5%), rice (14.9%), cowpea grain (11.8%), groundnut (11.1%), and yam (10.4%). The staples with relatively lower frequencies of consumption were sorghum (6.6%), plantain (5.9%), and soybean (2.6%).

Table 7. Frequency of consumption of staple food crops at the national level.

Staple food crop	N[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Cassava	6708	0.63	6.85	4.61	4.45	16.5
Cowpea grain	4805	0.31	4.31	4.45	2.77	11.8
Groundnut	4520	0.18	4.07	3.58	3.31	11.1
Maize	8170	0.68	6.15	6.35	6.96	20.1
Plantain	2402	0.63	3.45	1.29	0.55	5.9
Rice	6048	0.52	5.89	5.26	3.24	14.9
Sorghum	2682	0.08	1.22	2.19	3.12	6.6
Soybean	1036	0.25	1.48	0.47	0.35	2.6
Yam	4209	0.45	4.92	3.29	1.72	10.4

[1]Number of observations

Generally, and for most foods, less than 1% of the studied population did not consume them at all within the week. Most of the foods were usually consumed between once and twice a week and up to three or four times weekly.

Consumption over four times in a week which could indicate that the foods were consumed almost every day in a week substantially reflected foods most preferred by households or those that were available to them and affordable and of the utmost importance for their food security and nutrition.

The frequency of consumption of maize was consistently high as 7% of the studied population consumed it almost every day. The wide range of food uses of maize, especially as green maize, a major component of complementary foods in most Nigerian households and as a common beverage in the two major AEZ might have accounted for the indicated frequency of consumption.

After maize, the most frequently consumed food was cassava, followed by rice and sorghum. Among the staple legumes, groundnut had the highest frequency of consumption followed by cowpea. A considerable amount of yam was consumed once or twice a week. Although yam is another major source of energy for most Nigerian households, it was consumed less often than cassava.

Maize was consistently the most frequently consumed staple as 18.8% of households in the dry savanna, 21.9% in the moist savanna, and 19.8% in the humid forest consumed it at various times within the week (Table 8).

Table 8. Frequency of consumption of staple food crops by agroecological zone.

Dry savanna

Staple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Cassava	1552	0.25	9.61	4.01	0.4	14.3
Cowpea grain	1541	0.09	4.39	5.27	4.41	14.2
Groundnut	1373	0.13	5.48	4.62	2.39	12.6
Maize	2045	0.16	7.1	5.83	5.71	18.8
Plantain	59	0.01	0.33	0.14	0.06	0.5
Rice	1768	0.28	7.09	5.11	3.78	16.3
Sorghum	1291	0.08	1.84	3.57	6.37	11.9
Soybean	310	0.27	1.72	0.52	0.34	2.9
Yam	943	0.28	6.37	1.73	0.28	8.7

[1]Number of observations.

Moist savanna

Staple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Cassava	1801	0.31	7.76	4.26	3.41	15.7
Cowpea grain	1207	0	3.62	4.07	2.86	10.6
Groundnut	1209	0.08	3.62	3.42	3.45	10.6
Maize	2511	0.03	4.56	7.77	9.59	21.9
Plantain	423	0.18	2.53	0.75	0.23	3.7
Rice	1498	0.23	4.68	4.9	3.28	13.1
Sorghum	1095	0.03	2.04	3.78	3.72	9.6
Soybean	461	0.22	2.39	0.77	0.66	4.0
Yam	1238	0.06	4.49	4.14	2.12	10.8

Humid forest

Staple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Cassava	3355	1.06	4.63	5.18	7.51	18.4
Cowpea grain	2057	0.62	4.69	4.21	1.75	11.3
Groundnut	1938	0.27	3.51	3.05	3.78	10.6
Maize	3614	1.39	6.57	5.78	6.06	19.8
Plantain	1920	1.28	5.89	2.31	1.04	10.5
Rice	2782	0.84	5.93	5.58	2.89	15.2
Sorghum	296	0.12	0.35	0.36	0.80	1.6
Soybean	265	0.25	0.77	0.26	0.17	1.5
Yam	2028	0.79	4.32	3.69	2.31	11.1

[1]Number of observations.

The proportion of the overall respondents that consumed cassava increased as one moved from the dry savanna zone (14.3%), through the moist savanna (15.7%), to the humid forest (18.3%). Rice was most frequently consumed in the dry savanna zone (16.3%) while 11.9% of households indicated that they consumed sorghum at various times within the week, 9.6% in the moist savanna, and 1.6% in the humid forest.

The consumption of yam increased from 8.7% in the dry savanna zone to 10.8% in the moist savanna, and 11.1% in the humid forest. While less than 1% of the households consumed plantain at various times within the week, it was consumed by over 10% of households in the humid forest zone.

Among the staple food crops (major source of carbohydrate) for the dry savanna, the most frequently consumed staple food crop (over four times a week) was sorghum followed by maize and rice. For the moist savanna zone, it was maize followed by sorghum, cassava, and rice while in the humid forest it was cassava, maize, rice, and yam.

Among the legume staple food crops (major source of plant protein), in the dry savanna, the most frequently consumed legume was cowpea, followed by groundnut. In the moist savanna it was groundnut, followed by cowpea. The pattern of frequency of consumption in the humid forest was similar to that in the moist savanna.

Although maize was the most frequently consumed staple alongside other major staples across the sectors, overall, there were no marked differences in the frequencies of consumption of the major staples (Table 9).

However, the proportion of households that consumed rice almost every day (over four times weekly) was twice as high in the urban areas (5.2%) compared to rural areas (2.4%). Also, households that consumed yam three to four times in a week increased minimally from 2.9% in the rural areas to about 3.1% in the medium sector and 4.4% in the urban sector.

Those residing in rural areas consumed maize, cassava, groundnut, and sorghum more than four times a week. Those in the medium sector consumed maize, cassava, groundnut, sorghum, and cowpea; while those in urban areas consumed maize, rice, cassava, groundnut, and cowpea.

Table 9. Frequency of consumption of staple food crops by sector.

Rural

Staple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Cassava	2881	0.51	7.00	4.73	4.80	17.0
Cowpea grain	1973	0.33	4.47	4.37	2.50	11.7
Groundnut	1902	0.18	4.14	3.55	3.38	11.3
Maize	3430	0.57	6.13	6.16	7.42	20.3
Plantain	965	0.59	3.29	1.24	0.60	5.7
Rice	2497	0.48	6.86	4.99	2.44	14.8
Sorghum	1170	0.03	1.06	2.48	3.35	6.9
Soybean	404	0.12	1.50	0.44	0.32	2.4
Yam	1683	0.36	4.78	2.92	1.90	10.0

Medium

Staple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Cassava	2442	0.69	6.96	4.84	4.11	16.6
Cowpea grain	1770	0.27	4.12	4.41	3.22	12.0
Groundnut	1664	0.1	3.83	3.8	3.57	11.3
Maize	2971	0.61	6.34	6.34	6.89	20.2
Plantain	819	0.57	3.27	1.23	0.5	5.7
Rice	2180	0.52	5.95	5.39	2.95	14.8
Sorghum	1009	0.05	1.2	2.08	3.53	6.9
Soybean	389	0.28	1.47	0.52	0.37	2.6
Yam	1478	0.52	5.03	3.06	1.43	10.0

Urban

Staple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Cassava	1385	0.76	6.38	4.00	4.33	15.5
Cowpea grain	1062	0.31	4.30	4.68	2.57	11.9
Groundnut	954	0.30	4.32	3.26	2.77	10.7
Maize	1769	0.98	5.85	6.72	6.20	19.8
Plantain	618	0.80	4.07	1.49	0.55	6.9
Rice	1371	0.59	3.95	5.56	5.20	15.3
Sorghum	503	0.23	1.56	1.81	2.01	5.6
Soybean	243	0.42	1.45	0.46	0.38	2.7
Yam	1048	0.49	5.00	4.37	1.84	11.7

[1]Number of observations.

Frequency of consumption of major nonstaple food crops

Among the major nonstaple foods, fruit (orange, mango, pawpaw, guava, pineapple, and grapefruit) was often consumed (18.3%) by the households followed by nonleafy vegetables (onion, carrot, cabbage, cucumber, pepper, tomato, and okra) at 16.8%, fats and oils at 16.6%, meat products (14%), and leafy vegetables (13.2%). A high percentage of the households consumed fruit, leafy vegetables, meat products, and dairy products at least once or twice a week (Table 10).

Table 10. Frequency of consumption of nonstaple foods at the national level.

Nonstaple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Bakery prod.	4716	0.08	1.86	1.44	1.25	4.6
Banana	3513	0.32	2.14	0.73	0.26	3.5
Beverage	4991	0.52	1.91	1.35	1.13	4.9
Dairy prod.	7532	0.56	3.31	1.95	1.57	7.4
Fats and oils	9395	0.18	2.06	1.81	5.16	16.6
Fish prod.	7659	0.16	1.88	1.65	3.83	7.5
Fruit	19327	1.04	8.78	3.99	5.15	18.3
Leafy veg.	13426	0.75	7.05	3.74	1.64	13.2
Meat prod.	14258	2.17	7.83	2.51	1.48	14.0
Nonleafy veg.	17079	0.50	5.17	3.68	7.40	16.8

In the agroecological zones (Table 11), the most frequently consumed nonstaples consistently were fruit, leafy and nonleafy vegetables, meat and fish, and fats and oils. Although fruit ranked second at 19.9% in overall frequency of consumption percentage in the dry savanna, a majority of the households (10.6%) consumed fruit once or twice a week. Only nonleafy vegetables and fats and oils were consumed over four times a week.

In the moist savanna, the most frequently consumed nonstaple crops were fruit (19.4%), followed by nonleafy vegetables (16.4%), leafy vegetables (14.6%), meat products (14.1%), and fats and oils (9.5%). As in the dry savanna, a majority of the households consumed fruit, leafy vegetables, meat products, and dairy products once or twice a week.

A similar trend to that of the moist savanna was observed in the humid forest. It is worth noting that a majority of the households consumed meat and its products once or twice a week and fish and its products over four times a week (Table 11).

Table 11. Frequency of consumption of nonstaple foods by agroecological zone.

Dry savanna

Nonstaple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Bakery prod.	1372	0.08	2.65	1.24	0.88	4.9
Banana	984	0.15	2.63	0.62	0.08	3.5
Beverage	957	0.10	1.24	0.98	1.07	3.4
Dairy prod.	2447	0.20	3.79	2.61	2.06	8.7
Fats and oils	3015	0.02	2.00	2.66	5.98	10.7
Fish prod	1537	0.05	2.20	1.80	1.39	5.4
Fruit	5631	0.64	10.62	4.11	4.56	19.9
Leafy veg.	2904	0.13	7.02	2.71	0.41	10.3
Meat prod.	3555	1.26	7.73	2.45	1.13	12.6
Nonleafy veg.	5837	0.35	6.28	5.45	8.64	20.7

[1]Number of observations

Moist savanna

Nonstaple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Bakery prod.	1252	0.07	1.88	1.44	1.26	4.7
Banana	886	0.1	1.92	0.89	0.38	3.3
Beverage	1115	0.49	1.59	1.15	0.92	4.2
Dairy prod.	2133	0.61	3.65	2.03	1.64	7.9
Fats and oils	2557	0.05	2.42	2.02	5.01	9.5
Fish prod.	1593	0.06	1.81	1.48	2.57	5.9
Fruit	5225	0.40	9.05	4.31	5.67	19.4
Leafy veg.	3931	0.29	7.84	4.70	1.79	14.6
Meat prod.	3787	0.87	8.96	2.79	1.45	14.1
Nonleafy veg.	4418	0.07	4.73	4.10	7.53	16.4

Humid forest

Nonstaple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Bakery prod.	2092	0.07	1.37	1.57	1.46	4.5
Banana	1643	0.54	1.97	0.69	0.31	3.5
Beverage	2919	0.79	2.49	1.68	1.28	6.3
Dairy prod.	2952	0.74	2.83	1.50	1.24	6.3
Fats and oils	3823	0.36	1.90	1.16	4.76	8.2
Fish prod.	4529	0.28	1.72	1.66	6.03	9.7
Fruit	8471	1.65	7.52	3.75	5.21	18.1
Leafy veg.	6591	1.39	6.62	3.80	2.29	14.1
Meat prod.	6916	3.47	7.25	2.38	1.70	14.8
Nonleafy veg.	6804	0.83	4.76	2.38	6.58	14.6

[1]Number of observations

The pattern observed in the AEZ was equally observed across the sectors. A majority of the households residing in the rural areas consumed fruit, leafy vegetables, meat products, and dairy products between once and twice a week. The result also indicated that 2.2% of households in the rural areas did not consume meat products (Table 12).

The trend in frequency of consumption of nonstaple foods by households in the medium sector was similar to that observed in the rural sector. A majority of the households consumed more nonstaple foods once or twice a week. For almost all the nonstaple foods with the exception of fats and oils, their percentage frequency of consumption decreased after the once or twice a week frequency level.

In all the sectors, a relatively significant percentage of the households did not consume meat products (2%) or fruit (1%). Nonleafy vegetables followed by fats and oils, fruit, and fish products were consumed over four times a week in the urban sector.

Food security is defined as access by all people at all times to enough food for an active and healthy life. The objective of this section is to identify the socioeconomic and demographic factors that determine households' food insecurity level in Nigeria. A quantitative measure of food availability and its access by households was defined and compared across three sectors (rural, medium, and urban), three agroecological zones (dry savanna, moist savanna, and humid forest) and with respect to households' socioeconomic characteristics in Nigeria.

Results obtained from this procedure are shown in Figure 8. Across sectors and AEZ, higher availability and affordability of foods were associated with residents in the medium and urban areas, and in the humid forest as opposed to those in the rural sector, and the dry and moist savanna zones.

In decreasing order, households in the rural sector were relatively more food insecure, followed by those in the medium and urban sectors. Similarly, households in the moist savanna were more food insecure than those in the dry savanna and the humid forest (Fig. 9).

Comparisons across primary occupations of household heads showed that families headed by farmers were the most severely affected by food insecurity. The level of severity decreased as one moved from households headed by farmers to those headed by traders, artisans, civil servants, and fishermen (Fig. 10).

Table 12. Frequency of consumption of nonstaple foods by sector.

Rural

Nonstaple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Bakery prod.	1921	0.04	2.20	1.39	1.06	4.9
Banana	1403	0.32	2.16	0.66	0.28	3.4
Beverage	1832	0.61	1.90	1.14	0.82	4.5
Dairy prod.	2941	0.59	3.20	1.81	1.56	7.2
Fats and oils	3792	0.21	2.01	1.72	5.31	9.2
Fish prod.	3119	0.15	1.98	1.60	3.87	7.6
Fruit	7763	0.92	8.58	3.82	5.60	18.9
Leafy veg.	5557	0.66	7.34	3.78	1.77	13.5
Meat prod.	6032	2.20	8.42	2.63	1.45	14.7
Nonleafy veg.	6675	0.37	4.98	3.56	7.36	16.3

Medium

Nonstaple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Bakery prod.	1719	0.13	1.91	1.48	1.17	4.7
Banana	1284	0.30	2.24	0.72	0.23	3.5
Beverage	1786	0.47	1.86	1.41	1.12	4.9
Dairy prod.	2715	0.58	3.46	2.03	1.32	7.4
Fats and oils	3386	0.18	2.22	1.93	4.89	9.2
Fish prod.	2711	0.10	1.91	1.54	3.83	7.4
Fruit	6997	1.00	8.95	4.16	4.93	19.1
Leafy veg.	4968	0.76	7.30	3.87	1.59	13.5
Meat prod.	4971	2.13	7.71	2.42	1.27	13.5
Nonleafy veg.	6201	0.42	5.36	3.79	7.30	16.9

[1]Number of observations.

Urban

Nonstaple food crop	No[1]	0 × week	1–2 × week	3–4 × week	Over 4 × week	Overall percentage
Bakery prod.	1076	0.06	1.22	1.48	1.70	4.5
Banana	826	0.32	1.96	0.84	0.30	3.4
Beverage	1373	0.43	2.00	1.61	1.65	5.7
Dairy prod.	1876	0.46	3.28	2.06	1.98	7.8
Fats and oils	2217	0.15	1.93	1.77	5.34	9.2
Fish prod.	1829	0.24	1.65	1.92	3.77	7.6
Fruit	4567	1.30	8.88	4.03	4.72	18.9
Leafy veg.	2901	0.91	6.18	3.46	1.48	12.0
Meat prods	3255	2.18	7.02	2.44	1.85	13.5
Nonleafy veg.	4203	0.84	5.21	3.74	7.63	17.4

[1]Number of observations.

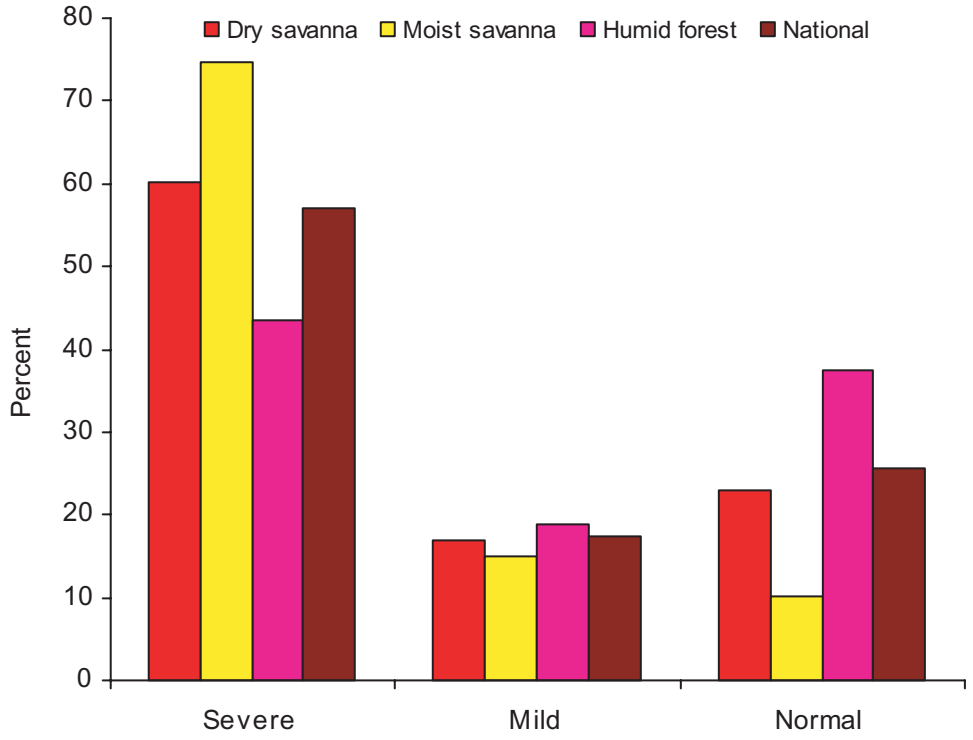

Figure 8. Percentage distribution of households according to the level of food insecurity by AEZ.

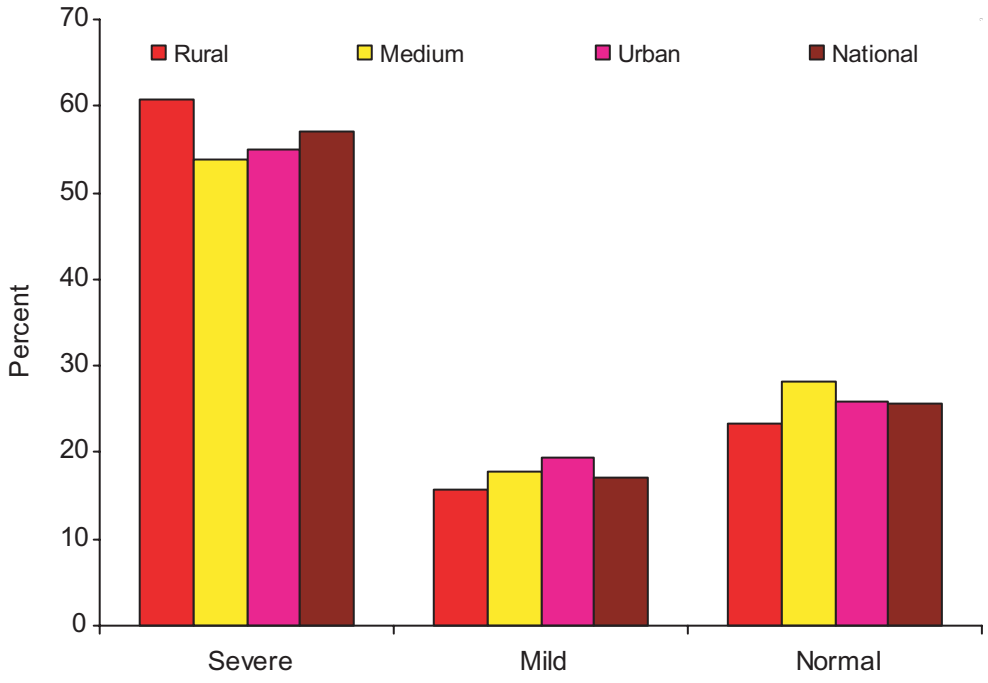

Figure 9. Percentage distribution of households according to the level of food insecurity by sector.

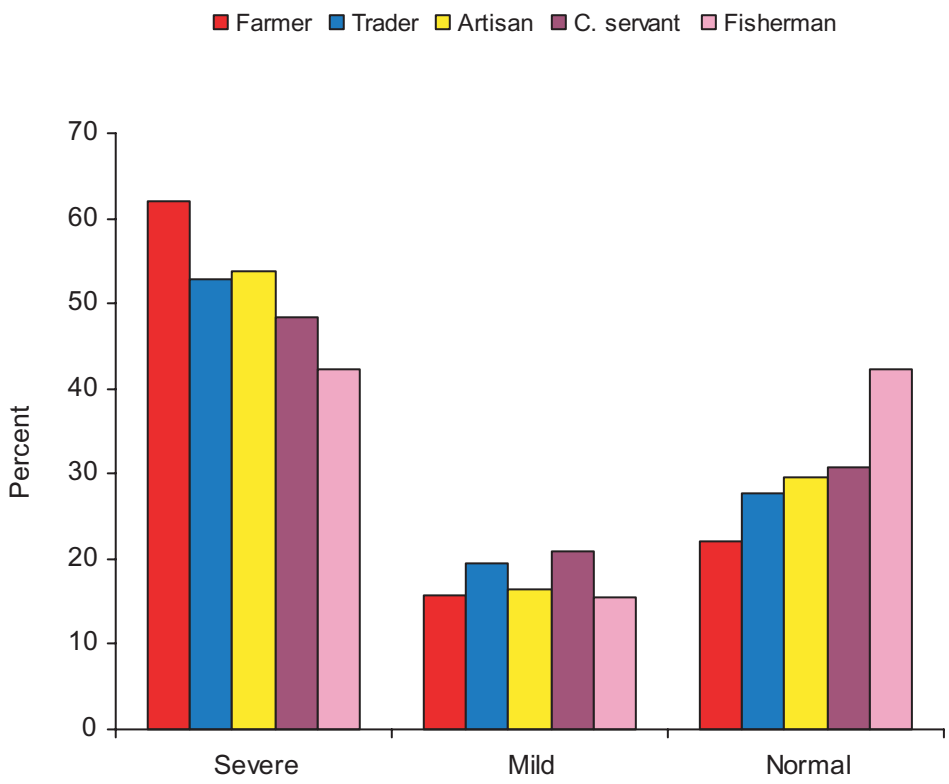

Figure 10. Percentage distribution of household's food insecurity by primary occupation.

The following three income classes were created and compared: (1) low, for a household annual income of less than N35 000, (2) medium, for an income between N36 000 and N55 000, and (3) high for an income more than N55 000. Food insecurity was more prevalent in households that fell within the medium income category but there was no apparent difference between low- and high-income classes (Fig. 11).

Food insecurity was relatively more severe within households in the low living standard category (Fig. 12), followed by those in the medium and high categories. This suggested a positive correlation between food security and living standards as measured in this study.

Estimated average household expenditure on major staples and nonstaples per week

At the national level, there was evidence of high expenditure on staples with cereals attracting the highest expenditure of about N643.97/week compared to an average expenditure of N347.73 on roots and tubers. Results further revealed that respondents spent more on sorghum (N228.3) than on either rice (N215.6) or maize (N127.2).

Across AEZ, while households in the moist and dry savanna spent as much as N833.48 and N770.51 on cereals, households in the humid forest zones spent an average of N311.06 per week.

Nationally, average household expenditure on nonstaples was highest on fish (N140.84) followed by meat products (N81.54). Here, the least weekly expenditure was on fruit (N13.62), followed by weekly expenditure on the leafy vegetables (N20.88). Relatively, the highest expenditure on major nonstaples was recorded in the moist savanna zone while the least was recorded in the dry savanna zone.

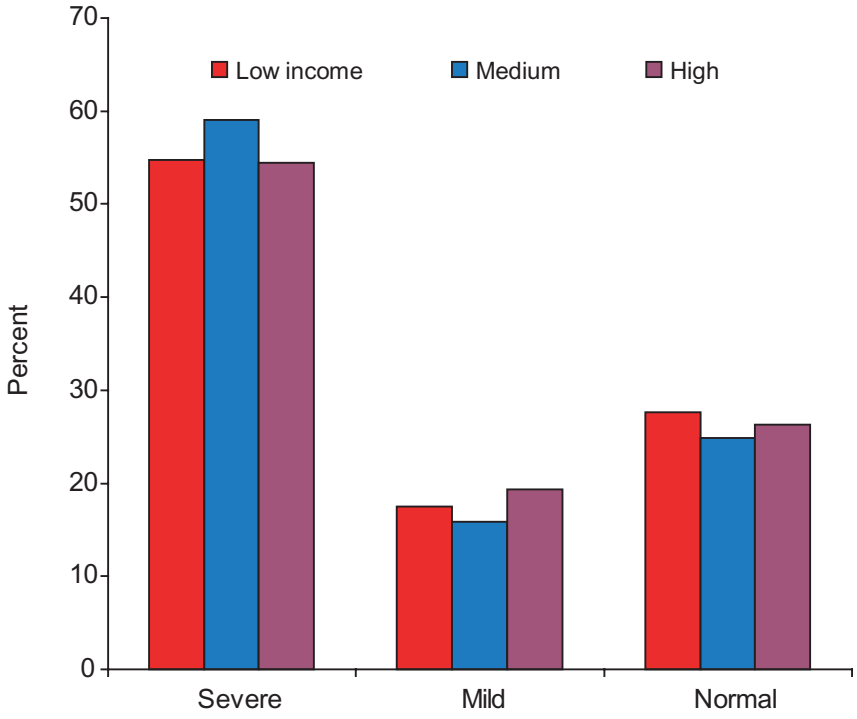

Figure 11. Percentage distribution of household food insecurity by income classes.

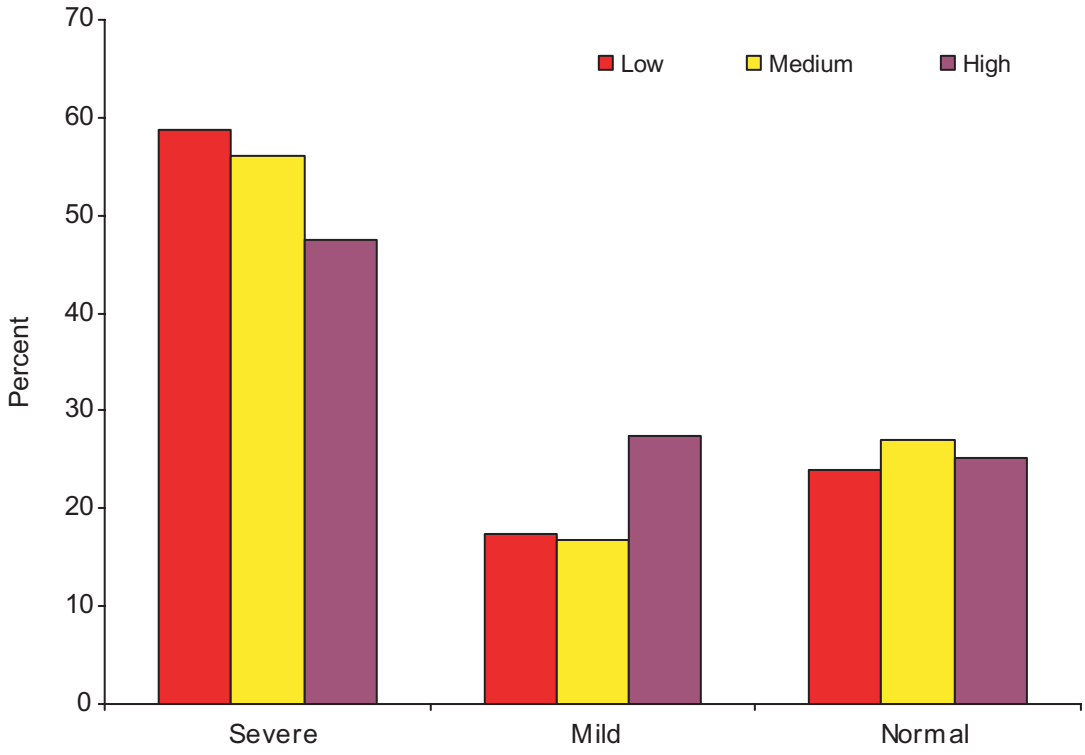

Figure 12. Percentage distribution of household food insecurity by living standard.

Food-related coping strategies

One of the indirect methods for assessing household food security is through food-related coping strategies, that is, the actions people take when they do not have enough food or money to buy food.

Borrowing food or money to buy food or purchase food on credit

Nationally, over 13% of the population reported purchasing food on credit. Closely related to that is borrowing money to buy foodstuffs (11.5%) and borrowing foodstuffs (7.2%). More household heads in the humid forest (18.5%) purchased food on credit than in either the moist (11%) or dry savanna zones (7.9%) to cope with the situation of food insecurity. A consistent proportion of the household heads (about 13%) purchased food on credit and about 11% borrowed money to buy foodstuffs during the hunger period in all three sectors.

Eating foods that are less preferred or less expensive

Table 13 shows that 24% of the population reported they either ate foods that were less preferred or less expensive as a means of adapting to lower real income or food insecurity. It is to be noted that 30.5% made the same report in the dry savanna, 19.1% in the moist savanna, and 22.1% in the humid forest zone.

Rationing money to household, limiting portions at meal time, and skipping meals

Lower income groups, in particular, commonly reduced the number of meals if food was not sufficient for three meals per day or rationed money to the household. Table 13 shows that 30% of the population ranked these coping strategies first. The use of these strategies was more pronounced in the humid forest (22.5% of the household heads) with a gradual decrease in the moist savanna (21.7%) to the dry savanna zone (18%). This pattern was suggestive of a higher population of food insecure households in the humid forest zone and the moist savanna than the dry savanna. The use of these strategies was reported more in the urban sector (23.5%) than in either the medium (20.2%) or rural sector (20.3%).

Table 13. Percentage distribution of households according to coping strategy in response to food insecurity by national level and AEZ.

		AEZ		
Coping strategy	National	Dry savanna	Moist savanna	Humid forest
Rely on less preferred food	11.9	15.1	9.9	10.8
Rely on less expensive foods	12.1	15.4	9.2	11.3
Borrow money to buy foodstuff	11.5	12.5	14.5	8.9
Borrow foodstuff	6.7	10.7	5.9	4.4
Purchase food on credit	13.3	7.9	11.0	18.5
Rely on help from relative	10.9	12.1	13.3	8.7
Limit portions at meal times	9.7	6.7	9.2	12.0
Ration money to household	2.6	4.2	1.4	2.1
Limit your own intake	9.9	7.9	10.9	10.6
Reduce number of meals	8.5	5.8	9.4	9.8
Skip whole day without eating	1.1	0.1	2.3	1.1
Other	2.0	1.8	2.7	1.7

Skipping meals for a whole day

Clearly, mainly the lowest-income group commonly practices a more severe means of dealing with food insufficiency, i.e., going whole days without eating. One out of every hundred respondents (1.0%) reported the use of this strategy, which was a pointer to the severity of poverty and food insecurity in the country. Results of this study revealed that more people adopted this strategy in the moist savanna (2.3%) and humid forest (1.1%) than in the dry savanna zone (0.1%).

Nutritional status

Nutritional status of children under 5

In infants and children under 5 years of age, assessment of growth has been the single most important measurement that defines their nutritional status. Disturbances in nutrition as a result of inadequacy of food intake, severe and repeated infections, or a combination of both, operating very often as a vicious spiral, invariably affect the growth of a child. These adverse conditions are closely linked to the general standard of living and the population's ability to meet its basic needs for nutritious food, safe water, good housing, acceptable levels of envlronmental sanitation, and ready and easy access to healthcare.

The national data showed that 42% of the children were stunted, 25% were underweight, and 9% were wasted (Fig. 13).

In disaggregating the prevalence of malnutrition by AEZ, sector, sex, and other parameters, data were calculated such that the prevalence values were derived from the total sample sizes of each of the segments considered. The average of the prevalence values obtained after disaggregating data equals the national average for variables considered.

Figure 14 represents the percentage of children under 5 that was malnourished by AEZ. The data showed that the prevalence of stunting was lowest (27%) in the humid forest zone and highest in the dry savanna zone (58%). Indeed, the dry savanna zone had the highest prevalence not only of stunting (58%), but of wasting (13%) and being underweight (38%).

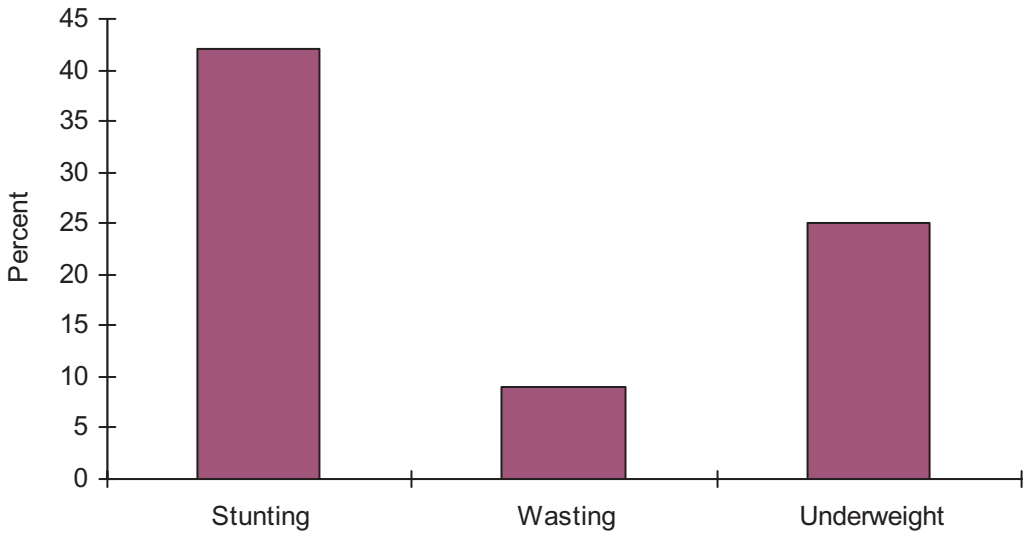

Figure 13. Percentage national prevalence of malnutrition in children under 5.

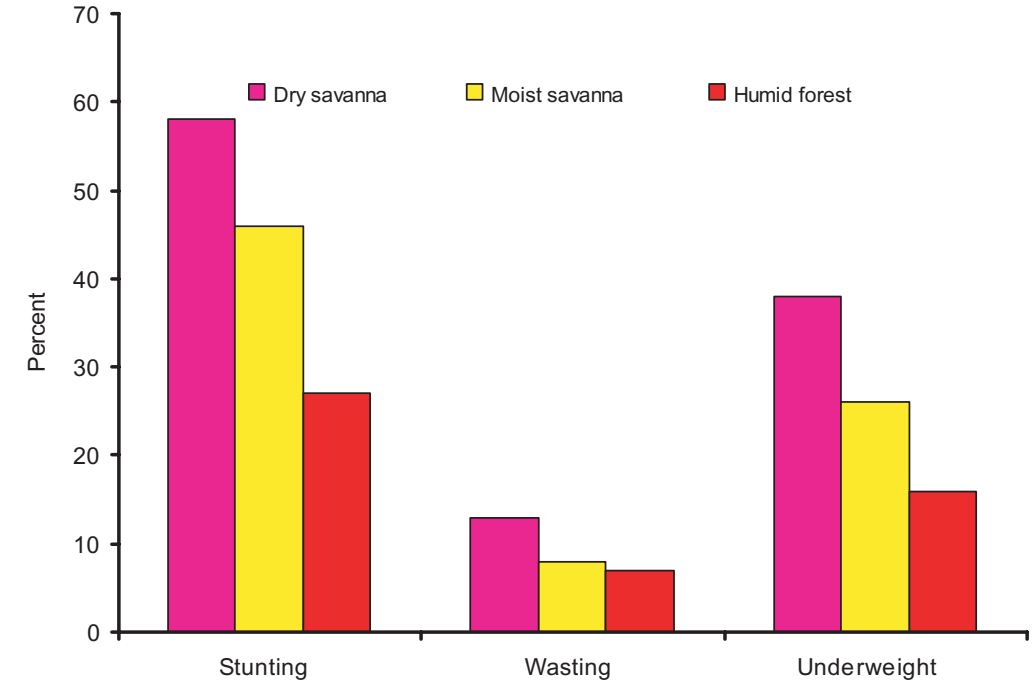

Figure 14. Percentage prevalence of malnutrition among children 0–59 months in the humid forest, dry, and moist savanna zones.

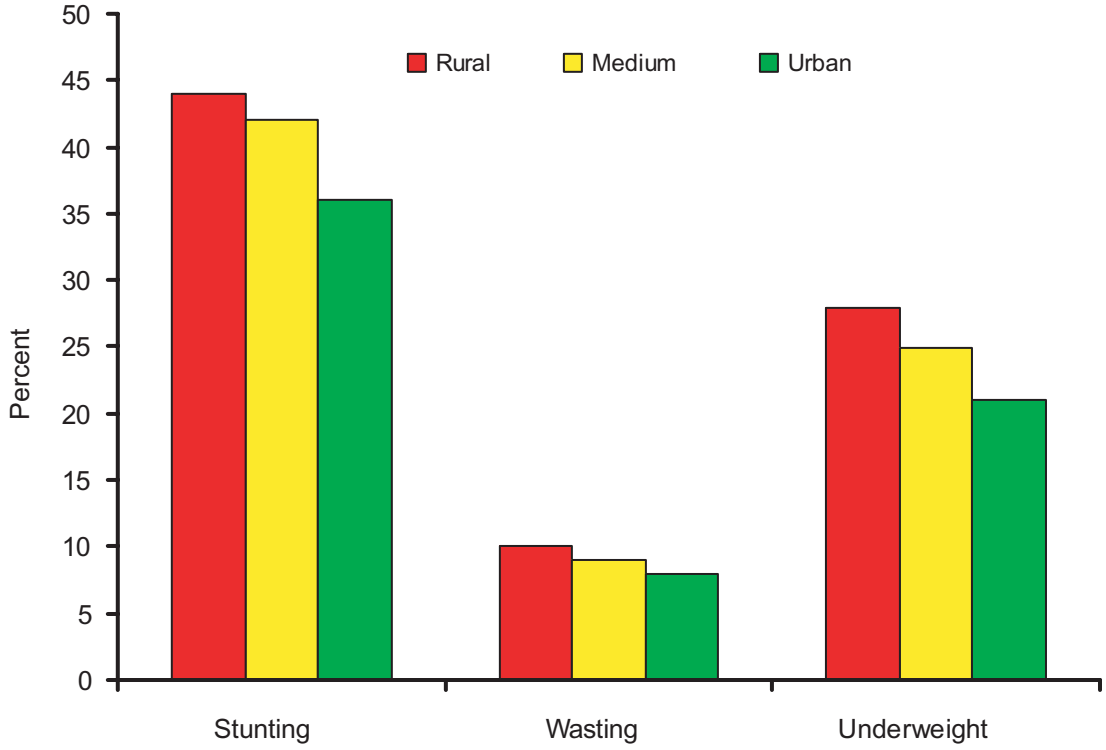

Figure 15. Percentage prevalence of malnutrition among children aged 0–59 months by sector.

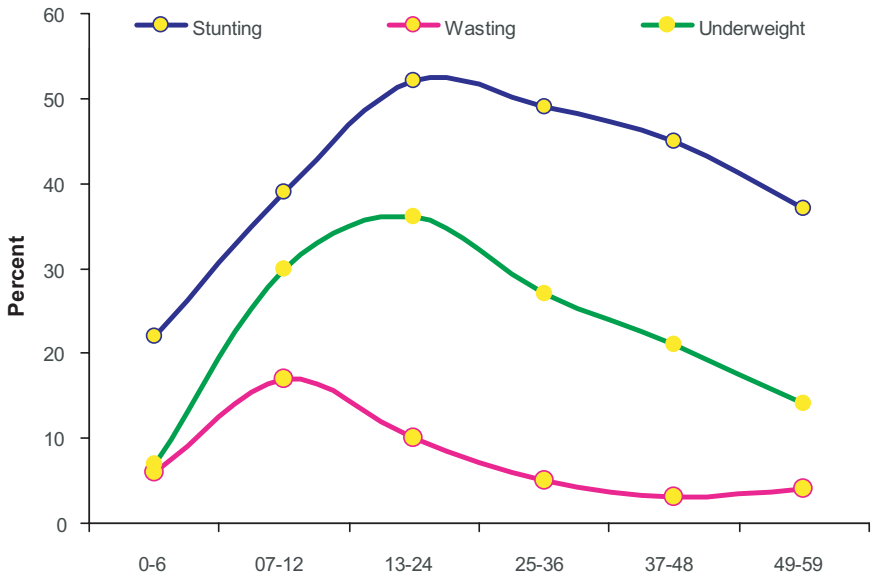

Figure 16. Percentage prevalence malnutrition among children aged 0–5 months.

When the data were disaggregated by sector, the urban sector had the lowest prevalence of all forms of malnutrition as shown in Figure 15 (36.3% for stunting, 8.4% for wasting, and 21.1% for underweight). The rural sector had the highest level of malnutrition (44.3% for stunting, 9.5% for wasting, and 27.7% for underweight). In the medium sector, malnutrition was 42% for stunting, 9% for wasting, and 25% for underweight (Fig. 16).

Taken together with the high level (20%) of underweight, these suggest poor long-term as well as short-term nutritional status. The profile of the three forms of malnutrition in the children under 5 is illustrated in Figure 16. It is obvious from this profile therefore, that the critical period for these entire conditions together lies between 6 and 24 months of age.

Nutritional status of mothers

The majority (68.5%) of the subjects fell within the normal range of body mass index (BMI). Similar percentages were encountered in the dry savanna (67.7%), moist savanna (67.1%), and humid forest (70%). Nationally, 11.6% of women were suffering from chronic undernutrition (Table 14).

Chronic undernutrition (< 18.5%) was more prevalent in the dry savanna (16.4%) than in the moist savanna (9.9%) and humid forest zone (9%) (Table 14). Only between 4.3% in the dry savanna and 6.6% in the moist savanna fell into the obese category. Within the different sectors, chronic undernutrition ranged from 10.3 to 12.7%.

Nationally, 14.2% of women of childbearing age were overweight and 5.7% were obese. The figures for overweight observed for the moist savanna zone (16.4%) and urban sector (18%) were higher than the national prevalence figure for overweight.

Obesity (BMI of 30 and above) was more prevalent in the urban sector (9%) than in the medium (4.8%) and rural (4.6%) sectors. The prevalence in the AEZ ranged from 4.3% in the dry savanna to 6.6% in the moist savanna. The total percentage of women who were overweight was higher (19.9%) than that of women suffering from undernutrition (11.6%) (Table 14).

Table 14. Percentage distribution of BMI of women at the national, AEZ, and sector levels.

	BMI classification			
Category	< 18.5	18.5–24.99	25.0–29.9	30 and above
National	11.6	68.5	14.2	5.7
AEZ				
Dry savanna	16.4	67.7	11.6	4.3
Moist savanna	9.9	67.1	16.4	6.6
Humid forest	9.0	70.0	14.8	6.1
Sector				
Rural	12.7	70.1	12.6	4.6
Medium	10.3	71.5	13.4	4.8
Urban	11.5	60.9	18.6	9.0

Further classification of the 11.6% of undernourished mothers (BMI below 18.4) to the different levels of chronic energy deficiency showed that only 8.4% nationally fell in the chronic energy deficiency grade III.

The highest percentage (12.1%) of grade III chronic energy deficiency was found in the moist savanna zone. About the same percentage (13.3%) was found in the urban area and this was twice as much as that found in both the rural (7.6%) and medium (6.3%) sectors. Chronic energy deficiency has serious implications for morbidity and low productivity of women. This condition is associated with a higher prevalence of low birth weight, predisposing to higher infant mortality.

It is important to note that both conditions (undernutrition and overweight/obese) have serious implications for the health of women and their newborns. Chronic energy deficiency has serious implications for morbidity and low productivity of women. This condition is associated with a higher prevalence of low birthweight predisposing to a higher infant mortality. Obesity is significant as a risk factor for serious noncommunicable diseases, including cardiovascular disease, hypertension and stroke, diabetes mellitus, and various forms of cancer.

Micronutrient status of children under 5, mothers, and pregnant women

Vitamin A status

Vitamin A status of children under 5

The vitamin A status of all children surveyed is presented in Figure 17. At the national level, 24.8% of children under 5 suffered from marginal deficiency (serum retinol concentration < 20 ug/dl) and therefore, were vitamin A deficient, 4.7% had serum retinol concentration < 10 ug/dl and hence, were suffering from severe vitamin A deficiency (clinical deficiency), and 71.5% of children were normal. If we combined those who were marginally deficient with those who were clinically deficient, 29.5% of children under 5 were suffering from vitamin A deficiency.

The levels of marginal deficiencies were 28.2% in the dry savanna, 21.6% in the moist savanna, and 22.8% in the humid forest. The clinically deficient were more in the humid forest (7.1%) than in the dry savanna (3.1%) and moist savanna (2.4%) (Fig. 18).

The distribution of the marginally deficient was 23.4% for the rural, 25.1% for the medium, and 22.5% for the urban sector. The clinical deficiencies were 7.5% in the medium sector while the urban (3.4%) and rural (2.2%) sectors were much lower (Fig. 19).

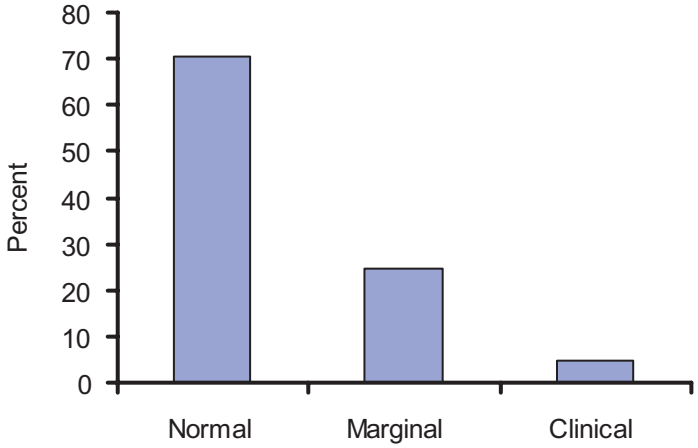

Figure 17. Vitamin A status of all surveyed children under 5 at the national level.

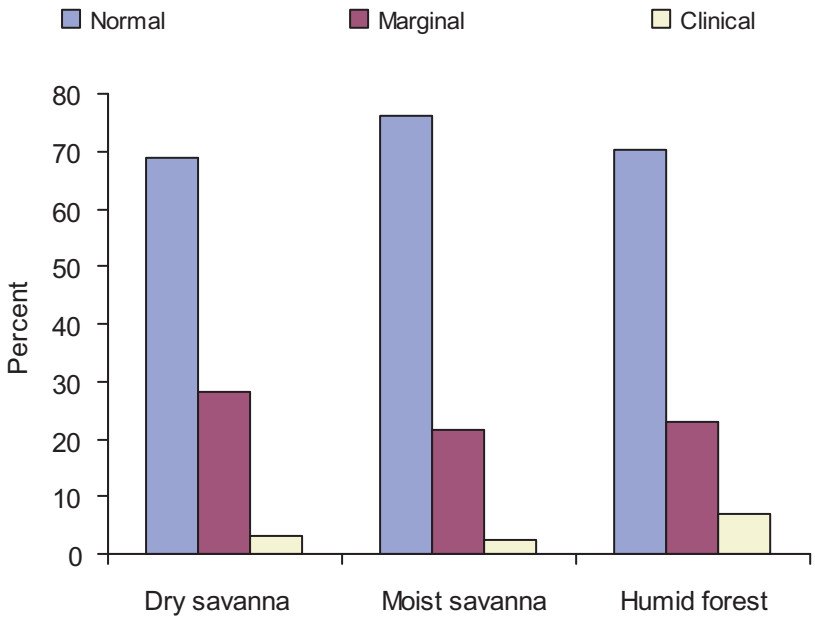

Figure 18. Vitamin A status of all surveyed children under 5 by AEZ.

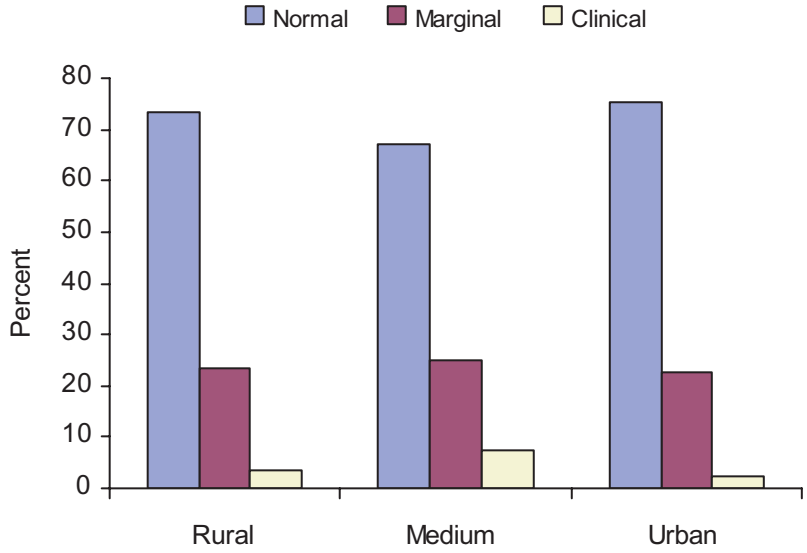

Figure 19. Vitamin A status of all surveyed children under 5 by sector.

Vitamin A status of mothers

In adults, mothers with serum retinol concentration < 30 ug/dl and considered as being at risk of vitamin A deficiency were 13.1% of the national sample population.

At the AEZ level, there was a decrease in the percentage of mothers at risk for vitamin A deficiency from 19.6% in the dry savanna to 14.5% in the moist savanna, and 8.8% in the humid forest.

More mothers were at risk of vitamin A deficiency in the medium sector (30.7%) sector than in the rural (11.2%) and urban (10%) sectors.

Mothers with serum retinol concentration < 20 ug/dl were considered as being vitamin A deficient. From those mothers who were at risk of vitamin A deficiency, only 4.1% were vitamin A deficient.

Vitamin A status of pregnant women

In adults, pregnant women with serum retinol concentration < 30 ug/dl and considered as being at risk of vitamin A deficiency were 19.2% at the national level.

The possibility of pregnant women being at risk of vitamin A deficiency showed a gradual decrease from the dry savanna (34.3%) through the moist savanna (28.3%) to the humid forest (21.6%).

More pregnant women living in urban (25.2%) and rural areas (24.4%) were at risk of vitamin A deficiency than those living in the medium areas (17.3%).

Pregnant women with serum retinol concentration < 20 ug/dl were considered as being vitamin A deficient. From those pregnant women who were at risk of vitamin A deficiency, 8.8% were vitamin A deficient.

Vitamin E status

For an individual to be considered of adequate vitamin E status, the cutoff points are between 4 and 14 ug/dl from 0 to 6 months, between 4.4 and 13.8 ug/dl from the age of 12 months, and between 5 and 18 ug/dl for adults.

Vitamin E status of children under 5

At the national level, 22.6% of children under 5 suffered from vitamin E deficiency (serum vitamin E concentration between 4 and 14 ug/dl) and 77.4% of children were normal (Fig. 20). The level of vitamin E deficiency was high at 27.6% in the humid forest, 20.7% in the moist savanna, and 15.5% in the dry savanna zone.

The distribution of vitamin E deficient children under 5 was 21.5% in the rural, 26.3% in the medium, and 17.8% in the urban sectors.

Vitamin E status of mothers

Nationally, 13.0% of mothers were vitamin E deficient. At the AEZ level, vitamin E deficiency levels were similar in the moist savanna (13.9%) and the humid forest (13.6%). The fewest deficient mothers were found in the dry savanna (11.9%) (Fig. 21).

In urban areas, the number of mothers suffering from vitamin E deficiency was low (7.9%) followed by those in the rural sector (13.0%) and medium areas (16.2%).

Vitamin E status of pregnant women

At the national level, 12% of pregnant women were vitamin E deficient.

The humid forest zone had the largest number of vitamin E deficient pregnant women (14.6%), almost double that of the dry savanna (7.6%).

Data for pregnant women showed that the largest numbers of vitamin E deficient pregnant women were in the rural areas (14.7%), while the lowest were in urban areas (5.3%) (Fig. 22).

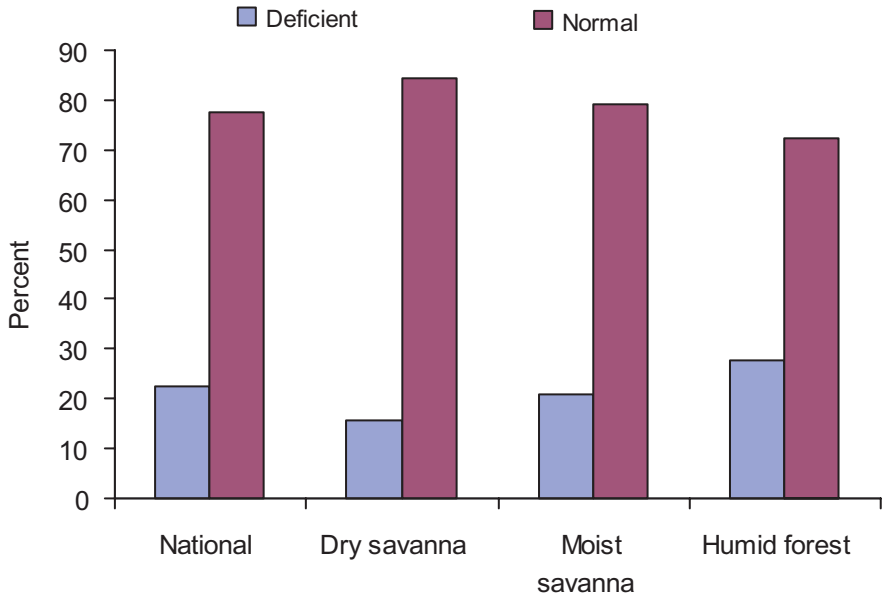

Figure 20. Percentage distribution of normal and vitamin E deficient children at the national level and by AEZ.

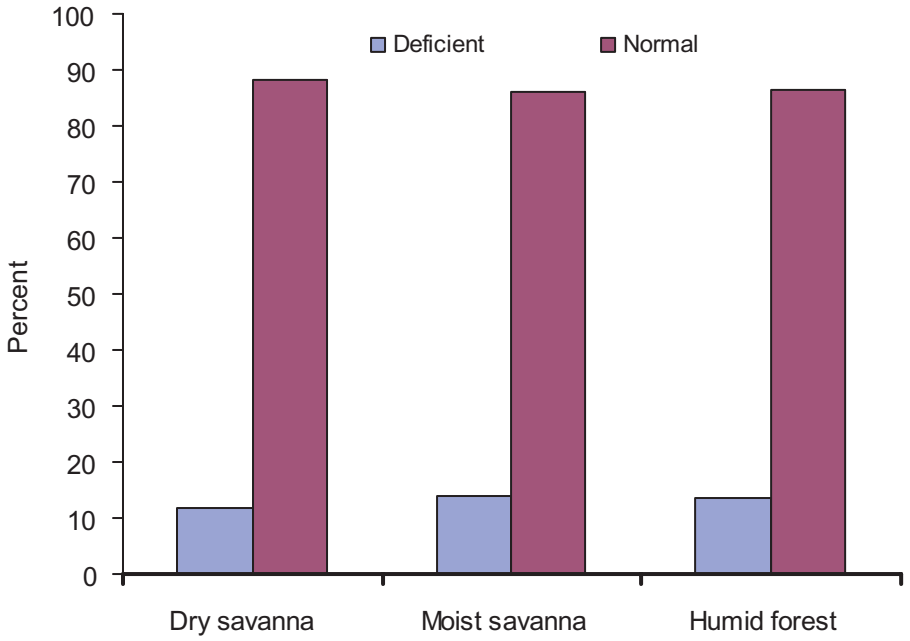

Figure 21. Vitamin E status of mothers by AEZ.

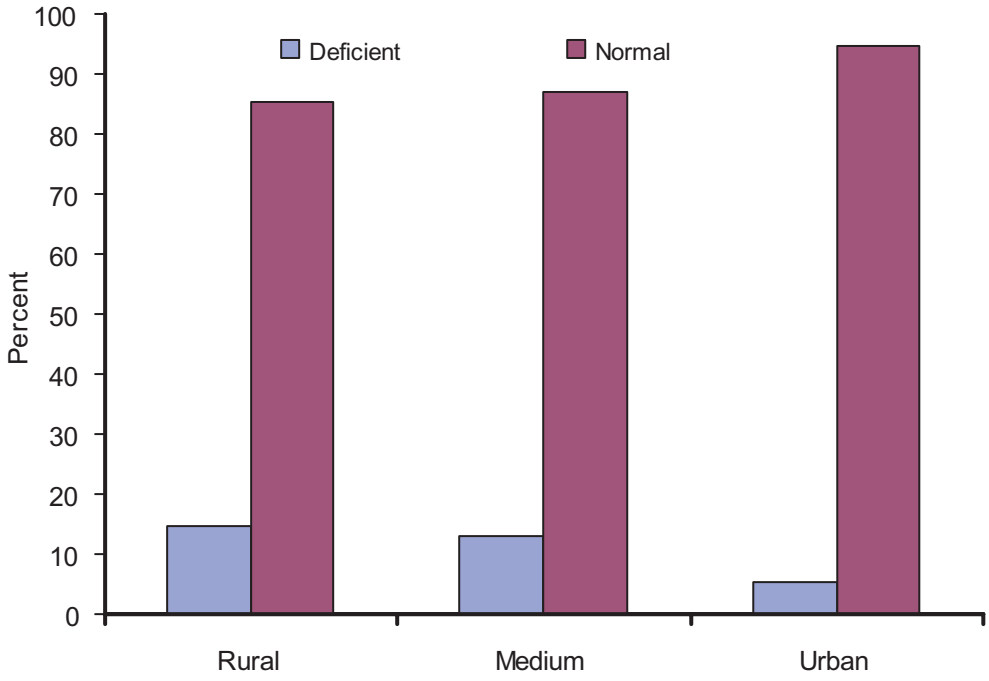

Figure 22. Vitamin E status of pregnant women by sector.

Iron status

The risk of iron deficiency increases during periods of rapid growth, notably in infancy, adolescence, and pregnancy. The consequences of iron deficiency include reduced work capacity, impaired body temperature and regulation, impairments in behavior and intellectual performance, and decreased resistance to infections. Iron deficiency results when ingestion or absorption of dietary iron is inadequate to meet iron losses or Iron requirements imposed by growth or pregnancy.

In most individuals, the concentration of serum ferritin parallels the total amount of storage iron; and serum ferritin is the only iron status index that can reflect a deficient, excessive, and normal iron

status. In this survey, iron status was assessed using the serum ferritin (SF) level of the serum samples collected from children under-5, their mothers, and pregnant women. Serum ferritin is a reliable and sensitive parameter the assessment of iron stores in healthy subjects. Quantitative phlebotomy has shown a close relationship between serum ferritin concentration and mobilizable iron stores and demonstrated that 1ng/ml of serum ferritin corresponds to 8–10 mg of storage iron; hence, serum ferritin is widely used in clinical practice and population screening.

Serum ferritin levels below 12 ng/ml are highly specific for iron deficiency and denote complete exhaustion of iron stores in adults. In children, a cutoff value of 10 ng/ml was suggested. In this survey, the following cutoff points were used:

Serum ferritin Level	Iron status
< 10 ng/ml (0–15 years)	Iron deficiency
< 12 ng/ml (16–74 years)	Iron deficiency
< 20 ng/ml	Iron store depletion
20–100 ng/ml	Normal range
101–300 ng/ml	Slightly above normal
> 300 ng/ml	Iron overload

Iron status of children under 5

The Iron status profile of children under 5 is illustrated in Figure 23. At the national level, 27.5% of children under 5 were at different stages of Iron deficiency, as 8.1% already had depleted iron stores (serum ferritin value of less than 20 ng/ml) while 19.4% had a serum ferritin value of less than 10 ng/ml, suggestive of Iron deficiency. A range of 20 ng/ml to 100ng/ml had been taken as normal. In this sample, 48.9% had the range of serum ferritin indicating adequate Iron nutrition.

The results of disaggregating by AEZ (Fig. 24) indicated that the proportion of children with varying degrees of Iron deficiency was 42.2% for the dry savanna, 68.2% for the moist savanna, and 21.8% for the humid forest. Iron deficiency was high in the moist savanna (37.6%), followed by the dry savanna (31.5%) and humid forest (14.8%). The same trend was observed for those with depleted Iron store (< 20 ng/ml); there were more children in this category in the moist savanna (30.6%) than in the dry savanna (10.7%) and the humid forest (7.0%).

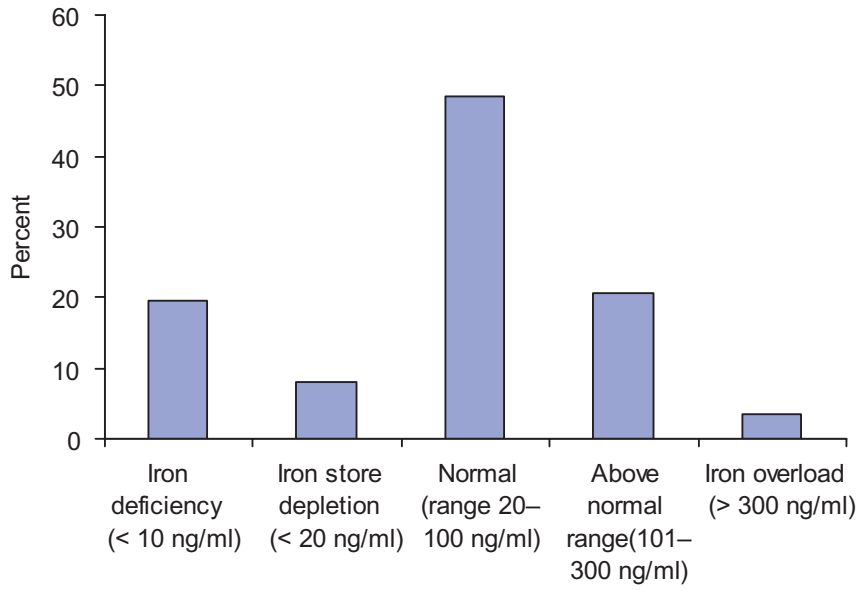

Figure 23. National profile of national Iron status in all surveyed children under 5.

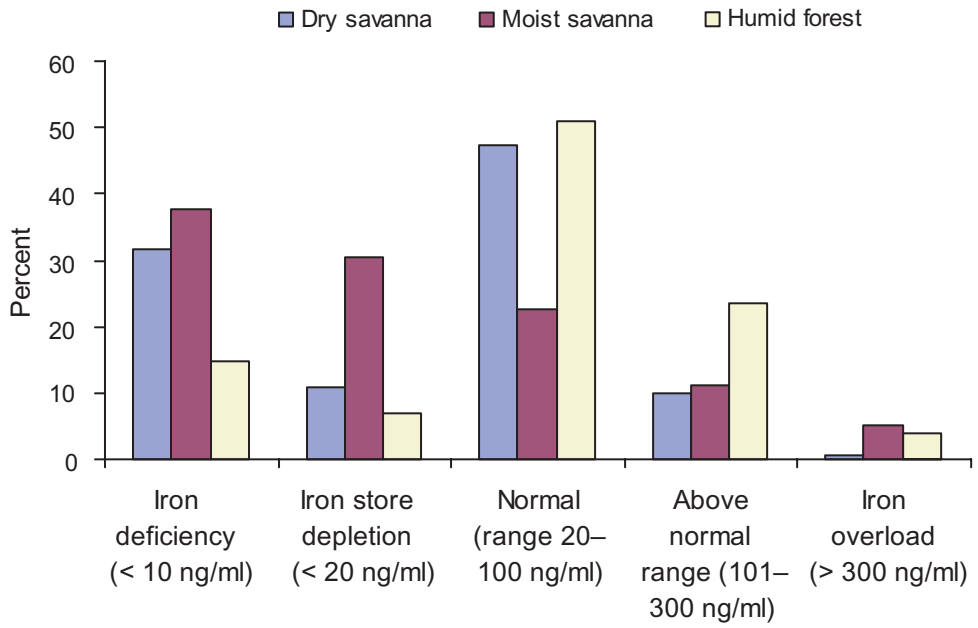

Figure 24. Profile of Iron status of all surveyed children under 5 by AEZ.

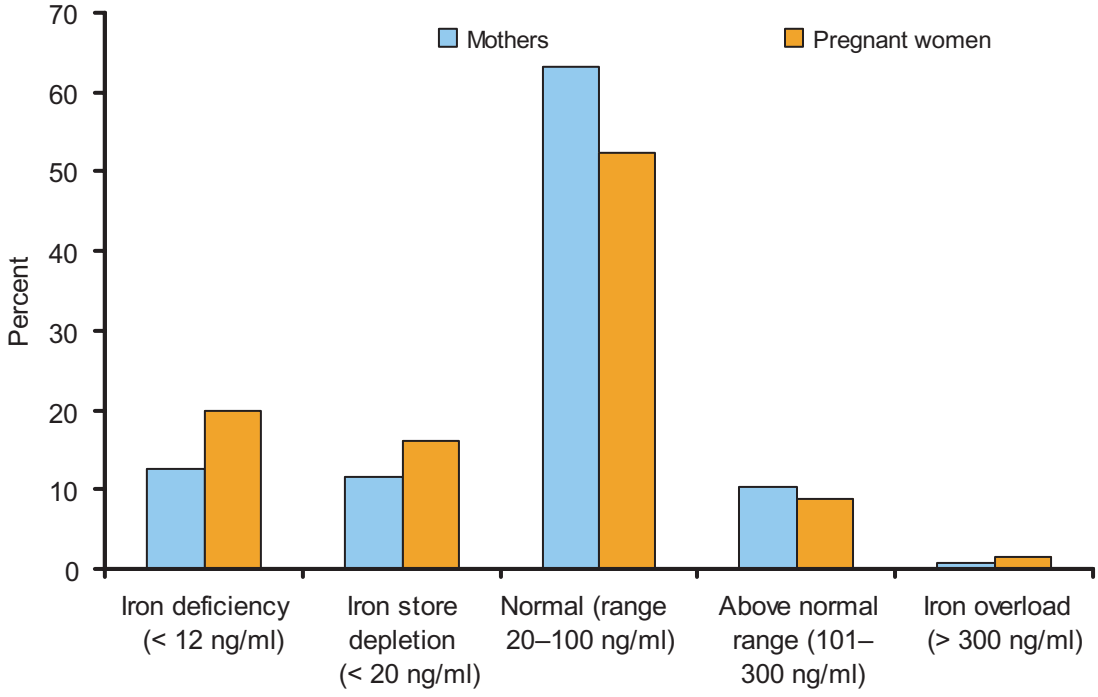

Figure 25. Profile of national Iron status for mothers and pregnant women.

Children under 5 with adequate Iron nutrition varied widely within the AEZ. They were 50.9% in the humid forest, 47.2% in the dry savanna, and 22.5% in the moist savanna. The distribution of children under 5 who had serum ferritin concentrations above the normal range in the AEZ showed that 9.8% were in the dry savanna and 11% in the moist savanna, while 23.4% were in the humid forest.

When data were disaggregated by sector, the results showed that the proportion of children with varying degrees of Iron deficiency was 24.4% for the rural sector, 27.9% for the medium, and 33.1%

for the urban. Iron deficiency (serum ferritin concentration < 10 ng/ml) was high in urban areas (22.6%), followed by the medium (17.8%) and rural areas (13.5%).

Children under 5 with depleted iron store (serum ferritin concentration < 20 ng/ml) were similar in the different sectors: 10.9% in rural areas, 10.5% in urban areas, and 10.2% in the medium sector. The percentages of the children with normal iron status (serum ferritin concentration 20–100 ng/ml) did not vary much in the sectors, being 47.8% in the rural, 49.4% in the medium, and 48.7% in the urban.

The distribution by sector of children under 5 who had a serum ferritin concentration above the normal range showed that 27.8% were in the rural areas, 22.7% in the medium, while 18.2% were in the urban areas.

Mothers and pregnant women

Approximately 24.3% of mothers and 35.3% of pregnant women were at different stages of Iron deficiency, with 12.7% of mothers and 19.9% of pregnant women already with iron stores (serum ferritin < 12 ng/ml) suggestive of Iron deficiency (Fig. 25).

The percentage distribution of Iron status for mothers and pregnant women are shown in Figures 24 and 25. Also 63.2% of mothers were within the normal serum ferritin range of 20–100 ng/ml, whereas only about half of the pregnant women (52.4%) fell within the normal range. Iron overload (serum ferritin concentration level > 300 ng/ml) was beginning to occur among the pregnant women (1.5%) as against the prevalence of 0.8% in mothers.

As presented in Figure 26, the corresponding values for mothers were 33.2% for the dry savanna, 18.4% for moist savanna, and 24.1% for the humid forest.

Pregnant women, on the other hand, had a high prevalence of 43.1% in the dry savanna, 31.5% in moist savanna, and 35.0% in the humid forest (Fig. 27). The prevalence of iron store depletion was highest in the dry savanna and lowest in the moist savanna.

The prevalence of various degrees of Iron deficiency was more common in the urban areas than in the medium and rural areas. For mothers, the prevalence of various degrees of iron deficiency was more common in the urban areas than in the medium and rural areas. The corresponding percentage distribution of iron deficiency for mothers was highest in urban areas (26.9%), followed by the medium areas (24.7%), and lowest (2.4%) in rural areas.

In pregnant women, about four out of every ten pregnant women (43.8%) in the urban areas were Iron deficient, compared with slightly over one-third (33.6%) in both rural and medium areas (34.0%). The prevalence of Iron overload was higher in the medium sector (2%) than in the rural and urban sectors (1.1%).

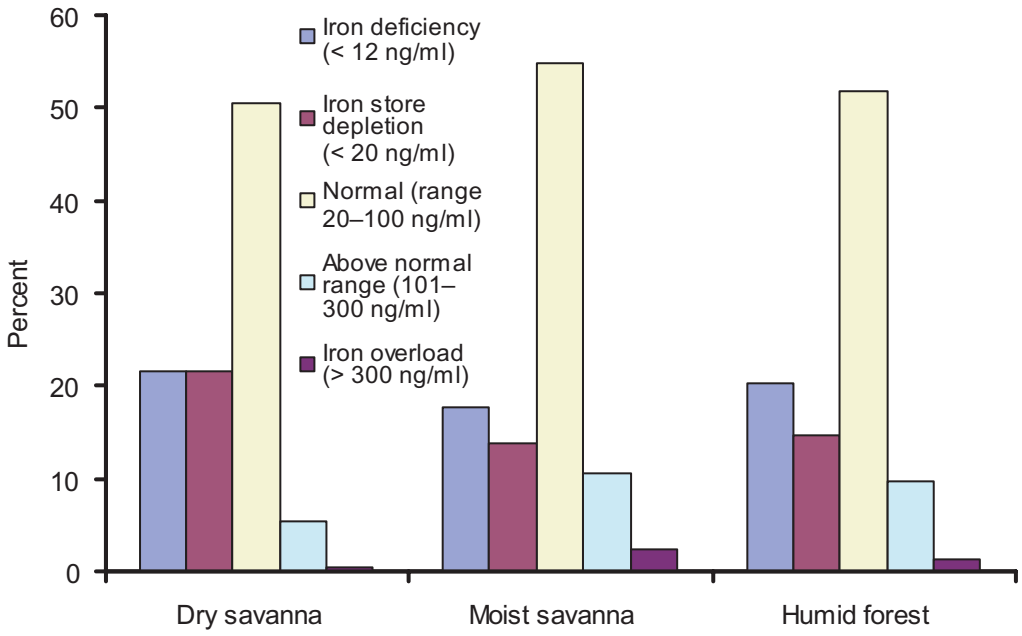

Figure 26. Profile of Iron status of mothers by AEZ.

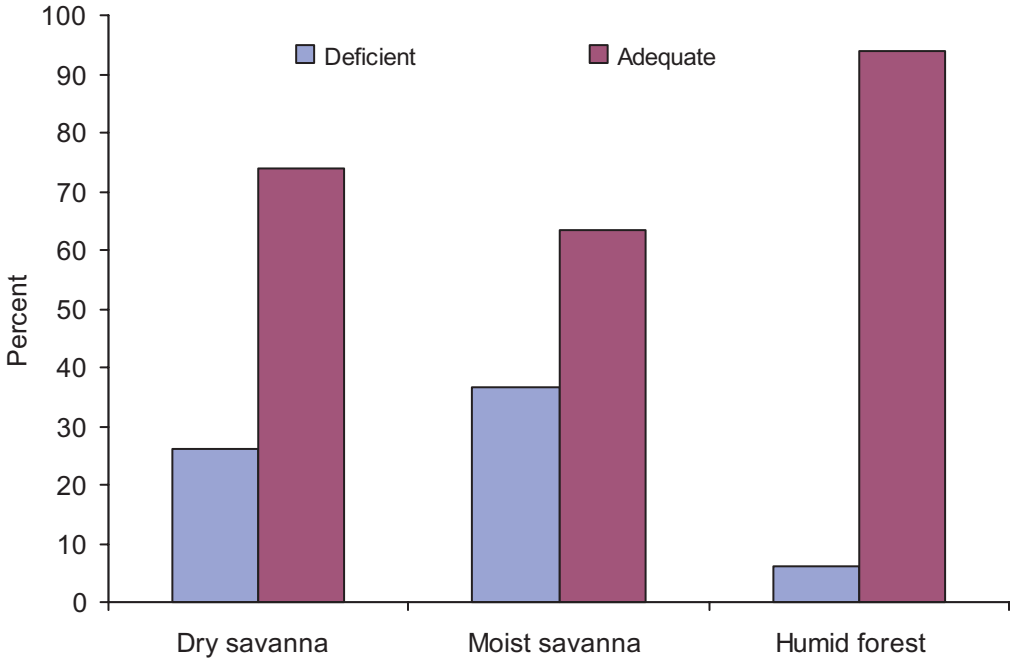

Figure 27. Profile of Iron status of pregnant women by AEZ.

Zinc status

Zinc is now recognized as an essential micronutrient (trace element) critical in human nutrition. The clinical syndrome associated with zinc deficiency includes growth retardation, male hypogonadism, skin changes, mental lethargy, hepatosplenomegaly, iron deficiency anemia, and geophagia. Apart from low zinc levels occasioned by rapid growth, pregnancy and lactation can also lead to zinc deficiency if these increased needs are not met.

Presently, no cutoff points for serum/plasma zinc levels have been recommended to classify zinc deficiency. However, plasma zinc concentration of 80 µg/dl has been established as a threshold beyond which no response to zinc supplementation is observed. Consequently, in assessing zinc nutrition of subjects in this survey, 80 ng/ml has been used as the cutoff value for determining zinc deficiency.

Zinc status of children under 5

At the national level, 20% of children under 5 are zinc deficient. Among children under 5, zinc deficiency was highest in the moist savanna zone (36.5%), intermediate in the dry savanna (26.0%), and lowest in the humid forest (6.3%). This is illustrated in Figure 28.

The prevalence of zinc deficiency in children under 5 is illustrated in Figure 29. The deficiency was higher (26.0%) in the rural sector than in either of the other two sectors (17%).

Zinc status of mothers and pregnant women

Zinc deficiency was highest in pregnant women (43.8%). One-quarter (28.1%) of the mothers were zinc deficient (Fig. 30).

The prevalence of zinc deficiency in mothers is illustrated in Figure 31. The prevalence was 48.3% in the moist savanna, 35.3% in the dry savanna, and 10.5% in the humid forest.

The prevalence of zinc deficiency in pregnant women was highest (73.4%) in the moist savanna, and lowest (23%) in the humid forest. The dry savanna zone had a prevalence of 42.6% (Fig. 32). The percentage zinc deficiency prevalence was slightly higher (30%) in the rural sector than in medium (28%) and urban (25%) sectors.

The prevalence across the three sectors was similar although the rural (43.3%) and medium (46.1%) sectors seemed to have slightly higher percentages than the urban sector (40.8%).

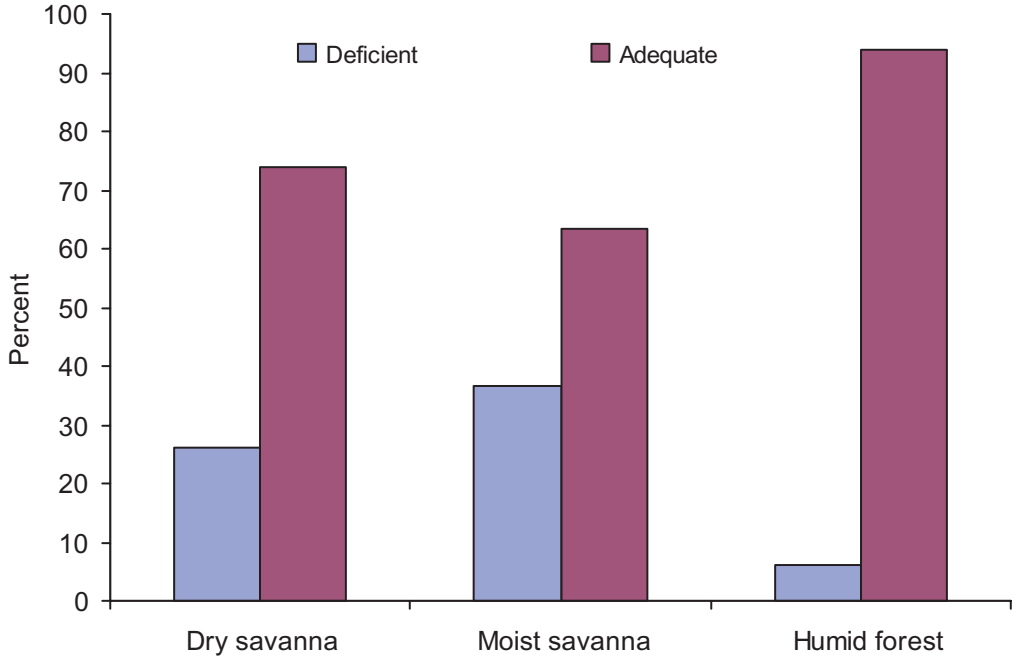

Figure 28. Zinc status of children under 5 by AEZ.

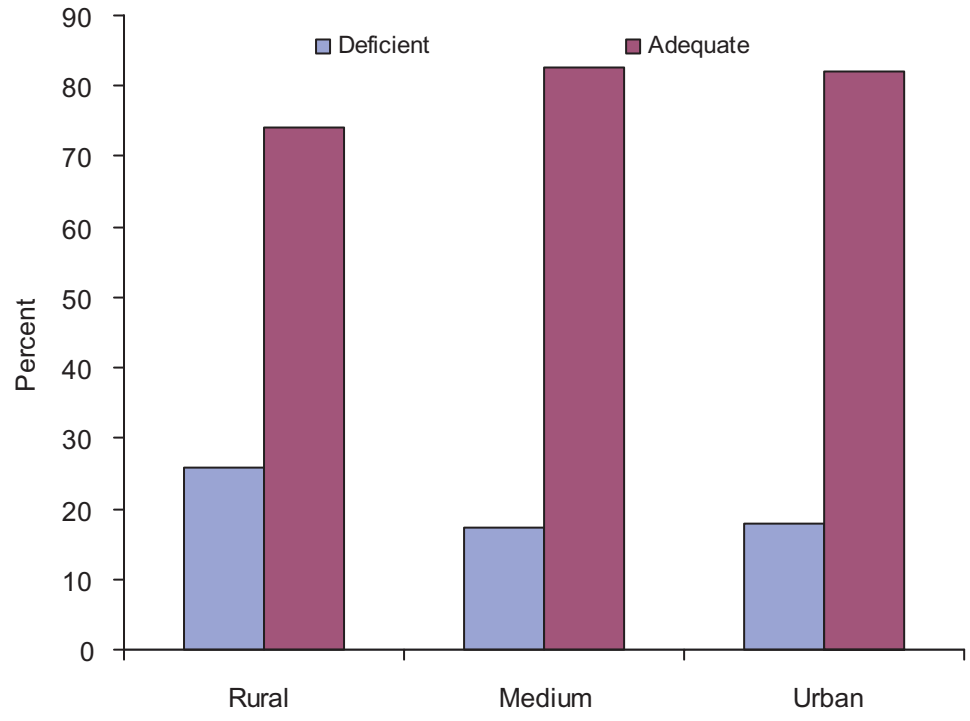

Figure 29. Zinc status of children under 5 by sector.

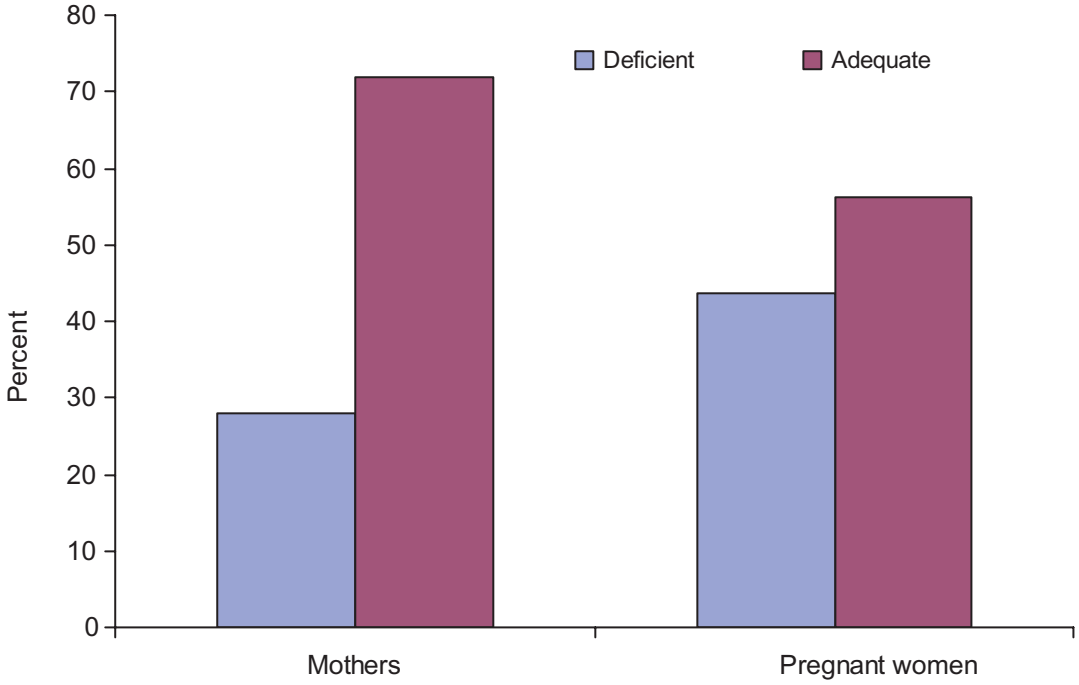

Figure 30. National zinc status of mothers and pregnant women.

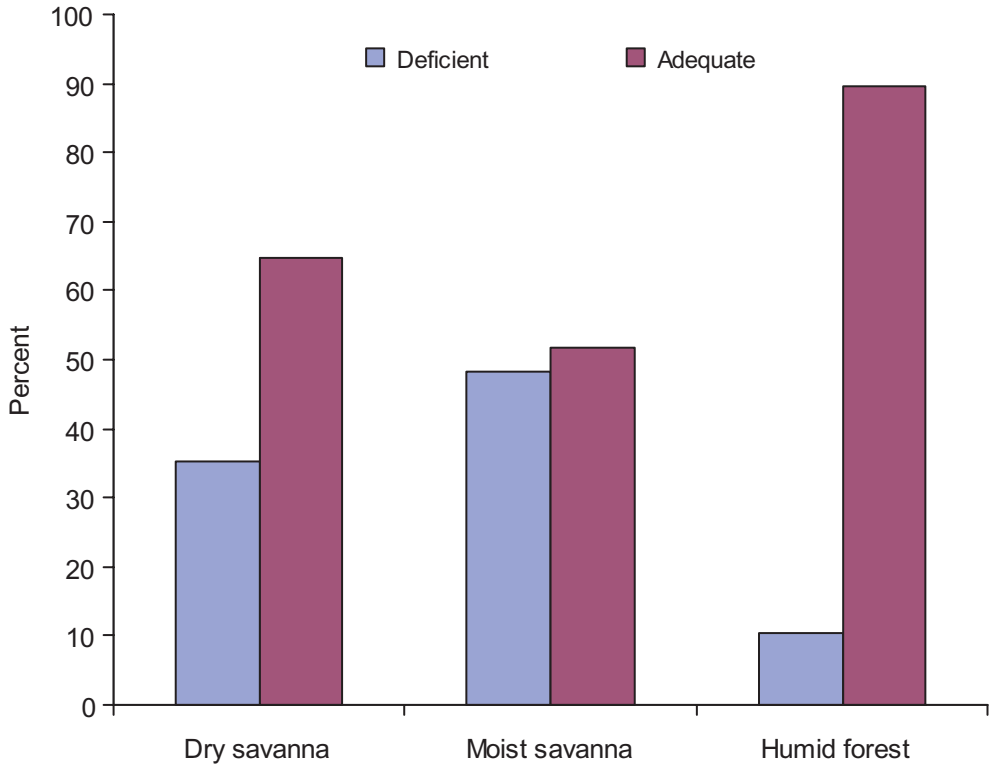

Figure 31. Zinc status of mothers by AEZ.

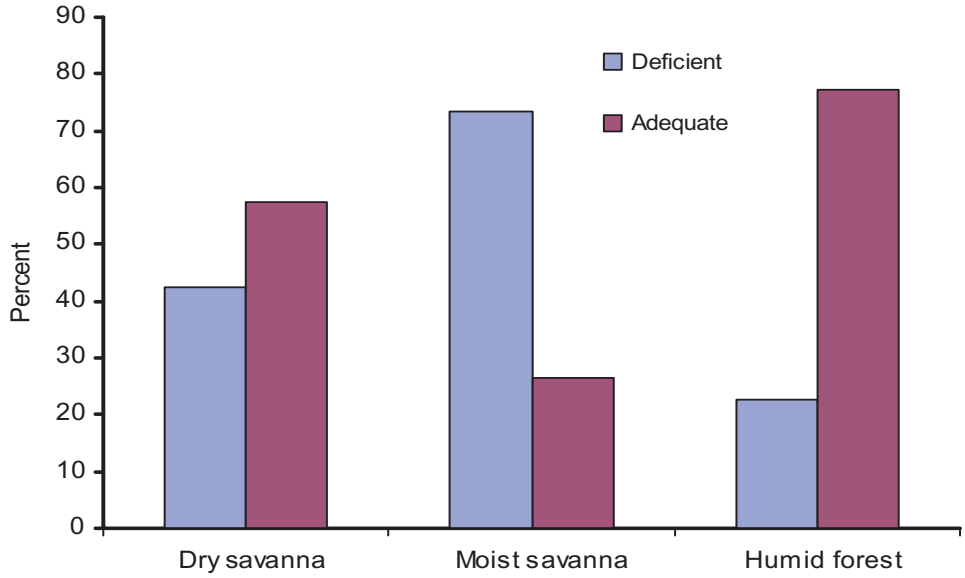

Figure 32. Zinc status of pregnant women by AEZ.

Iodine status

Iodine deficiency disorders (IDD) constitute the single greatest cause of preventable brain damage in the fetus and infant, and of retarded psychomotor development in young children. IDD remains a major threat to the health and development of populations worldwide, but particularly among preschool children and pregnant women. It results in goiter, stillbirth, and miscarriages, but the most devastating toll involves mental retardation, deaf-mutism, and impaired educability. Urinary iodine excretion is a good marker of the very recent dietary intake of iodine and, therefore, is the index of choice for evaluating the degree of iodine deficiency and of its correction. In this survey, urinary iodine has been adopted as the epidemiological criterion for assessing iodine nutrition of children under 5, mothers, and pregnant women.

Classification of laboratory results of urinary analysis has employed the references and cutoff points recommended by ICCIDD/WHO/UNICEF. The cutoff points are as follows:

Epidemiological criteria for assessing iodine nutrition based on median urinary iodine concentrations

Mean urinary iodine (µg/L)	Iodine nutritional status
< 20	Severe iodine deficiency
20–49	Moderate iodine deficiency
50–99	Mild iodine deficiency
100–199	Optimal
200–299	More than adequate
> 300	Possible excess

Iodine status of children under 5

A total of 27.5% of the children suffered various degrees of iodine deficiency while 46.5% had more than adequate levels. The deficiency was severe in 4.2%, moderate in 8.7%, and mild in 14.6%. Only 26.0% of the children had optimal levels of iodine. However, it is noteworthy that 16.6% of the children had more than adequate levels while 29.8% had a possible excess intake of iodine and ran the risk of adverse health consequences (Fig. 33).

Furthermore, in mothers, 30.7% had varying degrees of iodine deficiency, 28.8% had optimal levels, while 40.5% had a more than adequate intake. Deficiency was severe in approximately 4.2%, moderate in 8.8%, and mild in 17.8%. Among the mothers, 18.3% had a more than adequate iodine intake and 22.2% had a possible excess and ran the risk of adverse health consequences.

Among the subsample of pregnant women, 10.5% had iodine deficiency, 31.5% had a normal or optimal range of iodine intake, and 23.1% had a possible excess. Deficiency of iodine was reported as severe in 3.1%, moderate in 7.4%, mild in 16%, optimal in 31.5%, more than adequate in 18.9% and with possible excess in 23.1%.

In the review of iodine nutrition across the AEZ (Fig. 34), the proportion of children under 5 with possible excess intake, which might constitute a danger or health hazard, was 42.6% in the dry savanna, 25.3% in the moist savanna, and 28.1% in the humid forest zone. Iodine deficiency among children in the three AEZ was 6.9% in the dry savanna, 16.5% in the moist savanna, and 11.2% in the humid forest.

Deficiency of iodine was reported in 10.6% of children under 5 in the medium sector, 15.5% in the rural sector, and 10.6% in the urban sector. More than adequate and possible excessive intakes of iodine were seen in 51% of children under 5 in the medium sector, 42% in the rural sector, and 49% in the urban sector.

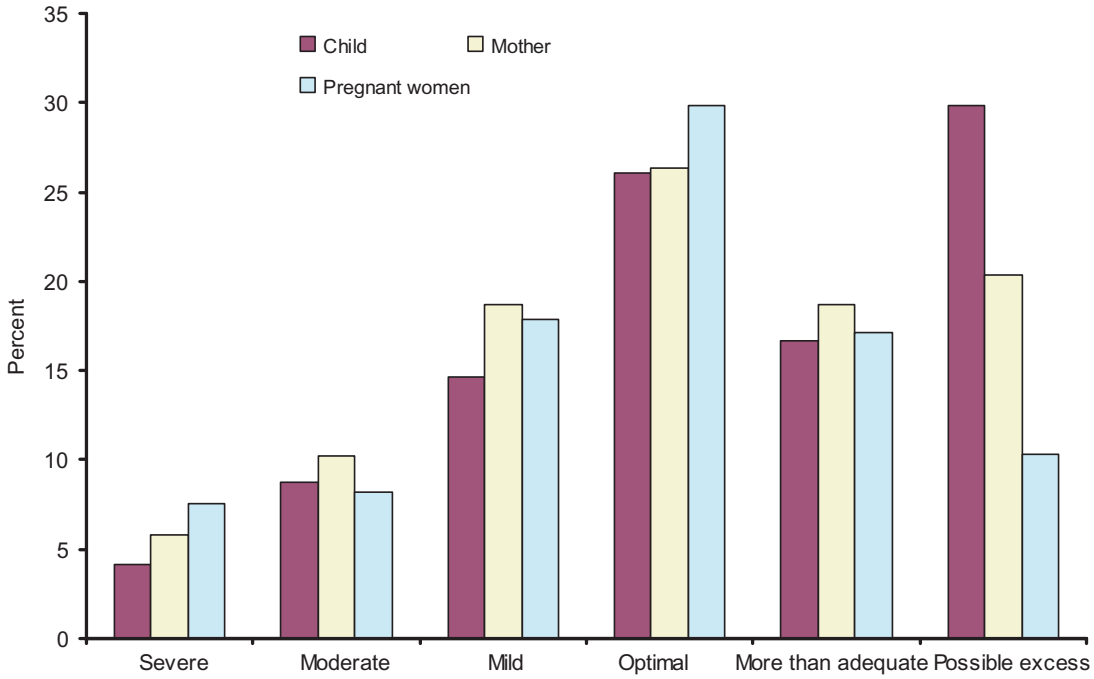

Figure 33. Profile of national iodine status of children, mothers, and pregnant women.

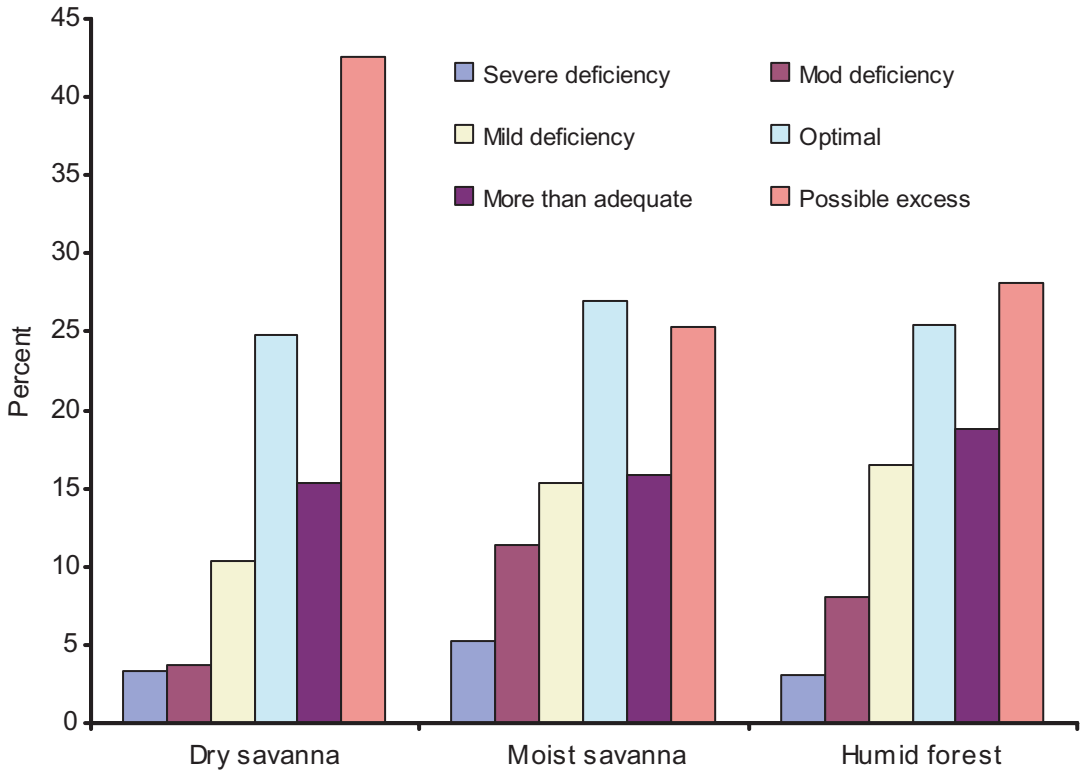

Figure 34. Profile of iodine status of children under 5 by AEZ.

Iodine status of mothers and pregnant women

Iodine deficiency in mothers by AEZ was 11.6% in the dry savanna, 19.0% in the moist savanna, and 15.2% in the humid forest (Fig. 35). The percentage of those with mild deficiency ranged from 16.8 to 21.6% across AEZ.

Iodine deficiencies among mothers were 10% in the urban sector, 13.7% in the medium sector, and 21% in the rural sector. A more than adequate intake was seen in 16.6% of the mothers in the rural sector, 20.6% in the medium sector, and 20.3 in the urban sector. Those with possible excess iodine intake were observed in the rural sector (14.6%), medium sector (25.9%), and urban (24.4%) sector.

In pregnant women, the deficiency rates were 8.0% for the dry savanna, 15% for the moist savanna, and 11.3% for the humid forest (Fig. 36). Although the deficiency level was low, over one-fifth of pregnant women in all AEZ had a possible excess iodine intake, being 22.3% in the dry savanna, 22.4% in the moist savanna, and 25.8% in the humid forest.

There were more pregnant women with adequate iodine status in the dry savanna (34.7%), followed by those in the moist savanna and humid forest (28.4%). Across the AEZ, the percentages of pregnant women with adequate iodine nutrition range from 27.4–34.9%.

Among pregnant women, iodine deficiency was reported as 10% in the medium, 9% in the urban, and 14% in the rural sectors. Excess intake was equally reported in 37% in the rural sector, 41% in the urban sector, and 45% in the medium sector.

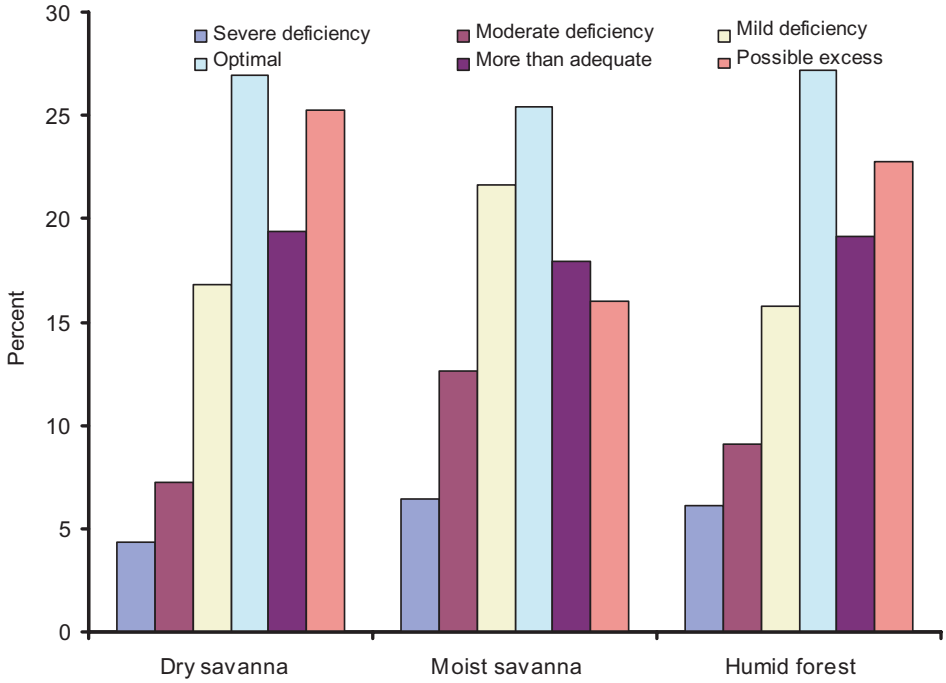

Figure 35. Profile of iodine status of mothers by AEZ.

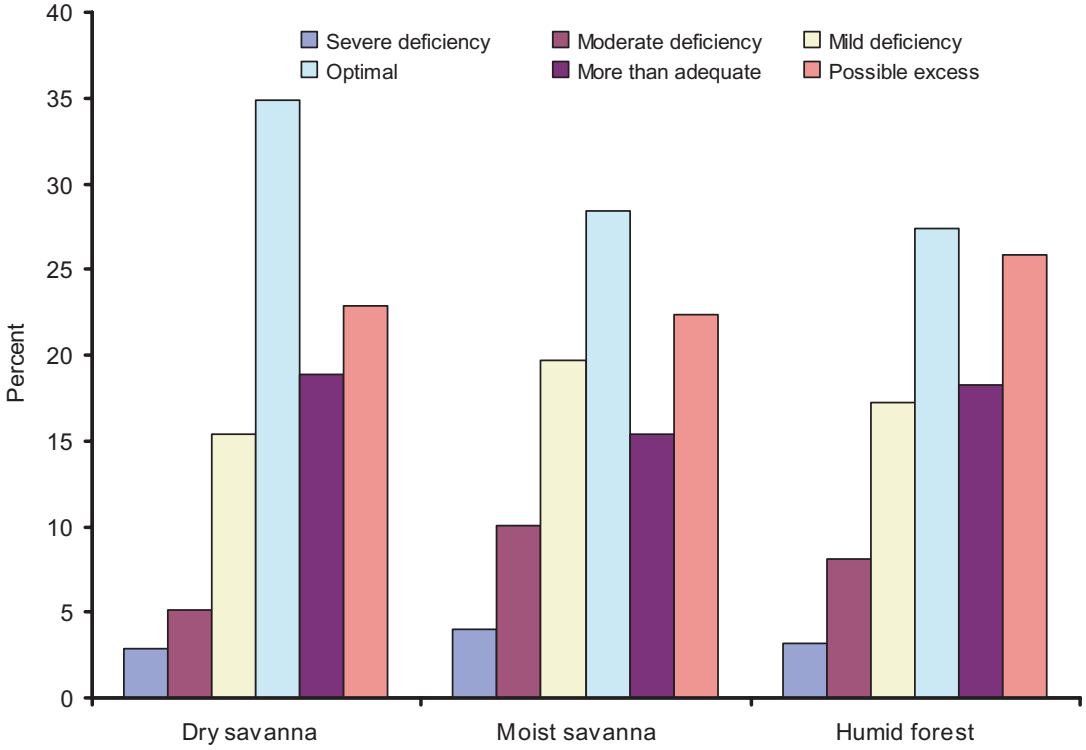

Figure 36. Profile of national iodine status of pregnant women by AEZ.

Health and care

Child health

One of the key objectives of the survey was to collect information on the health of the mother and her child under 5. The health of the child and data on mortality and morbidity constitute an important part of such information. Consequently, mothers of children under 5 were requested to provide information on the illness profile, methods of prevention (including vaccination), and treatment of common diseases of these children.

The health of children was first assessed on whether the child had been ill during the two-week period preceding the survey day. The observed results showed that 57% of all respondents' children had been ill during that period.

Information on how often the child had been sick with different illnesses during the year was solicited. Malaria was the most prevalent as it affected 71.3% of the children and a large majority (32.4%) between twice and four times a year.

The prevalence of malaria was higher in the humid forest (75.7%) and lower in the moist savanna (71.7%) and dry savanna (71.2%). More suffered from malaria two to four times a year in the dry savanna (36.3%) than those in the humid forest (35.2%) and moist savanna (31.1%).

More children in the rural areas (73.9%) were affected by malaria than in the medium (70.6%) and urban (67.5%) sectors.

Diarrhea was the second most prevalent sickness (48.7%) among children under 5. The prevalence of diarrhea was much higher in the rural sector (52.5%) than in either the medium (49.6%) or urban (42.7%) sectors. It was also higher in the dry savanna than in the humid forest and lower in the moist savanna (12.7%).

Cough without fever: This question was aimed at soliciting information on upper respiratory tract infections. This was the third most frequent ailment among the children surveyed (47.5%). This was higher in the rural sector (51.1%), and lower in the medium (44.4%) and urban (45.4%) sectors. This condition was higher in the humid forest (51.1%) than in the dry savanna (35.8%) and moist savanna (47.2%).

Measles is easily recognized by mothers but could be confused with other rash-associated febrile illnesses. However, it is a once-in-a-lifetime infection. This affected about 21.9% of the children; the highest prevalence was among children from the rural area (22.7%), and least from the urban (21.5%) and medium (21.3%) areas.

The nutrient-depleting nature of measles predisposes children to severe/clinical malnutrition. The prevalence in the dry savanna (30.1%) was higher than in the moist savanna (15.1%) and humid forest (20.2%).

Whooping cough: The prevalence of whooping cough was understandably low (8.9%) nationally. It was higher in the rural (11.0%) than the urban (6.8%) sector. It was also higher in the dry savanna (11.4%) than in moist savanna (8.1%) and humid forest (7.6%).

Location of treatment

In evaluating childcare practices, the place of treatment of a sick child, which is part of home health practices, is indicative of the quality of care given to the child. A wide range of social, cultural, and economic factors influences the choice households make in treating their sick children.

The four popular options household caregivers usual adopted were the following in their order of importance: use of primary health care (PHC) facilities (29%), going to chemists' shops (21%), traditional healing homes (17.6%), and the use of hospitals (13.5%).

Across the zones, the most common option in the dry savanna was the traditional healing home (39%), PHC in the moist savanna (39%), and the use of chemists' shops (27.2%) and PHC (27%) in the humid forest. The use of PHC facilities was equally appreciably low in the dry savanna (22%), followed by the use of chemists' shops (18%), and a substantially lower use of hospitals (9.2%) compared to the other zones.

About 17% of households in the humid forest zone use hospitals. It was interesting to note that use of traditional healing homes, which was observed to be the most common option in the dry savanna, and appreciably used in the moist savanna was least used in the humid forest zone (4%).

Malaria prevention methods

The most popular method used in the prevention of malaria was insecticide spray (52%). Across the AEZ, use was 44.8% in the dry savanna, 67.3% in the moist savanna, and 49.9% in the humid forest. Window netting use was low (4%) (Table 15).

The second most used method was "other methods" (29%), in which the mosquito coil was most frequently used (66.0%) followed by leaf and ***Ota Pia-Pia*** (11.3%). The use of insecticides in the prevention of malaria was 48.3% in the rural sector, 51.8% in the medium, and 60.4% in the urban sector.

Nationally, 14.2% of the respondents used bed nets. In the dry savanna, only 18.0% used bed nets followed by those in the humid forest (15.0%) and moist savanna (7.4%).

Bed nets are used in the prevention of malaria by 14.7% of the respondents in the rural sector, 14.8% in the medium sector, and 10.7% in the urban sector.

Table 15. Malaria prevention methods.

Type of prevention method	National	Agroecological zones			Sector		
		Dry savanna	Moist savanna	Humid forest	Rural	Medium	Urban
Insecticides	52.5	44.8	67.3	49.9	48.3	51.8	60.4
Bed nets	14.2	18.0	7.4	15.0	14.7	14.8	10.7
Windows/ door netting	4.1	0.5	3.6	8.1	3.5	3.7	5.7
Others	29.2	36.7	21.6	27.1	32.5	29.7	23.3

Treatment of diarrhea

Oral rehydration solution (ORS) was the most popular (55%) method of treating diarrhea, while homemade salt–sugar solution came a far second (26.8%). The use of ORS was by 64.8% of respondents in the dry savanna, 58.1% in the moist savanna, and about 43% in the humid forest.

The use of homemade salt solution was 17.9% in the dry savanna, 22.2%in the moist savanna, and 39.0% in the humid forest. The use of ORS in the sectors was similar, with the highest being 56.7% in urban areas, 55.9% in medium, and 53.8% in rural areas (Table 16).

It would appear that access (physical and economic) were determinants of the choice of treatment given by mothers to their children to treat/or manage diarrhea. About one-fifth of the mothers used other methods. The use of herbs and the dispensary was notably significant.

Table 16. Treatment of diarrhea.

Type of treatment	National	Agroecological zones			Sector		
		Dry savanna	Moist savanna	Humid forest	Rural	Medium	Urban
ORS	55.2	64.8	58.1	43.0	53.8	55.9	56.7
Homemade salt solution	26.8	17.9	22.2	39.0	24.4	29.5	26.8
Others	18.0	17.3	19.7	17.4	21.8	14.6	16.5

Immunization profile

Nationally, only 21% of the children surveyed had had all or "complete" immunization prescribed against vaccine-preventable childhood illnesses (BCG, DPT, and oral polio, measles). Thirty-six percent had had "no immunization" at all, while 43% had had "some" (Table 17).

Among the children who had had "complete" immunization, the highest proportion (32.8%) was in the humid forest and the lowest (9.6%) in the dry savanna. It was intermediate (20%) in the moist savanna.

Among those who had had no immunization, the highest proportion (64%) was from the dry savanna and lowest (10.7%) from the humid forest. The full benefits of childhood immunization are best achieved when all the prescribed immunization is given to the child.

The percentage of children who had had all immunizations was lowest (18%) in the rural sector and highest (28%) in the urban sector. Conversely, "no immunization" was highest (38%) in the rural sector and lowest (24%) in the urban sector. Does the educational level of the mother affect the immunization status of the child? The answer is not clear-cut.

The proportion of those who had had all immunization increased with the mother's education. It was 11.7% in mothers with no formal education, 24% in mothers with primary school education (not completed), 32.6% in those with primary school completed, 40% in those with secondary school completed, and 45% in the children of mothers with postsecondary education (Fig. 37). There was a gradual increase in the percentage of children under 5 with all immunizations as the age of the mother increased.

Table 17. Profile of immunization of children under 5 by national, AEZ, and sector levels.

Category	All immunizations	No immunization	Some immunizations
National	21.07	35.97	42.97
AEZ			
Dry savanna	9.6	64.0	26.0
Moist savanna	20.0	35.0	44.6
Humid forest	32.8	10.7	56.0
Sector			
Rural	18.0	38.0	43.0
Medium	23.0	34.0	42.0
Urban	28.0	24.0	46.0

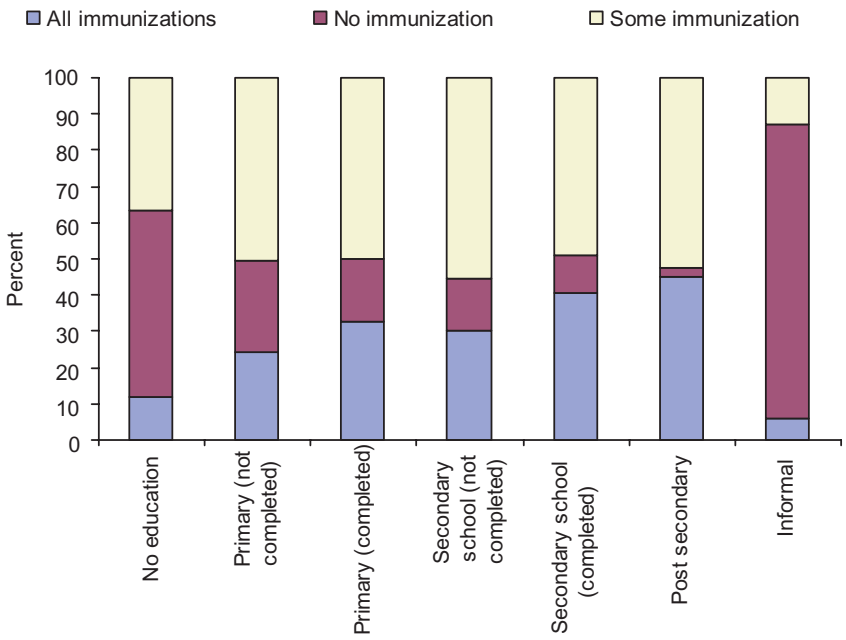

Figure 37. Profile of immunization of children under 5 by education level of mothers.

Awareness of exclusive breastfeeding in nursing mothers

Most nursing mothers (55%) were not aware of exclusive breastfeeding (EBF). This pattern was upheld in the dry savanna zone. There were more who were aware of it in the humid forest (62%) and the moist savanna (58%). There seemed to be about equal levels of awareness and no awareness in the rural sector, but there was more awareness in the medium and urban sectors.

Introduction of foods or water

Other foods/water were introduced in the first month in 73.2% of subjects. The practice of exclusive breastfeeding was low in parallel with the high levels of nonawareness. About 15% can be considered to have practiced EBF nationally for six months.

The majority in all the AEZ introduced other foods in the first month, and about 20% waited three to six months before introducing other foods or water with breastfeeding in the moist savanna and humid forest.

For how long was the last child exclusively breastfed?

The prevalence of those who did not exclusively breastfeed was similar to the previous record. The range for those who did not exclusively breastfeed was 58–90 % in the AEZ and nationally it was 69.6%.

Those who exclusively breastfed for four to six months were 7.9–24.7% in the different AEZ and 19.4% nationally. The figure was higher in the rural (70.8%) and medium sectors (69.4%), and lower (67.9%) in the urban sector.

Knowledge/awareness of growth monitoring

On a national basis, more mothers (58.6%) were not aware of growth monitoring while 41.3% were aware of it in the moist savanna and humid forest. From those who were aware, only 20.4% practiced it.

More mothers were not aware of growth monitoring in the dry savanna (68.9%) followed by the humid forest (55.9%) and moist savanna (50.8%). The percentage of those who practiced growth monitoring ranged from 6.8 in the dry savanna to 27.3 in the humid forest.

Mothers in the urban sector were more aware of growth monitoring (51.8%) and also practiced it (27.5%). Those in the rural areas were the least aware (32.8%) and also practiced it the least (16.6%).

Care for women

In a majority (70–80%) of cases, women would always discuss issues with their husbands especially when it related to their own (71%) or their children's health (83%). Between 3.3 and 4.4% of the respondents indicated that they would never discuss such issues with their husbands.

When it came to decision making, however, just over half (50.4%) of respondents at the national level indicated that their husbands might reconsider his position or accept theirs in the event of a disagreement.

The percentage of those who indicated that their husbands would reconsider his position or accept their opinion was high in the dry savanna (61.2%) followed by the moist savanna (48.9%) and humid forest (38.5%). For the sectors, the percentages were not very different at 49.4% (rural), 50.8% (medium), and 52.0% (urban).

The workload for women seemed to be heavier in the dry savanna and humid forest than in the moist savanna. About 20% of women respondents in the dry savanna (19.9%) and humid forest (17.5%) indicated that their workloads never allowed any time to rest. The corresponding figure in the moist savanna was 10%.

Awareness of child spacing was higher in the humid forest (76%) than in the moist savanna (63%) or the dry savanna (48%). Discussing with spouses was highest in the humid forest (50%) than the moist savanna (33%) and least in the dry savanna (7%). There is a parallel between awareness and discussion of the issue.

Access to antenatal care and its utilization was higher in the humid forest (76%) than in the moist savanna (69%) and dry savanna (39). It was also higher in the urban areas (75%), followed by the medium (64%) and rural (55%) areas.

When asked if women were allowed to participate in income-generating activities, almost 90% in the humid forest were allowed by their husbands to participate in such activities. However, almost 40% of respondents in the dry savanna said they were not allowed. Differences in response to this question were not so different across rural (78.6%), medium (74%), and urban (75.7%) sectors.

Nationally, 51% of women indicated that their food share improved during pregnancy. In the agroecological zones, approximately 50% of respondents said that their food share within the family was increased during pregnancy. The figures were 45.5% (dry savanna), 52.3% (moist savanna), and 53.4% (humid forest).

Seventy-three percent of the respondents said that women's education is encouraged while only 26% said it was discouraged with less than 1% saying it was tabooed.

Disaggregating by agroecological zone revealed that women's education was more encouraged in the humid forest (94.6%) than in the moist savanna (68.3%), and dry savanna (49.3%).

Responses were collected on the most preferred person to go to school when resources were scarce. These indicated that 40% preferred the boy/girl jointly while 12.2% would send the most intelligent persons to school irrespective of whether they were boys or girls.

A majority (67%) of the respondents nationwide covered the food but kept it in the open. About 13% kept the food in the cupboard. Approximately the same percentage of respondents (11.1%) kept the leftover food warm. Only 4% of respondents preserved the food in a refrigerator. Significantly, however, over 3% of women kept their food uncovered in the open.

Conclusions

The foregoing discussions of the National Food Consumption and Nutrition survey indicate the need to take appropriate actions to ameliorate the observed levels of malnutrition amongst Nigerians. Several clear deductions can be made based on the findings in this survey. These include the following:

Food security

Staple foods were available almost all the year round, although not all the survey respondents were able to afford them. Nonstaple foods were also available; however, the availability–affordability gap was wider in meat and fish products.

Severe food insecurity was found in over 40% of all households surveyed in all the zones across the country and in all sectors. The implication of this finding is that food security is not only in providing physical access but also economic access to food to increase the food availability index of households.

Differences in the pattern of food consumption were observed across the AEZ (Table 8), indicating that the foods people consumed were determined by the foods that were available in their areas and these foods were determined in turn by the agroecological characteristics of the area. While the frequency of consumption of the major staples was high across the zones, consumption of some foods was particularly high where such foods grow better.

Nutritional status of under 5 children and mothers

Nationally, 42% of the children in this study were stunted (chronic, longer standing malnutrition), while about 10% were wasted (acute, ongoing malnutrition). Underweight was 25%. With these indicators of malnutrition, protein energy malnutrition is still the major problem of public health importance in Nigeria. This magnitude of malnutrition deserve urgent attention knowing the consequences of malnutrition as it affects survival and health, education, and the economy of the nation.

Among the mothers, nationally, undernutrition was found in about 12%. This is of public health magnitude especially in the dry savanna and rural settings. There is therefore a need for nutrition intervention actions targeted at under 5 children, and their mothers.

Vitamin A deficiency

At the time of the survey, 29.5% of the children had (marginal) deficiency of vitamin A. This level is of public health importance. This was above 20% in all zones and sectors. The consequences of vitamin A deficiency as it affects morbidity, severity, and mortality of several infections make this level a trigger point for action. This is more so in view of vitamin A supplementation, which was, carried our close to the time of the survey. In mothers, those at risk of vitamin A deficiency were 13%, of these the highest prevalence (19.6%) was in the dry savanna and lowest (8.8%) in the humid forest.

Among pregnant women, 19.2% were at risk of vitamin A deficiency nationally. There was a gradual decrease in risk from the dry savanna, through the moist savanna, to the humid forest.

Iron

The iron profile from this survey showed that almost 20% of the children surveyed were iron deficient and another 8% with iron store depletion. It is noteworthy that usually iron deficiency anemia does not occur until after iron store depletion. A level of over 25% of iron deficient under 5 children, invites attention to the issues of adequate dietary intake of iron. This profile is not the same in the three agroecological zones. Iron deficiency in mothers was about 12% while it was higher (20%) in pregnant women.

The issue of iron deficiency hereby needs to be revisited to find out whether it was inadequate intake, inadequate absorption, or excessive demand was the reason. The effect of iron deficiency and anemia on child growth and cognitive responses and productivity as well as the propensity to infection should guide the actions at amelioration.

Iodine

Iodine deficiency was mild in 14.6% of the children surveyed, moderate in 8%, and severe only in 4%. Almost one-third of the children had optimal iodine levels. For mothers, about 18% had mild iodine deficiency, 10% had moderate iodine deficiency, and only about 7% had severe iodine deficiency. However, some survey subjects had more than adequate iodine levels while possible excess was found in others.

Zinc

Focus in recent times has shifted to the three relatively uninvestigated mineral elements—zinc, copper, and selenium. In this survey, 20% of the children surveyed were deficient in zinc, higher (36.5%) in the most savanna and lowest (6.3%) in the humid forest. Since zinc is a type II micronutrient, the effect of a deficiency in children is a slowing down or cessation of growth, among other effects. In mothers and pregnant women zinc deficiency was found in about 28% and 42%, respectively. Renewed attention should be paid to the issue of zinc deficiency in Nigeria.

Health and care

The frequency of illness and nature of the illness from this survey suggested that malaria is the most frequent of all illnesses. Diarrhea and cough without fever were other illnesses in children. Measles was noted to have affected about 20% of the children surveyed.

The Primary Health Care Center (PHC) was the most popular (29%) service of treatment followed by "patent medicine" sales/chemists (21%), traditional healing homes (1%), and hospitals (13%).

Malaria prevention was by the use of insecticide spray (52%), while others used the mosquito coil, among others. The use of bed nets at the time of survey was 14%. The need for intensive IEC on multiple methods of malaria prevention becomes apparent.

Immunization profile

Only 21% of all the children surveyed had all or "complete" immunization. The highest proportion (32%) was in the humid forest and lowest (9.6%) in the dry savanna. Immunization coverage must be over 90% for effective control of these vaccine-preventable children diseases. This low immunization coverage may have been an underlying factor in the level of illnesses observed in this survey.

Annex 1. Nutritional status of children under 5 and their mothers by state.

Percent prevalence of stunting among children 0–59 months by state.

State	Number of observations	Mild (< –1SD)	Moderate (< –2SD)	Severe (< –3SD)
Nasarawa	226	16.8	20.4	43.4
Taraba	408	20.1	16.9	27.9
Borno	519	17.9	15.2	31.6
Kaduna	428	22.9	18.2	29.2
Kebbi	345	11.6	16.8	57.1
Kano	694	16.1	19.6	38.3
Osun	472	29.7	17.4	12.5
Edo	415	21.2	15.2	18.3
Kwara	291	21.0	17.5	14.8
Imo	415	19.0	9.9	6.7
Bayelsa	250	20.4	9.6	9.2
Akwa Ibom	565	17.7	17.3	12.6

Percentage prevalence of wasting among children 0–59 months by state.

State	Number of observations	Mild (< –1SD)	Moderate (< –2SD)	Severe (< –3SD)
Nasarawa	211	15.2	7.1	3.3
Taraba	395	13.4	5.8	3.3
Borno	480	19.0	9.2	3.5
Kaduna	397	13.4	6.0	3.8
Kebbi	319	11.9	4.7	5.6
Kano	630	14.4	7.5	7.8
Osun	459	25.3	4.6	1.3
Edo	392	16.6	3.3	2.8
Kwara	283	12.0	2.8	1.4
Imo	401	18.5	5.7	3.0
Bayelsa	236	18.2	3.0	2.5
Akwa Ibom	545	22.8	4.8	1.5

Percentage prevalence of underweight, among children 0–59 months by state.

State	Number of observations	Mild (< -1SD)	Moderate (< -2SD)	Severe (< -3SD)
Nasarawa	224	23.2	22.8	12.1
Taraba	401	22.9	15.7	10.0
Borno	520	29.0	19.8	10.6
Kaduna	421	25.2	22.3	8.1
Kebbi	336	25.9	24.4	22.0
Kano	662	30.5	22.7	16.2
Osun	469	40.3	16.8	2.6
Edo	417	27.1	11.5	3.4
Kwara	289	28.0	10.4	3.1
Imo	414	24.2	9.7	4.3
Bayelsa	241	24.1	11.6	3.3
Akwa Ibom	560	27.5	14.5	2.1

Percentage prevalence of underweight, overweight. and obesity among women of reproductive age by state.

State	Number of observations	BMI < 18.5	BMI 25.0-29.9	BMI 30 and above
Nasarawa	222	5.4	16.2	9.5
Taraba	406	13.8	15.3	5.4
Borno	549	17.1	11.7	4.9
Kaduna	421	8.8	16.2	5.7
Kebbi	340	8.5	13.2	2.4
Kano	696	19.7	10.8	4.6
Osun	470	10.2	12.8	4.5
Edo	413	8.5	14.5	7.3
Kwara	287	9.4	18.5	7.7
Imo	422	7.3	19.4	7.6
Bayelsa	238	8.4	14.7	5.9
Akwa Ibom	567	9.9	13.4	5.6

Annex 2. Micronutrient status of children under 5 by state.

Vitamin A status of all children under 5 surveyed by states.

State	Number of observations	Normal (%)	Marginal (%)	Clinical (%)
Nasarawa	202	78.7	19.3	2.0
Taraba	330	79.7	17.8	2.4
Borno	280	63.6	32.1	4.29
Kaduna	212	69.8	27.8	2.36
Kebbi	107	48.6	46.7	4.67
Kano	398	77.8	20.7	1.8
Osun	259	76.1	22.4	1.5
Edo	251	38.7	27.6	32.8
Kwara	184	73.9	23.4	2.7
Imo	254	89.4	10.2	0.4
Bayelsa	179	77.1	22.4	0.6
Akwa-Ibom	436	70.9	27.3	1.8

Vitamin E status of all children under 5 surveyed by states.

State	Number of Observations	Normal (%)	Deficient (%)
Nasarawa	202	83.7	16.3
Taraba	330	79.7	20.3
Borno	280	87.9	12.1
Kaduna	212	84.9	15.1
Kebbi	107	74.8	25.2
Kano	400	84.7	15.3
Osun	259	76.4	23.6
Edo	256	40.6	59.4
Kwara	184	67.4	32.6
Imo	254	89.4	10.6
Bayelsa	179	70.4	29.6
Akwa Ibom	436	79.6	20.4

Iron status of all children under 5 surveyed by states.

State	N	Iron def. (%)	Iron store depletion (%)	Normal (%)	Above normal (%)	Iron overload (%)
Nasarawa	199	7.5	7.0	66.3	13.6	5.5
Taraba	279	19.4	11.5	53.1	14.3	1.8
Borno	267	37.6	12.0	37.2	12.4	0.8
Kaduna	215	12.1	7.9	43.7	30.7	5.6
Kebbi	101	33.7	12.9	42.6	10.9	0
Kano	294	19.4	15.0	57.5	7.1	1.0
Osun	233	3.4	4.3	42.9	43.4	6.0
Edo	219	15.1	15.5	46.1	18.7	4.6
Kwara	188	12.2	5.9	39.4	38.8	3.7
Imo	252	13.5	9.9	52.8	19.4	4.4
Bayelsa	178	24.7	10.7	49.4	11.8	3.4
Akwa-Ibom	438	13.2	11.6	47.5	24.0	3.7

Zinc status of children under 5 by state.

State	Number of observations	(%) Normal	(%) Deficient
Nasarawa	102	64.7	35.3
Taraba	131	74.8	25.2
Borno	106	89.6	10.4
Kaduna	95	64.2	35.8
Kebbi	34	41.2	58.8
Kano	121	69.4	30.6
Osun	98	94.9	5.1
Edo	97	93.8	6.2
Kwara	88	40.9	59.1
Imo	126	93.7	6.4
Bayelsa	53	84.9	15.1
Akwa-Ibom	174	93.1	6.9

Urinary iodine concentration in children under 5 by state.

State	Number of observations	Median ug/L	Mean ug/L	Std. Err.
Nasarawa	157	119.19	163.99	11.64
Taraba	227	157.88	199.09	11.19
Borno	192	237.09	350.62	26.02
Kaduna	214	163.18	239.19	15.67
Kebbi	44	152.84	208.32	31.93
Kano	210	309.65	383.72	20.08
Osun	272	173.35	221.93	10.54
Edo	189	199.10	274.67	16.84
Kwara	171	183.83	222.18	13.38
Imo	264	208.35	249.40	11.47
Bayelsa	167	231.35	299.19	26.19
Akwa Ibom	196	178.30	227.11	13.47

Iodine status of all surveyed children under 5 by state.

State	N	Severe deficiency (%)	Moderate deficiency (%)	Mild deficiency (%)	Optimal (%)	More than adequate (%)	Possible excess (%)
Nasarawa	157	7.0	16.6	19.1	25.5	17.2	14.7
Taraba	227	6.6	11.5	14.1	27.8	16.3	23.8
Borno	192	4.2	4.2	10.4	25.5	12.5	43.2
Kaduna	214	3.7	12.2	21.5	19.2	12.6	30.8
Kebbi	44	11.4	4.6	9.1	38.6	13.6	22.7
Kano	210	1.0	1.4	5.7	23.3	17.6	50.9
Osun	272	1.5	8.5	15.8	29.8	17.7	26.8
Edo	189	0.5	4.8	18.5	26.5	16.9	32.8
Kwara	171	1.8	9.9	16.9	23.4	23.9	23.9
Imo	263	2.7	5.3	17.1	23.6	16.7	34.6
Bayelsa	167	0.6	2.4	11.4	31.7	17.9	35.9
Akwa Ibom	196	4.6	8.7	15.8	29.1	16.3	25.5

Annex 3. Micronutrient status of mothers by state.

Vitamin A status of mothers by state.

State	Number of observations	(%) Normal	(%) Deficient
Nasarawa	204	99.0	1.0
Taraba	332	94.3	5.7
Borno	384	95.8	4.2
Kaduna	335	97.0	3.0
Kebbi	201	96.0	4.0
Kano	501	98.2	1.8
Osun	293	99.3	0.7
Edo	258	67.8	32.2
Kwara	249	100	0.0
Imo	365	99.2	0.8
Bayelsa	233	100	0.0
Akwa Ibom	519	98.8	1.2

Vitamin E status of women by state.

State	Number of observations	(%) Normal	(%) Deficient
Nasarawa	204	94.1	5.9
Taraba	332	77.7	22.3
Borno	384	87.0	13.0
Kaduna	335	89.9	10.1
Kebbi	201	89.6	10.4
Kano	501	87.4	12.6
Osun	293	88.7	11.3
Edo	258	48.4	51.6
Kwara	249	80.3	19.7
Imo	365	90.7	9.0
Bayelsa	233	94.0	6.0
Akwa Ibom	519	91.7	8.3

Iron status of mothers by states.

State	N	Iron def. (%)	Iron store depletion (%)	Normal (%)	Above normal (%)	Iron overload (%)
Akwa Ibom	512	12.5	17.2	59.4	9.5	1.5
Bayelsa	229	29.5	12.8	55.1	2.6	0.0
Borno	376	18.6	13.8	61.7	5.7	0.3
Edo	261	8.3	9.7	73.0	8.7	0.3
Imo	362	12.1	15.5	62.5	9.0	0.9
Kaduna	332	12.1	9.3	67.8	10.2	0.6
Kano	371	20.1	14.5	60.3	4.8	0.2
Kebbi	198	10.8	14.2	66.2	7.8	1.0
Kwara	275	8.1	7.0	71.0	13.2	0.7
Nasarawa	205	2.5	8.8	80.9	7.4	0.5
Osun	329	3.2	4.9	63.6	27.0	1.3
Taraba	329	14.8	8.6	59.3	15.4	1.8

Zinc status of mothers by state.

State	Number of observations	(%) Normal	(%) Deficient
Akwa Ibom	512	88.3	11.7
Bayelsa	229	75.1	24.9
Borno	376	78.7	21.3
Edo	261	92.3	7.7
Imo	362	93.1	6.9
Kaduna	332	41.3	58.7
Kano	371	66.6	33.4
Kebbi	198	34.3	65.7
Kwara	275	30.9	69.1
Nasarawa	205	58.5	41.5
Osun	329	95.4	4.6
Taraba	329	75.4	24.6

Iodine status of mothers by state.

State	N	Severe deficiency (%)	Moderate deficiency (%)	Mild deficiency (%)	Optimal (%)	More than adequate (%)	Possible excess (%)
Nasarawa	194	11.3	16.5	27.8	25.3	12.9	6.2
Taraba	238	6.3	13.0	19.3	21.4	21.0	18.9
Borno	252	2.4	8.7	17.5	28.6	15.1	27.8
Kaduna	275	6.2	8.7	23.6	27.3	16.4	17.8
Kebbi	171	14.6	15.2	24.6	26.9	9.9	8.8
Kano	290	0.3	2.1	10.7	23.8	27.2	35.9
Osun	273	3.7	9.2	20.2	32.6	17.6	16.9
Edo	211	2.4	5.7	15.6	28.0	19.4	28.9
Kwara	165	2.4	7.9	7.9	37.6	20.6	23.6
Imo	228	1.7	5.1	17.0	32.5	21.0	22.7
Bayelsa	208	0	3.4	11.1	30.3	19.2	36.1
Akwa Ibom	241	6.2	13.3	15.8	24.5	17.0	23.2

Annex 4. Micronutrient status of pregnant women by state.

Vitamin A status of pregnant women by state.

State	Number of observations	(%) Normal	(%) Deficient
Nasarawa	44	95.5	4.5
Taraba	66	89.4	10.6
Borno	92	89.1	10.9
Kaduna	65	92.3	7.7
Kebbi	55	92.7	7.3
Kano	102	92.2	7.8
Osun	62	95.2	4.8
Edo	38	52.6	47.4
Kwara	67	95.5	4.5
Imo	99	97.0	3.0
Bayelsa	41	90.2	9.8
Akwa Ibom	94	94.7	5.3

Vitamin E status of pregnant women by state.

State	Number of observations	(%) Normal	(%) Deficient
Nasarawa	44	100	0.0
Taraba	66	92.4	7.6
Borno	92	92.4	7.6
Kaduna	65	96.9	3.1
Kebbi	55	90.9	9.1
Kano	102	89.2	10.8
Osun	62	93.5	6.5
Edo	38	47.4	52.6
Kwara	67	77.6	22.4
Imo	99	90.9	9.1
Bayelsa	41	95.1	4.9
Akwa Ibom	94	84.0	16.0

Iron status of pregnant women by states.

State	N	Iron def. (%)	Iron store depletion (%)	Normal (%)	Above normal (%)	Iron overload (%)
Akwa Ibom	88	25.8	20.4	45.2	7.5	1.1
Bayelsa	35	40.0	14.3	34.3	11.4	0.0
Borno	87	25.6	25.6	41.9	5.8	1.2
Edo	43	10.9	15.2	69.6	2.2	2.2
Imo	101	21.7	13.4	54.6	9.3	1.0
Kaduna	65	23.4	9.4	64.1	3.1	0.0
Kano	70	24.1	17.7	53.2	5.1	0.0
Kebbi	52	11.5	21.2	61.5	5.8	0.0
Kwara	73	5.5	9.6	58.9	19.2	6.9
Nasarawa	44	9.3	13.9	72.1	4.7	0.0
Osun	71	11.9	10.7	58.3	16.7	2.4
Taraba	66	31.8	22.7	31.8	12.1	1.5

Zinc status of pregnant women by state.

State	Number of observations	(%) Normal	(%) Deficient
Akwa Ibom	88	79.6	20.4
Bayelsa	35	54.3	45.7
Borno	87	74.7	25.3
Edo	43	86.0	14.0
Imo	101	79.2	20.8
Kaduna	65	16.9	83.1
Kano	70	57.1	42.9
Kebbi	52	28.8	71.2
Kwara	73	16.4	83.6
Nasarawa	44	31.8	68.2
Osun	71	77.5	22.5
Taraba	66	43.9	56.1

Iodine status of pregnant women by state.

		Severe deficiency	Moderate deficiency	Mild deficiency	Optimal	More than adequate	Possible excess
State	N	(%)	(%)	(%)	(%)	(%)	(%)
Nasarawa	38	7.9	5.3	29.0	31.6	21.1	5.3
Taraba	46	6.5	17.4	8.7	26.1	15.2	26.1
Borno	47	0.0	8.9	13.3	20.0	35.6	22.2
Kaduna	56	1.8	8.9	26.8	41.1	3.6	17.9
Kebbi	45	6.7	6.7	22.2	42.2	13.3	8.9
Kano	53	1.9	3.8	9.4	30.2	17.0	37.7
Osun	58	3.5	6.9	20.7	36.2	20.7	12.1
Edo	36	0.0	5.6	27.8	16.7	27.8	22.2
Kwara	51	2.0	5.9	7.8	37.3	23.5	23.5
Imo	74	2.7	8.1	12.2	35.1	13.5	28.4
Bayelsa	38	2.6	0.0	7.9	39.5	23.7	26.3
Akwa Ibom	40	10.0	7.5	10.0	32.5	17.5	22.5

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Acronyms and abbreviations

AEZ	agroecological zone
ARS	Agricultural Research Services
BCG	Bacillus Calmete Guerin
BMI	body mass index
BMS	bench mark survey
CNRG	Community Nutrition Research Group
DPT	diphtheria, pertussis, and tetanus
EA	enumeration area
EBF	exclusive breastfeeding
FCNS	food consumption and nutrition survey
FGN	Federal Government of Nigeria
FIB	food instruction booklet
IITA	International Institute of Tropical Agriculture
LGA	Local Government Area
MICS	multiple indicator cluster survey
NDHS	national demographic and health survey
NPC	National Plannng Commission
PFC	principal food crop
PIC	participatory information collection
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USDA	United States Department of Agriculture